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Volume 29, issue 1

Canadian Medical Association

Volume 29, No. 1, January 1986

Symposium on Venous Disease

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The Canadian Journal of Surgery

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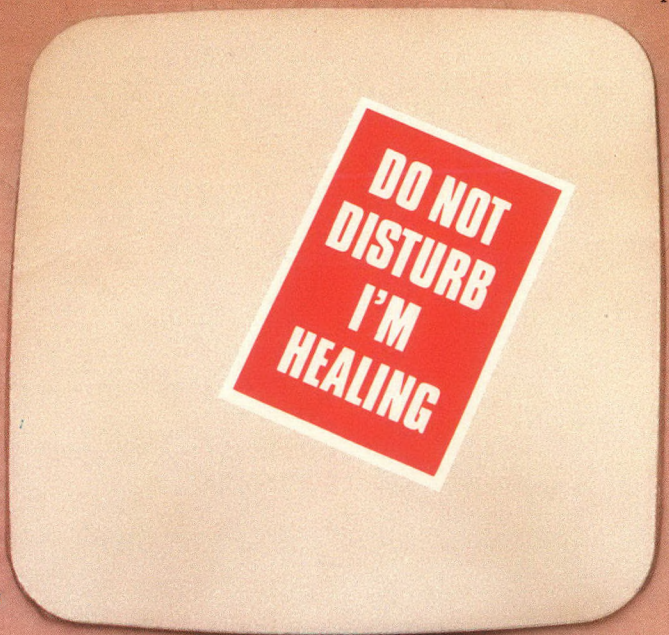

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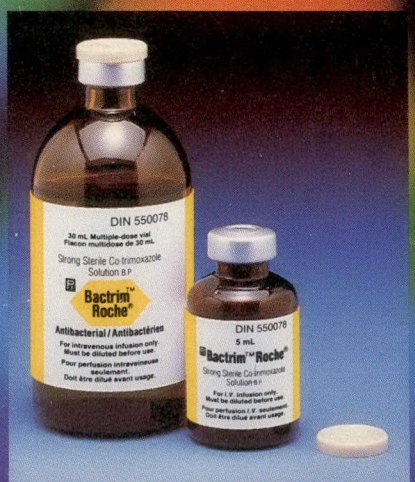

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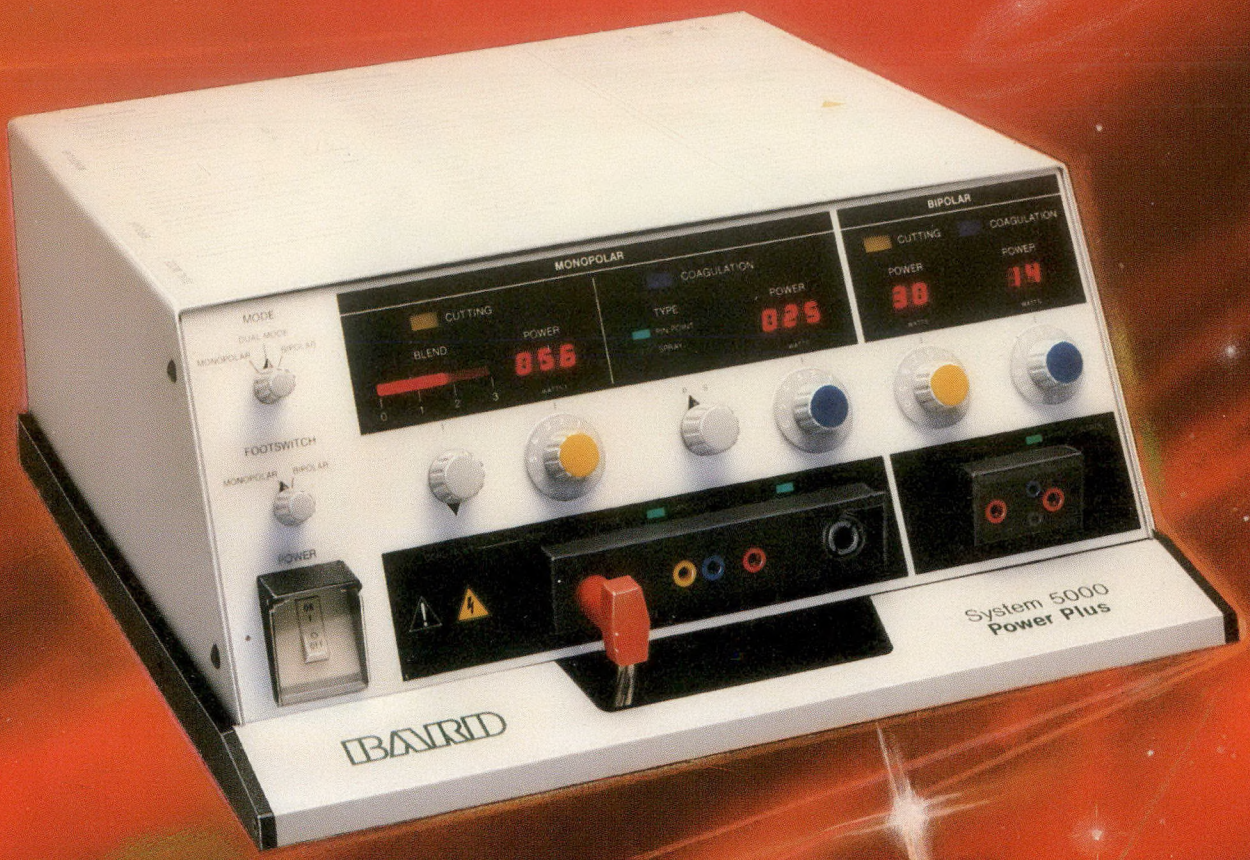

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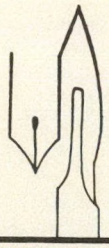

This section provides a medium through which Canadian surgeons can declare themselves, briefly and informally, on the day-to-day affairs of surgery.

The Treatment of Osteogenic Sarcoma

The management of osteogenic sarcoma has undergone many alterations in recent years. There have been many changes in adjunctive chemotherapy and an increased emphasis on limb-sparing surgery rather than amputation. Controversy continues regarding the safety of these newer treatments. The general public is also much more aware of this condition as a result of the publicity surrounding Terry Fox and his "Marathon of Hope". On page 29, Chowdhury and colleagues describe a patient who had a late recurrence following local excision of a telangiectatic osteosarcoma of the ulna. The telangiectatic type is one of the rarest forms of osteogenic sarcoma and is considered by many to be one of the most lethal varieties. Chowdhury's article emphasizes many of the problems in diagnosing and treating this tumour.

Most osteogenic sarcomas are stage IIB lesions at the time of diagnosis (i.e., they are high-grade extracompartmental sarcomas).[1] The best opportunity for local control is by radical resection or amputation. A local recurrence following definitive surgery decreases the chance of survival by half so it is a serious complication indeed. Most limb-salvage operations for osteogenic sarcoma are wide-excision procedures at best and many are marginal excisions. The risk of local recurrence following limb-salvage surgery ranges from 15% to 20%.[2] Amputation with a wide or radical margin of normal tissue has not always prevented stump recurrence.[3,4] This has been attributed to the existence of skip lesions, which are tumour deposits in the affected bone separated from the primary tumour by several centimetres of normal bone. Most local recurrences occur during the first 1 to 2 years after resection and it is very unusual for an osteogenic sarcoma to recur almost 6 years later. This is particularly true when the tumour is excised marginally as in the case Chowdhury and colleagues describe. In their article they state that telangiectatic osteosarcoma has a higher local recurrence rate than classic osteogenic sarcoma. Almost certainly this is related to the type of resection performed. They point out that these lesions are often mistaken for aggressive aneurysmal bone cysts and lesional or marginal excisions are performed. It is often only after the tumour recurs that the diagnosis is made. If this entity is recognized initially and an appropriate excision performed, the local recurrence rate should be the same as for standard osteogenic sarcoma. It is known that chemotherapy can delay the appearance of lung metastases and local recurrences. This is unlikely to have caused the late recurrence in Chowdhury's patient since the initial chemotherapy was one of the early adjuvant regimens and considered to be quite mild by current standards. Many patients with osteogenic sarcoma die with widespread lung metastases before a local recurrence becomes manifest. Since autopsy is seldom performed in these circumstances, the true local recurrence rate is unknown and is likely higher than presently believed. This creates difficulties in comparing the safety of limb-sparing procedures to that of amputations.

There has been marked improvement

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in the survival of patients with osteogenic sarcoma. Before 1972 only 20% of patients survived 5 years or more.[5] Now the 5-year survival is 60% or greater. The increase in disease-free survival was attributed to chemotherapy which was thought to treat the micrometastases that are present in 80% of patients at diagnosis.[6] The picture became clouded when the Mayo Clinic published a review of their experience with osteogenic sarcoma treated between 1963 and 1974.[7] Survival during the first few years of the study was similar to that of other published reports (i.e., 20%), but by 1972 the 3-year survival of patients treated by surgery alone had improved to 50%. Their data suggested that the natural history of the disease itself had changed and their recent results were not statistically different from the results of treatment with adjuvant chemotherapy. The validity of using historical control data as a comparison to treatment with adjuvant chemotherapy was questioned. There was speculation as to why more patients were surviving when treated by surgery alone. The most important factors were believed to be earlier detection of lung metastases by computed tomography and aggressive removal of lung nodules by thoracotomy. It became apparent that the issue could only be resolved by a prospective randomized study comparing patients treated with and without chemotherapy. This was undertaken by the Pediatric Oncology Group, which is a multicentre children's cancer study group. Patients were randomized into two groups. In one the patients were treated immediately after surgery by a modified Rosen T-7 chemotherapy protocol. The other group received no chemotherapy after surgery unless the tumour recurred or metastasized to the lungs. The study was closed after review of the initial 36 randomized patients demonstrated significantly poorer survival of patients who did not receive immediate chemotherapy.[8]

The current thrust for adjuvant chemotherapy in most centres is to give it preoperatively and modify the chemotherapy postoperatively according to the response of the tumour to the preoperative agents. The approach was instigated at the Memorial Sloan-Kettering Cancer Center.[9] Patients who underwent limb-salvage procedures were waiting up to 12 weeks for their customized prosthesis to be fabricated. During this period they were treated with the T-7 regimen, which consisted of high-dose methotrexate, bleomycin, cyclophosphamide and actinomycin C. The response of the tumour to the chemotherapy was graded pathologically and the poor responders were identified. This information led to the development of the T-10 protocol where the poor responders were treated by different agents such as cisplatin postoperatively.[10,11] Variations on this theme have been developed using intra-arterial injection of doxorubicin or cisplatin for local tumour perfusion as well as systemic intravenous chemotherapy.

For the treatment of osteogenic sarcoma in the future, more studies will be done with different preoperative chemotherapy regimens to find more effective agents. Limb-salvage procedures appear to be firmly established, and work is being done to find better solutions for limb reconstruction with prostheses that have a greater longevity. As the survival rate improves, thoughts are being directed to the patients' quality of life. The utilization of multicentre trials and the sharing of information make the future more promising for patients with osteogenic sarcoma.

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The Adrenal Incidentaloma

Before the development of computed tomography (CT), difficult and often dangerous procedures such as venography and arteriography were necessary to visualize the adrenal glands. These investigations were therefore limited to patients with clinical and biochemical evidence of adrenal disease. Now CT scanners visualize the normal adrenal glands in 95% of patients[1] and can identify adrenal adenomas as small as 1.0 cm in diameter.[2] Although this simplifies the investigation of adrenal disease, it creates a new problem — what to do with an incidentally discovered adrenal mass, the so-called incidentaloma? About 0.6% of upper abdominal computed tomograms reveal these incidentalomas,[3] the majority of which are benign and require no treatment.

Discovery of an incidental adrenal mass frequently sparks concern about an adrenocortical carcinoma and leads to surgical resection, but, as more experience is gained, a conservative approach is proving to be more appropriate. Of the 95 cases of adrenal incidentalomas described in the literature,[2-12] 71 were managed surgically, revealing diverse conditions — adrenocortical adenomas (30 cases), metastases (17), pheochromocytomas (4), cysts (9) and myelolipomas (5). But no case of adrenocortical carcinoma presenting as an incidentaloma has been reported.

Benign, nonfunctioning adrenocortical adenomas make up the majority of adrenal incidentalomas. Their natural history is obscure. Adrenocortical adenomas 2 mm or larger in diameter have been found in 8.7% of autopsies.[13] Cortical adenomas greater than 5 mm (the optimal resolution of the best CT scanners) were found in 1.4% of 1495 autopsies.[14] The frequency of adrenocortical carcinoma is

only 1 in 400 000,[15] indicating that malignant transformation is extremely rare. The infrequency of clinically important adrenocortical adenomas further suggests that few of these lesions would progress and thus require surgical excision.

The second commonest adrenal incidentaloma reported in the literature is a metastasis from a known primary tumour — especially the breast and lung, and lymphomas. The adrenal glands are a favoured site for malignant spread, with as many as 26% of cancer patients having adrenal metastases at the time of death.[16] These metastases, presenting as adrenal incidentalomas, may even precede the detection of the primary tumour.[12]

About 10% of adrenal incidentalomas are cystic lesions. Asymptomatic adrenal cysts are found in 0.06% of autopsies.[17] One half of these are true cysts with an endothelial lining, the others are cystic degenerated adenomas or pseudocysts,[18] which are often the result of hemorrhage into benign or malignant tumours.[19]

Pheochromocytomas have fortuitously been discovered as adrenal incidentalomas in several recent reports.[2,3,6] The high frequency of this diagnosis among incidentalomas is supported by a recent study demonstrating unsuspected pheochromocytomas in 0.3% of autopsies.[20] Correct diagnosis of this condition preoperatively substantially reduces perioperative morbidity.

The investigation of the adrenal incidentaloma includes three main steps: a review of the computed tomogram, a review of clinical data and results of investigations, and performance of hormonal studies (Fig. 1). The information thus obtained may suggest other diagnostic maneuvers.

A review of the computed tomogram may provide some answers. Lipomas and myelolipomas have very low attenuation coefficients due to their high fat content.[21] Simple cysts can often be confidently identified from their characteristic homogeneous water density, round shape, sharp margins and lack of contrast enhancement.[2] When there is doubt, needle aspiration may be useful. Aspiration of clear fluid strongly supports the diagnosis of a benign simple cyst,[22] but a bloody aspirate may be found in benign and malignant lesions. The confident diagnosis of other kinds of adrenal incidentalomas is usually not possible by computed tomography alone, and further investigation is indicated.

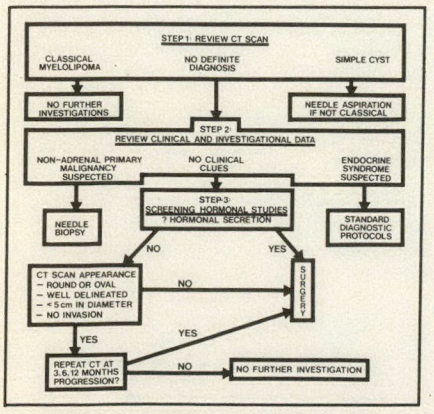

FIG. 1—Algorithm for investigation of adrenal incidentaloma.

A review of all available clinical and investigational data is essential at this point. If a specific endocrine syndrome such as pheochromocytoma, hyperandrogenic state, Cushing's or Conn's syndrome is suspected, then following the standard diagnostic protocols for these conditions is the most efficient approach. If the clinical setting suggests the presence of metastatic disease and the primary is occult, needle biopsy is the best way to make the diagnosis. Tissue obtained by percutaneous needle biopsy under computed tomographic guidance established the diagnosis in 94% of adrenal tumours in a recent study.[8] However, it is very difficult to differentiate adrenocortical adenoma from carcinoma in these specimens. Therefore, needle biopsy is most valuable when an adrenal metastasis is suspected.

Screening hormonal studies are necessary even when the clinical features of endocrine syndromes are absent, since even occult hormonal secretion may exact a metabolic price from the patient. Subclinical hypercortisolism still leads to osteoporosis and increased susceptibility to infections. The clinical effects of pheochromocytomas are characteristically paroxysmal but are life-threatening.

Adequate screening for excess steroid-hormone production includes measurement of serum cortisol, dehydroepiandrosterone sulfate and testosterone levels, as well as a minimum of two 24-hour urine collections to measure free cortisol. Urine collections can reliably be obtained on an outpatient basis with simultaneous measurement of the urinary creatinine value to assess the completeness of the collection. Since adrenocortical tumours with normal basal steroid excretion may show lack of dexamethasone suppression the measurement of steroid hormones should be repeated during 2 days of dexamethasone suppression (2.0 mg every 6 hours).

No aldosterone-secreting incidentaloma has been reported so far in the literature. However, the presence of hypertension or hypokalemia with inappropriate kaliuresis is an indication that plasma renin activity and aldosterone levels should be measured.

When the three main steps have failed to produce a diagnosis, the lesion is likely a benign cortical adenoma. Although adrenocortical carcinoma is rare, it has to be kept in mind since early resection provides the only chance of cure. Further investigations are rarely helpful. Other imaging techniques such as ultrasonography and angiography provide little new information. The role of radioisotope scanning with iodocholesterol for adrenocortical tumours or with iodobenzylguanidine for pheochromocytoma has not been studied in this clinical setting. Therefore, with respect to computed tomography, the question is: Does the lesion appear sufficiently benign to allow nonsurgical management? Comparison of the computed tomographic appearance of adrenocortical carcinomas and adenomas has revealed certain characteristic features. Criteria suggesting an adenoma include a round or oval shape, diameter of less than 5 cm and clear delineation from surrounding structures.[10] The criterion of 5 cm is useful since adenomas are almost always smaller than this while more than 90% of carcinomas are larger.[23] Close clinical follow-up and repeat computed tomography at 3 months, 6 months and 1 year is necessary. Mitnick and colleagues[10] followed up 12 patients who satisfied the above criteria and found no evidence of progression. Enlargement of the lesion calls for surgical resection.

The management of the adrenal incidentaloma presents a new challenge in medicine. Few lesions investigated will be clinically important, yet they will cause patients and their physicians much anxiety. On the basis of our review of 95 cases of incidentaloma in the literature, we recommend a conservative approach to management of these lesions.

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SESAP IV Question

130. During operation, a 2-cm incision is accidentally made in the dome of the bladder of a patient with a normal lower urinary tract. The opening should be closed and

(A) a suprapubic cystostomy performed
(B) the cystotomy should be converted into a suprapubic cystostomy
(C) a Foley catheter should be left in the bladder for two to three weeks and removed after a cystogram shows that the bladder has sealed
(D) the bladder should be drained with a Foley catheter for three to five days
(E) the lower abdomen should be drained and bethanechol chloride (Urecholine chloride) administered postoperatively

For the incomplete statement above select the best completion of the five given. For the critique of Item 130 see page 71.

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CORRESPONDENCE

Contributions to the Correspondence section are welcomed. They should be typewritten and double spaced.

Radiation Exposure and the Surgeon

To the editors.—Sometimes different surgeons will look at the same data and come to opposite conclusions. In their recent article on Ender's nailing of hip fractures (*Can J Surg* 1985; 28: 25–26), Moreau and Ashmore stated that "the radiation received by the operating team is well within the acceptable limits". I disagree with this statement. In their table of 31 patients (Table I), the radiation dosage received by the operating team varied from 0 to 69 mrem per case for the surgeon, 0 to 14 mrem for the nurse and 0 to 12 mrem for the anesthetist. Since 62 patients received this operation over 18 months, the case and exposure load might be approximately 40 patients per year for the institution or approximately 15 patients per surgeon, since the table indicated that three surgeons performed the procedure. Thus, one surgeon might reasonably average 290 mrem exposure per year for Ender's nailing procedures alone (excluding all other exposures he might receive from other procedures). Another surgeon would probably average 180 mrem and the third might average 130 mrem per year. One would need more information to calculate individual nurse and anesthetist doses. One assumes that the criterion for "acceptable limits" is the official Canadian government standard for "acceptable" radiation exposure: a Canadian maximum of 500 mrem per year for an individual in the general population and 5000 mrem per year for an individual whose livelihood involves radiation risks (e.g., doctors, radiographers, uranium miners, nuclear power plant workers).

A threshold below which damage from radiation does not occur has never been demonstrated, and many now believe that a threshold does not exist. What seems clear is that the greater the exposure to radiation the more likelihood there is of incurring serious side effects such as cancer, cataracts and birth defects. There is no good scientific evidence to demonstrate that 500 mrem is "safe". Many would argue that the limits of 500 and 5000 mrem are unreasonably high and should be set lower. While Canadian authorities use one of the international standards, some countries, the United States in particular, use lower exposure limits. On the other hand, intertrochanteric fractures will continue to occur and patients need to be treated properly.

At the relatively small hospital where I work (fewer than 100 beds), I use Richards' sliding compression lag screws. We do not have an image intensifier for the operating room and we use a standard portable x-ray machine that gives us anteroposterior and lateral views as required. It is inconvenient having to wait several minutes to see the films, but our patients have not suffered because of the extra anesthetic time required. We generally, but not always, leave the room during roentgenography. My radiation badge has not detected any exposure in the 5 years that I have worked at this hospital and we serve an older population so we treat fractured hips frequently. In fact, the radiology equipment at our hospital is modern enough and the practice of the radiologist and radiographers diligent enough that x-ray exposure for all medical purposes in our hospital is at a far lower level per individual per year than that incurred by the surgeons in Moreau's article. A full-time radiologist with almost 30 years' service who is diligent about wearing his exposure badge has less than 700 mrem of life-time exposure which means that he is being exposed to less than 25 mrem of additional radiation per year because of his job. The radiographers on our staff have exposures in the same range. The surgeon's radiation badge indicates even lower exposure, and this includes performance intraoperatively of roentgenography for many fractures both closed and open, as well as routine operative cholangiography during cholecystectomies.

In Nova Scotia the average background radiation is 110 mrem per year and this is of course an irreducible risk in that you cannot be alive and have no radiation exposure and thus no risk. The radiation exposure of health professionals at our hospital is so small per year that we are not concerned.

Radiation exposure of patients is not restricted by government regulation, and diagnosis and treatment are handled on an individual risk versus benefit basis for each case. Most health professionals at our hospital are reasonably healthy and require very few diagnostic roentgenograms during the year; thus, our medical diagnostic and treatment radiation levels are extremely low and these people receive less total radiation exposure than that received in the performance of Ender's nailings by the surgeons in Moreau's paper. Presumably these surgeons have additional exposure from other procedures in addition to background radiation within their location.

While no one can say how many side effects, such as cancers and cataracts, may be incurred by the extra exposure of Moreau's surgeons, I believe that it is a risk a surgeon should not take if there are alternative ways to treat the patients. More important, I think that it is unethical for surgeons to subject anesthetists and nurses to additional exposure. Were participating nurses in Moreau's series advised of the exposure involved? Have any of them read the current best theoretical calculations in "Radiation and Human Health"?[1]

In conclusion, although patients should receive the best treatment available, such treatment should present the minimum risk to patients and staff alike. The treatment studied by Moreau and Ashmore does not appear to fulfil this criterion.

W. THURLOW, MD, FRCSC, FACS

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Reference

1. GOFMAM JW: *Radiation and Human Health*, Sierra Club Bks, San Francisco, 1981

Preoperative Embolization of Supratentorial Meningiomas

To the editors.—Rutka and associates (*Can J Surg* 1985; 28: 441-443) are to be congratulated for their series.

They do not state how long after the embolization the surgery was performed except that all patients but one were operated on within 4 days. Our own experience has been that the reduction of blood flow is greatest immediately after embolization or after the occlusion of a vessel. Almost within minutes, expansion of visible collaterals can be seen, as for example during a scalp incision for a craniotomy when the external carotid artery is ligated or embolized. We embolize these extremely vascular meningiomas intraoperatively using serial angiography to direct catheter placement and subsequent embolization through the external carotid artery branches.[1] In their conclusions, Rutka and colleagues point out that the overall reduction in vascularity depends on the relative contributions of the internal and external feeders. Unless a meningioma arises close to the carotid artery to which its meningeal branches have access, virtually none of its supply comes from the internal carotid. The reduction in blood supply after embolization, followed immediately by the surgical exposure, is dramatic. If the embolization is carried out during the turning of the flap or afterwards, the field becomes virtually dry under the surgeon's eyes.

We agree that total tumour removal must be the objective in cases of meningioma and almost invariably the best way to control the bleeding is by total removal of the tumour, particularly its point of attachment.

We would suggest to the authors that they try intraoperative embolization. They will be delighted by the enormous reduction in vascularity that will last for several hours.

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Reference

1. PARKINSON D, LEGAL J, HOLLOWAY AF, et al: A new combined neurosurgical headholder and cassette changer for intraoperative serial angiography. Technical note. *J Neurosurg* 1978; 48: 1038-1041

To the editors.—Dr. Parkinson's observations that intraoperative embolization of highly vascular meningiomas results in a marked reduction in tumour vascularity is an extremely important observation. With one exception all our patients underwent operation within 4 days of embolization, but none on the day of embolization. We demonstrated the computed tomographic and angiographic changes that occurred after embolization but avoided speculating as to the efficacy of reduction in tumour vascularity. It might be noted from the results that the amount of intraoperative blood loss did correlate with tumour diameter.

Dr. Parkinson's observation that intraoperative embolization results in a visible reduction in tumour vascularity is a very welcome and important observation.

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Medical Management of Endometriosis

To the editors.—The interesting report by Buckspan and associates on endometriosis (*Can J Surg* 1985; 28: 447-449) raised two issues: the cause of endometriosis and its management at unusual sites.

It has been well established experimentally and clinically that retrograde menstruation does occur in humans and that the endometrium shed at that time can grow in ectopic sites. Sampson, especially, spent most of his professional life demonstrating this phenomenon. The serosal metaplasia theory dates back to Rokitansky in 1860 and should perhaps now be considered a historical curiosity.

With respect to the management of endometriotic deposits in unusual sites, the diagnosis is frequently made at laparotomy (as in the case described by Buckspan and colleagues), and the temptation to remove the lesion is often irresistible. However, medical treatment, particularly with Danazol, is often effective in decreasing the size of the endometriotic deposit and in reducing the inflammatory process caused by the cyclical localized bleeding. In Buckspan's case, a histologic diagnosis and the decision concerning management was made at the time of surgery. Possibly ureteric catheterization immediately followed by medical treatment would have been successful. The point, however, is that this ubiquitous disease is now frequently managed successfully and conservatively by suppressing ovulation.

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Simple Stapling Technique to Fashion an Intestinal Valve

To the editors.—Recently there has been a resurgence of interest in recreation of the ileocecal valve after its resection. Below, I describe a simple technique I have devised; by using available stapling devices, very little extra time is added to the original operation.

Before handling, segments of the large and small bowel are isolated with noncrushing clamps about 30 cm from the divided edges and contents are milked into sponges, which are immediately discarded. An EEA stapler (Auto Suture Company, Division of US Surgical Corp., Norwalk, Conn.), without the anvil, is inserted through the open end of the colon (Fig. 1). Alternatively, a distal colotomy may be used. The centre rod dents the antimesenteric side about 5 cm from the cut edge. A small nick with a

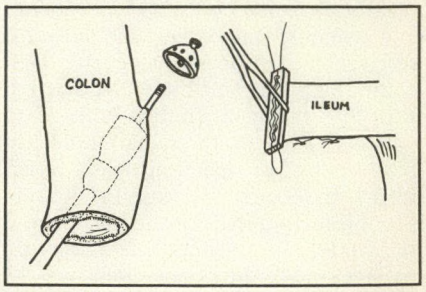

FIG. 1—Stapler without anvil is passed through colon.

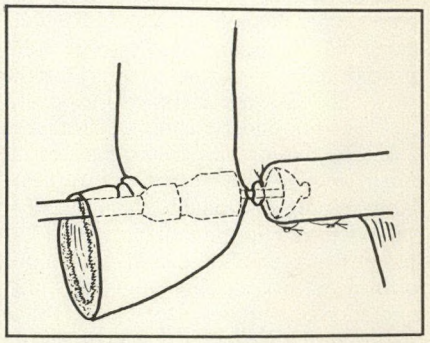

FIG. 2—Anvil of stapler is inserted into ileum and purse-string suture around cut end is tied tight.

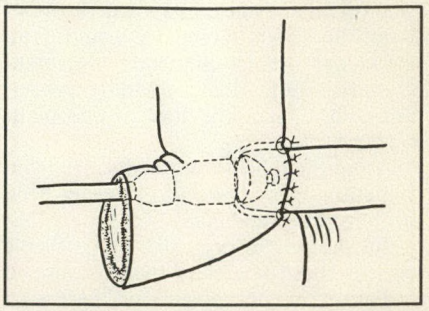

FIG. 3—Anastomosis of ileum to colon is intussuscepted into colon and fixed with sutures.

scalpel is made here and the centre rod is pushed through and the anvil attached. A purse-string suture is placed around the cut end of the small intestine, which has had the distal 4 cm of mesentery removed. The anvil is inserted into the small gut and the purse-string tied tight (Fig. 2). The EEA stapler is closed and fired. Without opening the instrument, the anastomosis is now intussuscepted into the colon for about 3 to 4 cm and fixed in place with seromuscular sutures around the invagination (Fig. 3). The stapler is now opened and removed, and the rings obtained are inspected. Hemostasis of the intussuscepted anastomosis is confirmed. The distal colon is closed with a TA-55 stapler.

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Localization of Occult Breast Tumours

To the editors.—Neither in his letter (*Can J Surg* 1985; 28: 300) nor in his original article on the intraoperative localization of occult breast tumours (*Can J Surg* 1985; 28: 329–330) does Mahoney address the major flaw in his technique, namely the lack of mammographic evidence preoperatively to establish the relationship of the needle to the lesion. The needle is your guide even if you replace it with dye. It is not uncommon for a needle to be off the mark sufficiently to require reinsertion and, even with acceptable placement, it may be a centimetre or so out in either plane. We make the necessary corrections at surgery, based on our estimate of the distance and direction the needle may be off the mark. Not knowing where the needle is in relation to the lesion makes Mahoney's procedure relatively blind. His very meticulous excision is being performed without knowing the exact site of the lesion.

Most patients, in whom we find carcinoma in an occult mammographic lesion, are treated as Mahoney indicates. When we stated in our editorial (*Can J Surg* 1985; 28: 297–298) that these mammographic lesions should be managed aggressively, we did not refer to the extent of surgery, but rather the timing. We believe that biopsy should be performed early, using a proper localizing technique rather than waiting a few months and repeating the mammogram to see if there is any change.

Mahoney discusses our use of a circumareolar incision. Obviously if the lesion is well away from the areola, we do not attempt to excise it through the areola, but when the areola is fairly large and the lesion not more than 2 or 3 cm from its margin, the lesion can be removed easily through an areolar incision, excising mainly the distal part of the dye-stained tract, thus giving excellent cosmesis.

Knowing exactly where the lesion is in relation to the needle simplifies the operation and allows me to remove much less tissue than would be necessary if I was operating "blind". Because about 85% of these lesions are benign, removal of a minimal amount of tissue is possible and this maintains better breast form.

Surgeons attempting to follow Mahoney's technique, with omission of the vital preoperative needle-localization mammogram, are going to miss many lesions at surgery, in spite of a wide and frequently inappropriate excision of normal breast tissue. Although it appears to work quite well in Mahoney's hands, I would not recommend it as an exploration technique. You will not get marks for performing a meticulous wide excision in the wrong direction. My advice is that you get acquainted with your radiologist and take the extra step.

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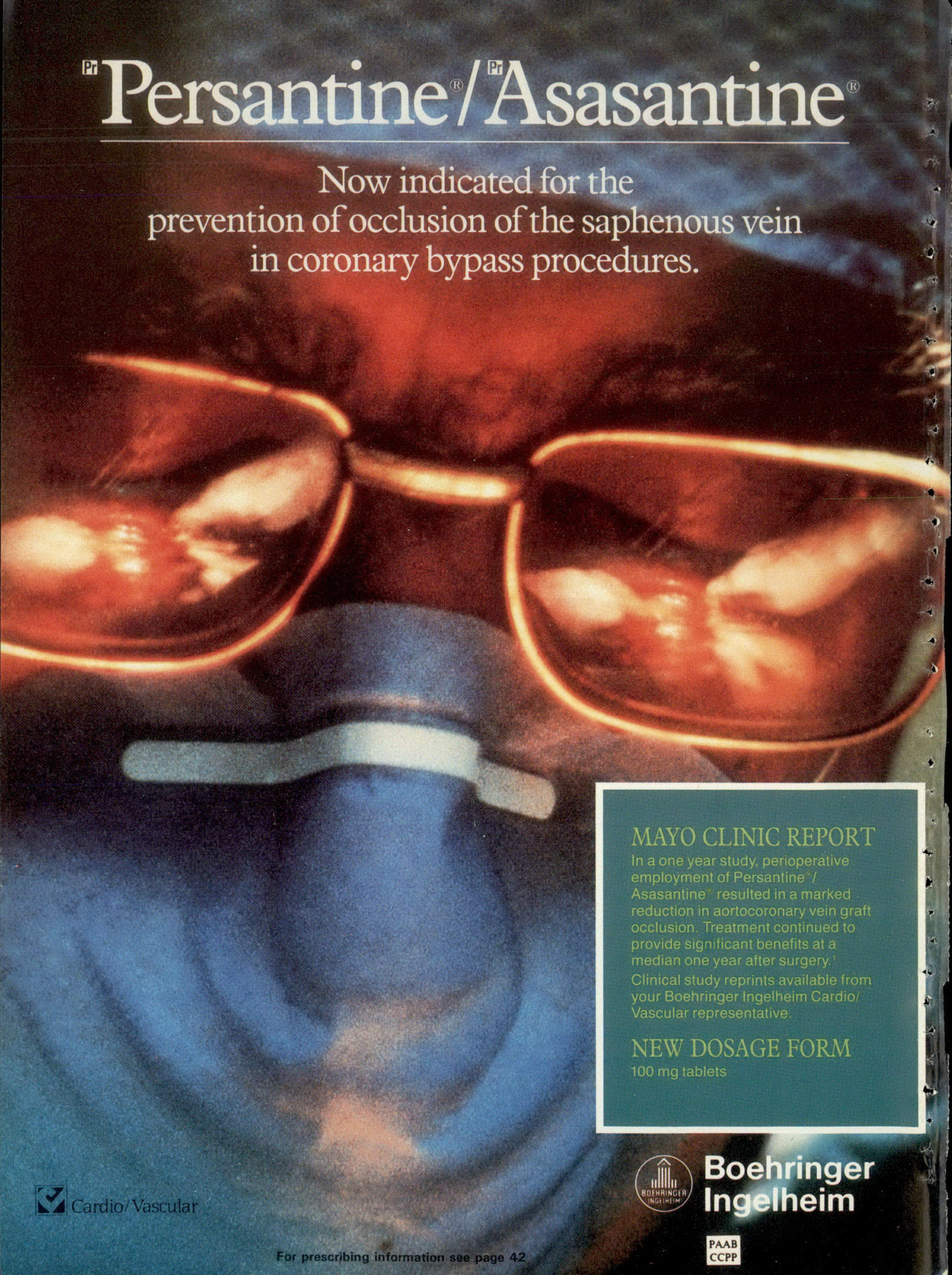
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SURGEONS' UPDATE

What's new in surgery is the subject of this column. The short items are designed to let readers know who's doing what and why. Surgeons are interested in what other surgeons are doing in research, education, practice and administration. Surgery is a vibrant specialty, and, as its practitioners, you must be the source as well as the readers of this column.

OSCE Is Effective, Efficient and Not Too Painful

"It's practical and reasonably efficient, and better-structured than oral exams," says Walter Waddell, FRCSC, "and it allows us to look at things that are impossible to test by other means."

An exciting new diagnostic technique? In a way, yes, but the objective-structured clinical examination (OSCE) is to find out how well students, rather than patients, perform. Waddell, who is the coordinator of undergraduate education for the Department of Surgery at the University of Ottawa, was talking to CJS about the exam, which is being used for the first time in the department this academic year. In July the first batch of 4th-year students faced OSCE (pronounced like a nickname for Oscar) as part of the surgical rotation; the second batch completed the exam in November and early next month a third will follow suit.

Students move through "stations" that test their skills rather than their recall; for example, the test in November incorporated 21 stations in which, among other activities, the students examined the back of one patient and the vascular system of another, studied x-ray films to come up with a differential diagnosis and wrote orders for a patient with acute pancreatitis.

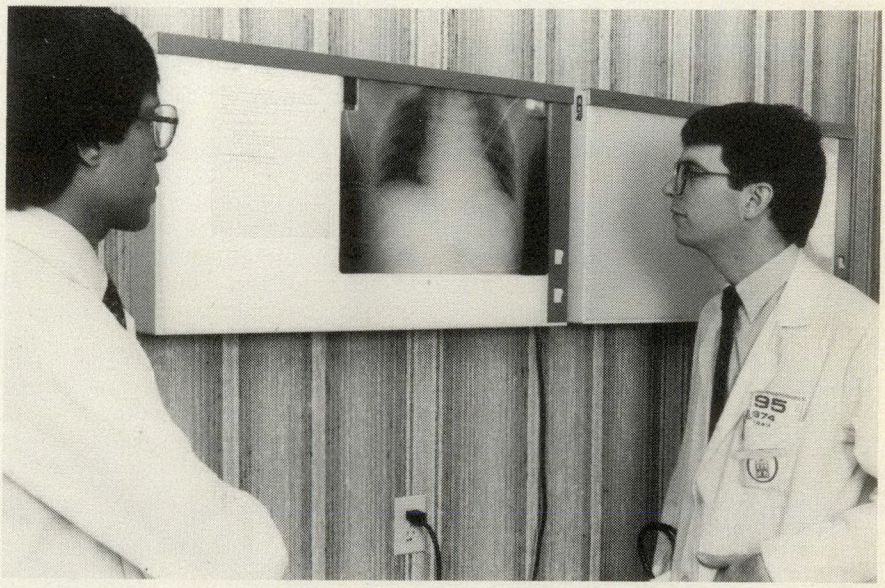
Says Waddell, "We also asked them to close a 5-cm laceration; now this is pig's skin, but the history was for a 16-year-old girl who had fallen on the school yard and sustained a clean, sharp wound on broken glass. In addition to the practical thing, we asked about tetanus prophylaxis, choice of suture material, wound débridement and when to bring her back to take out the sutures." Each station was designed to take 5 minutes, and the 20 students taking the exam had completed the test in just 2 hours. As Waddell points out, "10 students in half-hour orals would take 300 minutes — 5 hours. The exam takes more preparation than an ordinary oral but less than a multiple choice test with 100 to 150 questions."

In fact, as long as the numbers of students are fewer than 100, OSCE probably takes less time than any other format now being used extensively, says Ian Hart, FRCPC, the man who introduced the concept to North America just 6 years ago. Hart chairs the Department of Medicine at the Ottawa Civic Hospital and has been an active advocate of reforms in methods of assessing clinical competence.

Says Hart, "OSCE is a format rather than a type of examination; it allows examiners to use many different methods of testing students but encourages them to consider exactly what they want to measure and how best they might do so. OSCE was developed because no single exam can measure the skills and knowledge needed to practise medicine.

"If you want to measure how well someone examines a patient's chest, there's no point in asking him or her to write an essay; you are measuring the person's ability to write clear, lucid English in an organized fashion. You aren't measuring anything about what the person does with his or her hands on the patient's body. At one time I could write a superb description about how to remove someone's appendix but I wouldn't under any circumstances ever let me do an appendectomy.

"If you want to find out how well students write and organize their thoughts, there's no reason you can't ask them to write a short essay in one station; in the next station you might ask them to do something with their hands — examine a chest, feel for the patient's liver; at the next station you might ask them to do a lumbar puncture in a rubber model; in the next station you might ask them to sit and talk to a patient whose daughter has died of some genetic disease and is worried about having more children — a counsel-



Interpreting x-ray films is part of the OSCE that is being used in the Department of Surgery at the University of Ottawa to test medical students' skills. Dr. F. Shamji (left) is one of the department's examiners.

Contributions to this column are welcome. Please send your material to: Mrs. Amy Chouinard, *Canadian Journal of Surgery*, PO Box 8650, Ottawa, Ont. K1G 0G8.

ling station; the next station might be one in which they take some information from an x-ray film, interpret it and make a treatment decision."

In the most recent medical exam, students were asked to advise an AIDS patient (simulated) on the changes in lifestyle demanded by the disease. Says Hart, "Counselling is not normally tested, but we feel it's important because most physicians spend a majority of their time advising and counselling patients."

The patients in the University of Ottawa surgical OSCE were volunteers from the Civic Hospital's day-care program, and Hart notes that most Canadian medical schools have little difficulty recruiting patients to assist in the testing. "In the US, patients seem to feel, 'I pay doctors; why shouldn't they pay me?' "

How can OSCE be used to judge a student's ability to perform an appendectomy? That's a good question says Hart and he doesn't feel it's possible or realistic to set up a station to assess one's capability to operate. However, as OSCE spreads to surgical departments, clearly Hart is correct when he says: "With innovative thinking, the potential for testing surgical techniques is vast."

For some reason, however, surgical departments have been somewhat slower than others to adopt the approach: of the 16 medical schools in Canada, 12 now have some form of OSCE, but until this year the University of Toronto was the only school whose surgery department was using the format regularly. Ironically, the group in Dundee, Scotland, who pioneered OSCE, published results of its use for surgery almost immediately.

Says Hart, "I don't want to sound as if the surgeons are behind — they are not the only group not using OSCE. Word is just now spreading: when the concept was new, it mainly appeared in articles for journals of medical education," but the body of journal articles and conferences as well as experience with the format is growing rapidly. Hart's department in Ottawa hosted an international conference in July 1985; they expected about 60 participants but ended up with more than 200. They are planning a follow-up meeting in 1987. Also the most recent annual meeting of the Royal College of Physicians and Surgeons of Canada included a session about assessing clinical competence and Hart was one of the speakers.

Reflecting the growing interest is an expanding databank of stations housed by the University of Ottawa. At present the databank includes five complete 20-station examinations, available for a nominal charge to cover handling and postage. Any medical school can access or add to the databank.

Students do not have access to the information, says Hart, mainly because the databank is incomplete. "If they have access to what is there now, they may think that's all they need to know. When the bank adequately covers all facets of medical practice, then I have no problem with giving students access." Anyway, "they know the stations that have been used and word gets around".

Waddell agrees. "The first group of students had no idea what to expect, so they weren't as happy about the exam as the next group who had an opportunity to talk to the first group and were better prepared. Overall, however, the first group scored higher than the second. With this examination, we are able to give immediate feedback and that helps. If you provide instant feedback, the examination — if not accepted with pleasure — is at least not too painful."

Research Workshop to Be Regular Event of CAGS

"Surgeons who spend all their time in clinical practice seem to feel that surgical investigators or research fellows are wasting their time," says Max M. Cohen, FRCSC, Associate Professor, University of Toronto.

Combatting this attitude, according to Cohen, is what 25 general surgeons had in mind when they met last year at Chateau Montebello to discuss the problems peculiar to surgical research. The group were all actively involved in research and were anxious to draw into their midst other members of the Canadian Association of General Surgeons. They decided to convene annually and have chosen the Rocky Crest Resort in Muskoka District, Ontario, as the site for their meeting June 2 and 3 this year.

The group plans to come up with positive steps to remedy the low status, low pay and shortage of operating funds that they say combine to limit interest and, hence, numbers of surgeons doing research.

Grant applications to the Medical Research Council seem to support their claims. According to Lewis Slotin, PhD, Director of the Council's Program Branch, applications from surgeons are few: "Although we don't have exact statistics, the overall impression is that applications from surgeons are not that plentiful. The success rate for surgeons in the competition was higher in the late 1970s and early 1980s; then there was a dip; and there seems to be a slight upswing now."

Slotin spoke to the CAGS group that met in Montebello and outlined MRC's objectives, review process and priorities. As the first deadline for applications in 1986 is Feb. 1, he gave CJS a recap.

"I pointed out that there was no bias in the Council against clinical research. In fact, it has a strong interest in encouraging clinicians to become involved in research. At present 60% of the funds we provide for operating grants are held within clinical departments. This represents a shift from 15 years ago when 80% of funds went to basic science departments. The milieu in which biomedical research is going on in this country is changing. There has been an expansion of hospital-based research.

However, Slotin admitted that the Medical Research Council is biased against poorly written applications. "There's no question that the way an application is written is important. All applicants need to interact with people who have been successful as well as to interact with people who sit on the review committees. You need to know a priori what will be looked for and how to structure the application. Across the country, there should be grant-preparation days at which MRC personnel or people from other grant agencies come and explain what is useful. The very obvious requirements are to begin with a single, broad statement of where you want to be in knowledge in 20 years or so. Then follow with specific objectives or milestones along the route. Do a good, thorough literature search to pick out those things that suggest your hypothesis has merit or that the methods you plan to use will answer the questions you are posing. If a portion of the research proposal requires techniques that you don't have, you need letters from collaborators who attest to the fact they will assist you."

Appointments and Changes in Kingston

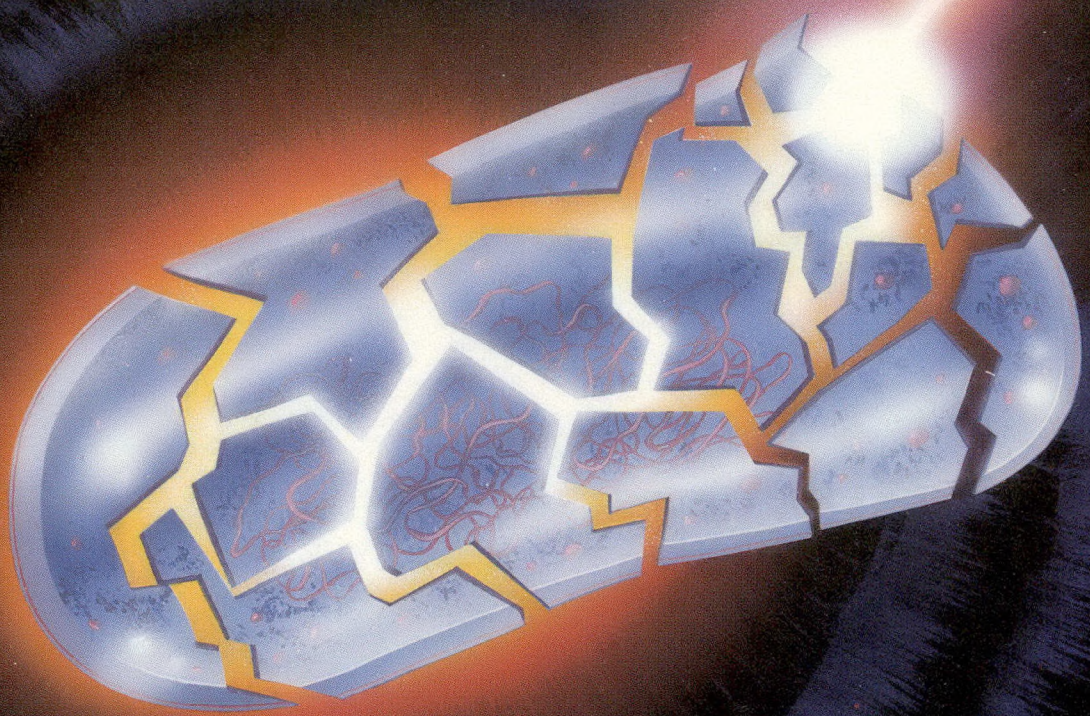
Dr. Dale Mercer, a general surgeon with particular interest in managing problems of the esophagus and upper gastrointestinal tract, has just joined the staff of the Hotel Dieu Hospital in Kingston after 2 years studying in Seattle, Washington.

Dr. Ronald Pace, a graduate of the University of Western Ontario, has been appointed general surgeon on the staff of the Kingston General Hospital. He is researching splenic function.

J.R. McCorriston, FACS, FRCSC, head of the Department of Surgery at Queen's University from 1963 to 1978, retired from active practice June 30, 1985. During his term as head of the department, Dr. McCorriston also served on the editorial board of CJS.

AMY CHOUINARD

NO PROVEN RESISTANCE



B. fragilis, the most prevalent anaerobe in intra-abdominal infections, was responsible for up to 60% of mortalities in patients with *B. fragilis* bacteremia when inappropriate treatment was given[1]. And recent North American studies show[2,3] *B. fragilis* is becoming resistant to newer antibiotics such as clindamycin or cefoxitin.

Average resistance	Clindamycin	Cefoxitin	Moxalactam	Metronidazole
B. fragilis	4.8%	8.8%	17.9%	0%

No proven resistance to metronidazole

Flagyl 500 Inj. (metronidazole) remains unaffected by *B. fragilis* resistance[2,3]. Flagyl 500 Inj. is active, regardless of bacterial concentration or growth stage[4,5]. It has an excellent record of safety, and it is compatible with most antibiotics[6] used for aerobic coverage in intra-abdominal and pelvic surgery.

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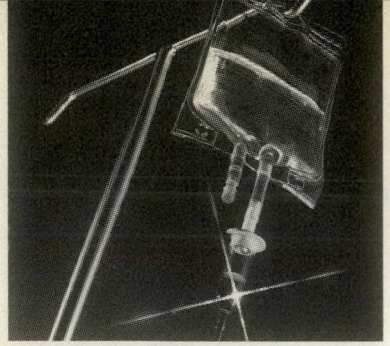

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Flagyl (metronidazole) is bactericidal against anaerobic bacteria, it exerts trichomonacidal activity and is also active against *Giardia lamblia* and *Entamoeba histolytica*. Its exact mechanism of action has not been entirely determined as yet. It has been proposed that an intermediate in the reduction of metronidazole, produced only in anaerobic bacteria and protozoa is bound to deoxyribonucleic acid and proteins, and inhibits subsequent nucleic acid synthesis.

INDICATIONS AND CLINICAL USES

Bacterial infections

The treatment of serious anaerobic abdominal infections due to susceptible anaerobic bacteria, such as *Bacteroides fragilis* (and other species of *Bacteroides), Clostridium, Fusobacterium, Peptococcus,* and *Peptostreptococcus* species. Culture and susceptibility studies should be performed to determine the causative organisms and their susceptibility to metronidazole.
Based on clinical judgment and anticipated bacteriological findings, therapy may be started while awaiting the results of these tests.
In mixed aerobic and anaerobic infections, consideration should be given to the concomitant administration of an antibiotic appropriate for the treatment of the aerobic component of the infection. (See Warnings).
Flagyl (metronidazole) has also been used in the treatment of a small number of cases of brain or lung infections (some with abscesses) caused by anaerobic bacteria.

CONTRAINDICATIONS

Flagyl (metronidazole) is contraindicated in patients with a prior history of hypersensitivity to metronidazole or other nitroimidazole derivatives.
Flagyl should not be administered to patients with active neurological disorders or a history of blood dyscrasia, hypothyroidism and hypoadrenalism.

Warnings

Flagyl (metronidazole) has no direct activity against aerobic or facultative anaerobic bacteria. In patients with mixed aerobic-anaerobic infections appropriate concomitant antibiotics active against the aerobic component should be considered.
Known or previously unrecognized moniliasis may present more prominent symptoms after treatment with Flagyl.
Studies in rats and mice have provided some evidence that metronidazole may cause tumors in these species when administered orally for a long period at high doses. The relevance of these findings in humans is not known.
Severe neurological disturbances (i.e. convulsive seizures and peripheral neuropathy) have been reported in patients treated with Flagyl (administered orally or intravenously). These have been observed very infrequently.

Precautions

Patients taking Flagyl (metronidazole) should be warned against consuming alcohol, because of a possible disulfiram-like reaction. For the same reason, patients receiving Flagyl should not be administered disulfiram concomitantly.
Transient eosinophilia and leukopenia have been observed during treatment with Flagyl. Regular total and differential leukocyte counts are advised if administration for more than 10 days or a second course of therapy is considered to be necessary.
Metronidazole crosses the placental barrier. Although Flagyl has been given to pregnant women without apparent complication, it is advisable that oral administration be avoided in pregnant patients and Flagyl be withheld during the first trimester of pregnancy. In serious anaerobic infections, if the administration of Flagyl to pregnant patients is considered to be necessary, its use requires that the potential benefits be weighed against the possible risks to the fetus.
Metronidazole is secreted in breast milk in concentrations similar to those found in plasma. Intravenous or oral administration of Flagyl should be avoided in the nursing mother.
Metronidazole has been reported to potentiate the anticoagulant effect of warfarin resulting in a prolongation of prothrombin time. This possible drug interaction should be considered when Flagyl is prescribed for patients on this type of anticoagulant therapy.
Clinical experience in children is very limited. The monitoring of this group of patients is particularly important. The safety and effectiveness of intravenous Flagyl in children has not been established.
A rare case of reversible but profound neurological deterioration has been reported following a single oral dose of Flagyl; it is therefore advisable that a patient taking Flagyl for the first time not be left unattended for a period of two hours. The appearance of abnormal neurologic signs demands prompt discontinuation of Flagyl therapy and, when severe, immediate medical attention. Gastric lavage may be considered if no more than two or three hours have elapsed since administration of the drug.
Treatment with Flagyl should be discontinued if ataxia or any other symptom of CNS involvement occurs.
Patients with severe hepatic disease metabolize metronidazole slowly with resultant accumulation of metronidazole and its metabolites in the plasma. Accordingly, for such patients, doses of Flagyl below those usually recommended should be administered and with caution. The determination of serum glutamic oxaloacetic transaminase (SGOT) by the Technicon SMA 12/60 system in blood samples from patients receiving Flagyl may give abnormally low values. This abnormality is artifactual and caused by the absorption of metronidazole at the wavelength where the enzymatic reaction is monitored spectrophotometrically.

Adverse reactions

Gastrointestinal: diarrhea, nausea, vomiting, anorexia, epigastric distress, dyspepsia, constipation.
Mouth: furred tongue, dry mouth, unpleasant metallic taste.
Hematopoietic: transient eosinophilia or leukopenia.
Dermatologic: rash and pruritus.
Cardiovascular: palpitation and chest pain.
Central Nervous System: convulsive seizures, peripheral neuropathy, transient ataxia, dizziness, drowsiness, confusion, insomnia and headache.
Peripheral neuropathies have been reported in a few patients on moderately high to high-dose prolonged oral treatment with metronidazole. It would appear that the occurrence is not directly related to the daily dosage and that an important predisposing factor is the continuation of oral and/or I.V. medication for several weeks or months.
Profound neurological deterioration, within 2 hours after Flagyl administration has been reported. The occurrence is not directly related to the dosage level.
Metabolic: An antithyroid effect has been reported by some investigators but three different clinical studies failed to confirm this.
Local Reactions: Thrombophlebitis has occurred with I.V. administration.
Other: Proliferation of *Candida albicans* in the vagina, vaginal dryness and burning; dysuria; occasional flushing and headaches, especially with concomitant ingestion of alcohol; altered taste of alcoholic beverages. Darkening of the urine has been reported. This is probably due to a metabolite of metronidazole and seems to have no clinical significance.

SYMPTOMS AND TREATMENT OF OVERDOSAGE

Symptoms

Massive ingestion may produce vomiting and slight disorientation.

Treatment

There is no specific antidote. Early gastric lavage may remove a large amount of the drug; otherwise, symptomatic treatment.

DOSAGE AND ADMINISTRATION

Treatment of anaerobic infections

Treatment should be initiated by the I.V. route. Oral medication may be substituted when it is feasible and/or practical. Duration of therapy depends upon clinical and bacteriological assessment. Treatment for seven days should be satisfactory for most patients. However in cases where infection sites cannot be drained or which are liable to endogenous recontamination by anaerobic pathogens, a longer treatment may be required.

I.V. Administration

100 mL (500 mg) by intravenous infusion every 8 hours. The injection should be infused intravenously at the rate of 5 mL per minute.
Flagyl Injection is compatible in a volume ratio of 1:5 with normal saline, dextrose-saline, dextrose 5 per cent w/v or potassium chloride injections (20 mmol and 40 mmol). These admixtures will remain stable for a period of 24 hours when kept in the dark or in combined daylight and artificial light. Not to be mixed with sodium lactate injection 5% w/v, or dextrose injection 10% w/v.

AVAILABILITY

Injection 0.5% w/v Viaflex* plastic bags of 100 mL (500 mg) for i.v. infusion.

*Trademark of Baxter Travenol Laboratories Inc.

Complete information available on request.

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Symposium on Venous Disease

JACK HIRSH, MB, BS, FRACP, FRCPC

1. Diagnosis of Thrombophlebitis

There is overwhelming evidence that a clinical diagnosis of venous thrombosis is nonspecific and that patients suspected clinically of having venous thrombosis should be investigated by more reliable objective tests. The reference standard for the diagnosis of the disease has been venography. If a venogram is adequate and the results are negative, then an alternative diagnosis should be sought and anticoagulants may safely be omitted. It should be stressed, however, that before a venogram can be read as negative, all of the veins normally seen by ascending venography (peroneal and posterior tibial veins and the popliteal, superficial and common femoral, and external and common iliac veins) should be visualized and seen to be free of intraluminal filling defects. In our experience, approximately 15% of all venograms are technically unacceptable, in which case the procedure should be repeated.

Clinical studies have shown that venography can be replaced by less invasive procedures. Noninvasive tests that have been evaluated clinically and shown to be reliable are: the combination of impedance plethysmography and iodine 125 fibrinogen leg scanning, serial impedance plethysmography alone, serial Doppler ultrasonography and other plethysmographic techniques.

The plethysmographic and Doppler techniques are sensitive and specific for proximal vein thrombosis but less sensitive for calf vein thrombosis. They can be used in patients with clinically suspected venous thrombosis provided that, when the result is negative, the test is repeated serially over the next 7 days to detect an extending calf vein thrombosis.

From the Department of Pathology, McMaster University Medical Centre, Hamilton, Ont.

Summary of a paper presented as part of a symposium on venous disease at the 53rd annual meeting of the Royal College of Physicians and Surgeons of Canada, by the Royal College in cooperation with the Canadian Society for Vascular Surgery, Montreal, PQ, Sept. 12, 1984

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JOSEPH G. SLADEN, MD, FRCSC

2. Complicated Deep Venous Insufficiency: Conservative Management

An understanding of venous pathophysiology is helpful in managing deep venous insufficiency. Examination of the patient after standing for 10 minutes by searching for perforator tenderness and milking away the edema will reveal incompetent perforators. A sponge pump improves calf pumping and reduces local tissue damage from the systolic peak pressures of walking. It is an invaluable aid in treatment. The combination of high ligation of the superficial system and compression sclerotherapy for the perforators gives excellent control. Compression sclerotherapy can be readily repeated as necessary. Patients with severe deep venous insufficiency should always be advised to wear a surgical support stocking indefinitely.

Une bonne connaissance de la physiopathologie veineuse est utile au traitement de l'insuffisance veineuse profonde. La perméabilité des veines perforantes est évaluée en cherchant chez le patient laissé en position debout pendant 10 minutes la sensibilité des veines perforantes et en vérifiant la résorption de l'oedème après massages. Une pompe à éponge améliore le pompage des mollets et réduit les dommages tissulaires locaux causés par les pointes de pression systolique à la marche. Il s'agit d'une aide thérapeutique considérable. D'excellents résultats sont obtenus en associant la ligature haute du système superficiel et la sclérothérapie par compression des veines perforantes. Au besoin, la sclérothérapie par compression peut être facilement répétée. On devrait conseiller aux patients souffrant d'insuffisance veineuse profonde de toujours porter un bas de soutien chirurgical.

From the Division of General Surgery, Department of Surgery, University of British Columbia, Vancouver, BC

Presented as part of a symposium on venous disease at the 53rd annual meeting of the Royal College of Physicians and Surgeons of Canada, by the Royal College in cooperation with the Canadian Society for Vascular Surgery, Montreal, PQ, Sept. 12, 1984

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I would like to introduce my portion of this symposium with a description of the anatomy and pathophysiology of the deep venous system.

The normal calf pumps blood when we walk. In the standing position venous pressure at the ankle is about 120 cm H_2O (120 cm being roughly the distance between the heart and the ankle). In the normal limb this pressure drops to about 40 cm H_2O on walking but rises to the resting value when exercise ceases. The limb with deep venous insufficiency has an inconsequential drop in pressure with walking whereas the limb with superficial venous disease alone has a reduction in pressure that is about half way between the two. Anatomically both the superficial and deep systems have valves so placed that they prevent reflux of blood from groin to calf. Additionally, there are one to three valves in each perforator vein, located deep to the fascia, directing the blood from the superficial to the deep venous system. The perforator veins do not join the saphenous veins directly but through connecting or communicating veins.

Mechanically there are two types of deep venous insufficiency — obstructive and incompetent. In both cases, the deep venous pressure rises, perforator valves become incompetent and blood in the calf vein stagnates and is directed to the surface through the incompetent perforators. (Dr. Bergan will discuss new approaches to the surgery of deep venous insufficiency, which are aimed at bypassing obstructed veins and providing valves in the incompetent group.)

The deep system may be obstructed by thrombus that has not lysed but progressed to fibrosis or by tumour. Patients with obstruction present with swelling and bursting pain that may increase to the point of venous claudication on walking as the calf "loads up" because of increased inflow and obstructed outflow. Incompetent veins can be familial or may be acquired secondary to valvular damage associated with deep phlebitis. These limbs are characterized by signs of tissue damage that develop a little later in the disease process and are secondary to the water-hammer effect of systole with walking. Pressure is directed from the deep system through the perforators to the superficial tissues and skin, bruising them from within. The three perforators most often affected are referred to as Cockett's perforators. They are unsupported by muscle, situated posteriorly at the level of the medial malleolus and 7 and 12 cm above it.

What is the role of the superficial system in deep venous insufficiency? Browse and colleagues stated that if this system is incompetent, it contributes more than 50% of the pressure, as measured at the ankle.[1] We must be aware of this as more than half of the patients with deep venous insufficiency have an incompetent superficial system.

Examination

Before examination patients stand for 10 minutes to load up the venous system and remain standing during examination. Saphenofemoral incompetence must be noted and may be checked easily with a Doppler. We search for perforators and control points using the "sliding finger technique", milking away the edema over perforator sites to display high-pressure veins, palpating particularly for tenderness over Cockett's perforators. Findings are recorded on an appropriate form.[2]

The patient is prepared for more definitive treatment by fitting a below-knee surgical stocking. My own preference is the Sigvaris (S.H. Camp & Co. of Canada Ltd., Trenton, Ont.). To gain patient compliance, we prescribe the 30 to 40 mm Hg compression and use a "sponge pump" over the Cockett perforator area. The pump is made from 1.25 cm soft latex foam, about 20 × 8 cm, and bevelled so that the edges do not indent the tissue. This pump is wrapped on, using half of a 10-cm tensor bandage, applied tightly below by crisscrossing and easing the pressure proximally. The patient is directed to walk 3 km daily and given a handout on deep venous insufficiency and compression sclerotherapy.

Treatment

If the long saphenous vein is incompetent, I do high ligation of the vein and its branches under local or general anesthesia on a day-care basis. Although there may be temporary improvement of saphenofemoral incompetence after treatment of the perforators by compression sclerotherapy, it has been my experience that each long saphenous vein that was incompetent before compression sclerotherapy was again incompetent 2 to 3 years later. The expedient treatment is to tie the vein off initially. Both Douglas and associates[3] and Hobbs[4] agree with the indication for surgery under these circumstances.

We treat the perforators by compression sclerotherapy. This treatment and its complications are well described in the literature but I wish to emphasize a few points. The vein is needled most readily when the patient is standing and the vein is "loaded up", but the leg must be elevated and the vein empty when the sclerosant is injected. Trapping the sclerosant by wrapping the leg (i.e., the compression) and compliance with it are important despite a report[5] that it is not possible to keep compression on the leg for more than 6 to 8 hours. Pressure over the needle puncture site in the vein reduces the occurrence of "injection ulcer". The bandage is protected by an old nylon stocking at all times and pressure is maintained by applying the Sigvaris stocking over the nylon stocking whenever the limb is dependent. We keep the legs wrapped with the initial bandage and sponge for 3 weeks, tightening the bandage if it loosens. This is followed by 3 weeks in the surgical stocking supported by the sponge pump. Incidentally, if the patient cannot tolerate the sponge pump during the preparatory period, we do not carry out compression sclerotherapy. This eliminates the occasional patient who has a totally inadequate deep system.

One hundred patients who had presented initially with complicated deep venous insufficiency (Table I) were followed up at an average of 4 years after compression sclerotherapy. Of these, 95 were pleased with the treatment and would repeat it. Of 229 incompetent perforators that had been injected, about 20% were again incompetent. One third of the patients underwent repeat compression sclerotherapy or were advised to do so. All patients were advised to continue wearing a surgical support stocking; about two thirds complied. Of interest is that at least one third of these patients would have been poor candidates for operation because of age or obesity. Ideal patients for compression sclerotherapy are those with the majority of the disease below the knee. Perforators, very large veins and stasis ulcers are well treated by this method which should be part of the armamentarium of every surgeon treating venous disease.

Table I—Primary Complaint of 100 Patients With Complicated Deep Venous Insufficiency Treated by Compression Sclerotherapy

Complaint	No. of patients
Bursting pain	25
Dermatitis	5
Pigmentation	14
Induration	28
Ulceration	28

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F. MICHAEL AMELI, MB, CH B, FRCS(EDIN), FRCSC, FACS

3. Current Concepts in the Management of Varicose Veins

Varicose veins are a very common problem, affecting women more than men. The major concern is usually the unsightly appearance of the veins. Various options to deal with this problem are discussed — compression stockings, compression sclerotherapy and surgery. For good results and patient satisfaction, the cause and natural history of varicose veins must be understood. Depending on the type of varicose vein, different modalities of treatment are required and may need to be combined. "Cosmetic" varicosities can usually be managed conservatively with compression stockings. Sclerotherapy is best used for dilated superficial or residual varicose veins, recurrent varicosities or leg perforators. Operation should be reserved for very large varicose veins or an incompetent long or short saphenous vein.

A sound understanding of the problems and discussion of anticipated results with the patient will prevent unrealistic expectations.

Les varices, un problème courant, affectent davantage les femmes que les hommes. La principale inquiétude à leur sujet concerne habituellement leur aspect inesthétique. On commente les diverses options qui s'offrent pour faire face à ce problème: bas de soutien, sclérothérapie par compression et chirurgie. Pour obtenir de bons résultats à la satisfaction du malade, la cause et l'histoire naturelle des veines variqueuses doivent être bien comprises. Selon le type de varices, diverses modalités de traitement sont nécessaire et doivent parfois être associées. Les affections variqueuses dites "cosmétiques" peuvent habituellement être traitées de façon conservatrice à l'aide de bas de soutien. La sclérothérapie convient davantage aux varices superficielles dilatées ou résiduelles, aux varices récidivantes ou aux varices des veines perforantes. L'opération doit être réservée pour les varices très grosses ou dans les cas d'insuffisance des saphènes longues ou courtes.

Une solide compréhension des problèmes et une bonne discussion des résultats escomptés avec les patients permettra d'éviter les attentes irréalistes.

From the Division of Vascular Surgery, The Wellesley Hospital, University of Toronto, Toronto, Ont.

Presented as part of a symposium on venous disease at the 53rd annual meeting of the Royal College of Physicians and Surgeons of Canada, by the Royal College in cooperation with the Canadian Society for Vascular Surgery, Montreal, PQ, Sept. 12, 1984

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Varicose veins are the commonest vascular condition, affecting 20% of the population. There is a preponderance of females and a 20% familial incidence of varicose veins.

Current management is based on a sound knowledge of the anatomy, pathophysiology, treatment alternatives and cost of therapy.

Pathophysiology

In the ambulatory person, venous drainage is inward to the deep veins through the perforating veins.[1] Integrity of the valves in the perforating veins is essential to prevent high-pressure leaks, leading to local venous hypertension upon exercise. There is disagreement on how much of a pressure rise is necessary before varicosities will develop.[2,3] Even a slight rise may be sufficient in a susceptible person.

Primary varicose veins are associated with defective valves and a congenital weakness in the vein walls. Congenital incompetence of perforators is rare.[1] Damaged valves in the perforators, permitting high-pressure leaks to occur, may be due to minor episodes of phlebitis or thrombosis in the deep veins.

An unusual type of varicose veins is seen on the lateral aspect of the lower limb. They usually occur in women and have no obvious communication with the long or short saphenous veins. Probably there is a congenital abnormality of the vein wall and although "points of control" may be demarcated, they do not necessarily correlate with perforators.

History, Physical Examination and Investigation

The main complaint of women with varicose veins is of their cosmetic appearance, although these women may also complain of discomfort, tiredness and heaviness aggravated by menstruation. Men tend to wait until they have large varicosities or complications thereof. Swelling in primary varicosities is unusual and, if present, should alert the physician to the possibility of deep venous thrombosis. Pigmentation and ulceration indicate incompetent perforators and do not occur in primary varicose veins.

The patient is examined standing and in good light. The configuration of the varicose veins is assessed, including their association with the long or short saphenous system, their distribution above or below the knee or atypically on the lateral aspect of the limb. Incompetence at the saphenofemoral junction is elicited by the cough test. An impulse is normal, but a thrill indicates incompetence and can be verified by a bidirectional Doppler.

Perforators can be assessed using tourniquets or digital compression to determine points of control. Other methods that are used are photoplethysmography, bidirectional Doppler, ultrasonography, venography and invasive pressure measurements.[4] The bidirectional Doppler is used to record abnormal flow patterns in the superficial venous system and to assess the integrity of the deep venous system. Venography should be reserved for patients suspected of having deep venous thrombosis.

Management of Varicose Veins

Conservative

Many women complain of visible veins that they find unsightly. It is important

to reassure them that these are normal veins and no treatment is required. Patients with early or primary varicose veins should be assured of the benign nature of their condition. Many have a friend or relative in whom an ulcer has developed, and they are scared that this may happen to them.

Low-pressure stockings are of dubious benefit to patients with minor varicose veins, but they may be helpful during pregnancy. With larger varicose veins, properly fitting elastic stockings (Jobst or Sigvaris) can control the condition indefinitely. These stockings are used if the patient refuses invasive treatment or is not a suitable candidate for surgery. Theoretically, the stockings should cover the varicose veins and points of control; however, patient compliance is poor with the high-level stocking or panty-hose. Below-knee varicosities are the ones most likely to give problems and may be controlled with a below-knee stocking. Men tolerate the stocking better than women mainly because it is not visible.

In patients with varicose veins above and below the knee, below-knee stockings are advised for two reasons: better patient compliance and the lower limb varicosities are subjected to higher pressures, which must be controlled.

The patients with secondary varicose veins due to post-phlebitic conditions must wear below-knee elastic stockings indefinitely. Compression by elastic stockings reduces peak systolic venous pressure during exercise in the post-phlebitic limb.[5] Lateral varicosities on the thigh should be treated conservatively whenever possible. These veins have a very high recurrence rate no matter what type of treatment is used. If the patient insists on some form of therapy, then compression sclerotherapy is recommended.

Compression Sclerotherapy

In 1963, Fegan[6] was responsible for renewed interest in sclerotherapy. He combined injections with compression and exercise and achieved good results. The aim of compression sclerotherapy is to restore normal pressure patterns within the superficial venous network.[7] Current sclerotherapy uses 3% sodium tedradecyl sulfate (Thrombovar); 0.5-mL boluses are injected into points of control that do not necessarily correlate with perforators.[8-10] Three to 10 injections per leg are made and up to three visits may be needed to get a good result. A pad or dental pledgets are taped in place over the injection site. A crêpe or rubberized bandage is worn for 2 to 3 weeks and the patient is urged to walk at least 3 km daily. This relatively low-risk, low-cost procedure can be repeated. The most annoying complications of the procedure are pigmentation, and residual and recurrent varicose veins. Allergic reaction, arterial injury and deep venous thrombosis are very rare.

Hobbs[8] carried out a prospective trial of surgery versus sclerotherapy in 1977. His results after 5 years are summarized in Table I, which shows that surgery gave a better result for incompetence of the greater and lesser saphenous vein system, while sclerotherapy gave a good result for dilated superficial varicosities and varicose veins due to incompetent perforators in the leg. Good results have also been reported by Sladen[9] and Douglas and colleagues[11] in Canada, and the procedure was shown to be cost effective.[9-11]

Some areas of controversy remain. They include the strength of the sclerosing solution that should be used and the length of time that bandaging is necessary. Raj and colleagues[12] showed that a crêpe bandage had to be reapplied every 8 hours to be effective. Batch and associates[13] did a randomized trial on bandaging for 3 to 6 weeks with no resulting difference. Compression sclerotherapy is useful for dilated superficial veins, the atypical lateral varicosities and for residual tributaries and recurrent varicosities after surgery.

Surgery

With a better understanding of the pathophysiology, the surgical approach to varicose veins has undergone change. An important consideration is the use of the long saphenous vein in the surgical treatment of coronary artery disease and vascular reconstruction. Stripping the long and short saphenous veins should be restricted to patients with incompetence of these veins. Patients with saphenofemoral incompetence must undergo flush ligation and division of all the tributaries of the long saphenous vein in the groin to prevent recurrence.

Those with incompetent leg perforators may be treated by compression sclerotherapy. With very large subcutaneous varicosities a surgical approach may be indicated. The decision will be based on the likely final cosmetic and functional results.

For subcutaneous, residual and recurrent varicose veins, compression sclerotherapy is the best palliation. Rarely are multiple ligations required.

With stripping, various methods have been used to remove subcutaneous varicosities. These include large incisions, small multiple incisions, coagulation probe,[14,15] cautery and subcuticular ligation with Dexon.[16] The most appropriate method and one that gives a good cosmetic result is multiple incisions 0.3 to 0.5 mm closed by one or two 5–0 nylon sutures. Of patients who undergo surgery, 33% to 45% subsequently need injections for residual or recurrent varicosities. Thus, a combined approach to these varicosities (surgery and sclerotherapy) is successful.[8,17]

The most annoying complications of operation are scars, nerve injury, which occurs in 5% to 20% of patients, and residual varicose veins.[18] To obviate the possibility of having a good technical result and an unhappy patient, the various treatment alternatives should be discussed with the patient, with emphasis on the advantages, disadvantages and possible complications of operation.

Table I—Randomized Varicose Vein Trial (After Hobbs, 1977[8])

Type of varicose vein	% failed at 5 yr	
	Surgery	Injection
Dilated veins	55	19
Lower leg perforators	57	0
Incompetent long or short saphenous vein	12	69

Conclusions

A better understanding of the pathophysiology of varicose veins, alternative treatments and improved results have allowed surgeons to give better advice to their patients. A frank discussion with the patient will prevent unrealistic expectations. Varicose veins do not have a single cause and no one treatment is better than all others. Good judgement and a sound knowledge of the problem are essential for good management. "Cosmetic" varicose veins are best dealt with conservatively and if necessary by compression sclerotherapy. Varicosities in many patients can be managed adequately by compression stockings. Surgery should be restricted to patients who have an incompetent long or short saphenous vein or very large subcutaneous varicose veins. In patients with dilated superficial varicose veins, residual varicose veins, recurrent varicosities or leg perforators, compression sclerotherapy is recommended.

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JOHN J. BERGAN, MD, FACS*

4. Direct Venous Reconstruction

Direct reconstruction of veins is being applied to patients with chronic venous stasis. Crosspubic bypass and saphenopopliteal bypass have proven satisfactory, and valve reconstruction by valvuloplasty, segment transfer and autotransplantation is being explored. These procedures add to the surgeon's armamentarium in dealing with chronic venous stasis. The results of their application are summarized.

Des reconstructions veineuses directes sont effectuées chez les patients souffrant de stase veineuse. Les dérivations pubiennes et saphéno-poplitées se sont avérées satisfaisante et l'on explore maintenant les reconstructions valvulaires par valvuloplastie, les transferts segmentaires et l'autotransplantation. Ces opérations élargissent les moyens d'intervention du chirurgien dans les cas de stase veineuse chronique. On résume les résultats de leur utilisation.

The patient with chronic, intractable, venous stasis that prevents gainful employment or the enjoyment of leisure activities may be a candidate for surgical therapy. Many of these patients have incompetent distal deep veins but they account for less than 15% of patients with documented proximal, major venous thrombosis.[1] It remains to be shown whether thrombolytic therapy or direct surgical intervention prevents sequelae of venous stasis. In some patients these sequelae develop without known previous occurrence of deep vein thrombosis.

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Which Patients Have Intractable Disease?

While it has been noted that conventional interruption of subfascial perforators and varicose-vein stripping both fail to prevent recurrence of venous ulceration in about 20% of patients, it is also true that such conventional therapy can produce healing in the remaining 80%. Patients who do not respond to treatment with graded elastic compression, careful attention to skin hygiene, avoidance of allergenic medications and removal of superficial varicosities may be considered for venous reconstruction. The patient with intractable disease is one in whom surgery is unsuccessful, particularly when removal of superficial varicose veins is combined with subfascial interruption of perforating veins and when the photoplethysmography tourniquet test or venography has revealed the presence of incompetent perforating veins.

Methods of Venous Reconstruction

Palma and Esperon[2] described an ingenious method of venous bypass using a single venous anastomosis. This technique of decompressing a limb obstructed by a proximal iliac occlusion was modified by Gruss,[3] who added a distal arteriovenous fistula. Subsequently, the use of externally reinforced polytetrafluoroethylene grafts, with or without arteriovenous fistulas, provided another alternative. In addition, free venous bypasses as described by Danza and colleagues[4] may find application in selected cases.

Experimental venous valve autotransplantation was used in the 1960s, but reports of follow-up studies have been contradictory. The most important breakthrough has been direct venous reconstruction using valvuloplasty, introduced by Kistner[5] in 1968. His operation has only recently become generally recognized. The technique enables surgeons to evaluate patients for direct venous reconstruction by selecting those who had failed a course of conservative care and conventional subfascial interruption of perforating veins. Investigation of these patients by ascending and descending venography gave surgeons the opportunity to perform crosspubic bypass (the Palma operation), saphenopopliteal bypass or valvuloplasty. Kistner's contribution should also be recognized for the use of venous-segment transfer, which enables the venous stream to be redirected through a competent proximal valve. His methods produced excellent long-term results in over 80% of patients and he noted that "When interruption of incompetent perforators was performed in addition to femoral vein reconstruction an excellent result was achieved in 12 of 25 cases. In comparison, in 16 cases of repair of the incompetent deep system without treatment of incompetent perforators, good results were achieved in 11, and excellent results in only one." The cautionary message from Kistner is that primary valve repair alone is not sufficient in the management of chronic venous stasis. Moreover, there is an urgent need for objective evaluation of venous reconstructive surgery because clinical results alone do not provide an acceptable method of assessment. If direct venous reconstruction is to succeed, objective scientific data must be provided.

Future Directions

The availability of direct venous reconstruction, and the accuracy of evaluation by noninvasive techniques and ascending and descending phlebography have

resulted in the establishment of surgical services whose prime interest is the treatment of venous disease. This must be regarded as a step forward. When such clinics are established in institutions where scientific methods of evaluation are used, knowledge of venous physiology could be updated, the natural history of venous disease processes recorded and the long-term results of direct surgical reconstruction properly evaluated. Only in this way can rational methods of modern surgical treatment be planned. Until such information becomes available, the best method of managing severe venous stasis remains the application of conservative and standard techniques, reserving more modern direct venous reconstruction for patients who do not respond to conventional therapy.

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Gastric Carcinoma: 30-Year Review

The records of 1030 patients with gastric carcinoma seen between 1941 and 1970 were analysed. A 10-year follow-up was available for 1024. The overall operability and resectability rates were 80.9% and 53.5% respectively, and in the two decades 1951 to 1960 and 1961 to 1970, the rates increased significantly, as did the subtotal gastrectomy rate of 46.9%. Subtotal resection for cure was done in 59.5%, and for palliation in 40.5%. Fifty-six patients underwent a total gastrectomy.

There was no significant increase in consecutive decades in either overall 5-year survival or survival following subtotal gastrectomy. The 5- and 10-year survival rates of 15.1% and 6.6%. Of the 5-year survivors, 54% had no lymph-node involvement and 35.2% had nodes positive for tumour spread.

Gastroesophagectomy was associated with a high morbidity and extremely low survival. Of 56 patients having a total gastrectomy, 37 lived 1 year or more while only 5 survived 5 or more years. Linitis plastica occurred with equal frequency in men and women. Operability and resectability rates were lower and there was a 90.6% 1-year death rate.

On a analysé les dossiers médicaux de 1030 patients qui ont souffert de cancer de l'estomac entre 1941 et 1970. Pour 1024 d'entre-eux, on possède un suivi de 10 ans. Pour l'ensemble, les taux d'opérabilité et de résécabilité ont été de 80.9% et de 53.5% respectivement et, aux cours des décennies de 1951 à 1960 et de 1961 à 1970, ces taux ont augmenté de façon importante tout comme le taux de gastrectomie partielle de 46.9%. Résection partielle à visée curative fut accomplie pour 59.5%, et pour résection à visée palliative 40.5%. Cinquante-six patients ont subi une gastrectomie totale.

Au cours des décennies consécutives, on n'a observé aucune augmentation significative de la survie à 5 ans ou de la survie après gastrectomie partielle. Après résection à visée curative, les taux de survie à 5 et 10 ans ont été de 34% et 20.5%. Les résections à visée palliative ont donné des taux de survie à 5 et 10 ans de 15.1% et 6.6%. Parmi les survivants à 5 ans, 54% n'avaient pas d'atteinte des ganglions lymphatiques alors que 35.2% avaient des signes ganglionnaires d'envahissement tumoral.

Les gastro-oesophagectomies ont été reliées à une morbidité élevée et à une survie extrêmement faible. Des 56 patients qui ont subi une gastrectomie totale, 37 ont survécu 1 an ou plus, alors que seulement 5 ont dépassé 5 ans. Les épithéliomas squirrheux de l'estomac ont été observés aussi fréquemment chez les hommes que chez les femmes. Les taux d'opérabilité et de résécabilité étaient faibles et on a constaté une mortalité à 1 an de 90.6%.

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This study reviews the records and follow-up of 1030 patients with gastric carcinoma admitted to the Royal Victoria Hospital, Montreal, from 1941 to 1970. A review of 427 patients admitted between 1941 and 1950 was presented previously.[1] The results of that study are included here to expand the follow-up and survival data and to compare the results obtained for each of the three decades.

Methods

Follow-up of the 1030 patients was carried out by the central tumour registry of the Royal Victoria Hospital. Six patients were lost to follow-up, leaving a total of 1024 who were followed up for more than 5 years. Significance was tested statistically using the χ^2 test with Yates' correction for continuity with a 2×2 contingency table.

Findings

Figure 1 demonstrates the annual incidence of carcinoma of the stomach at the Royal Victoria Hospital from 1941 to 1983. The numbers of new cases for each decade between 1941 and 1970 were 427, 363 and 240 respectively.

Thirty-six patients had two primary tumours and 3 a triple primary. One patient, in addition to her gastric lesion, had a right breast carcinoma, a lung carcinoma and a carcinoma of the bladder.

Fifty-three (5.2%) patients (28 women) had linitis plastica. The youngest was 26 years old and the oldest 80; only 9 were over 70 years of age. Weight loss was a symptom in all but seven of these patients. Forty (75.5%) were operated upon, with 18 (34%) having resections. Subtotal resections were done in 10 and total gastrectomies in 8. Seventeen had an exploratory procedure only while 5 had miscellaneous operations in an attempt to achieve palliation. Forty-eight (90.6%) died within 1 year. The survival times and

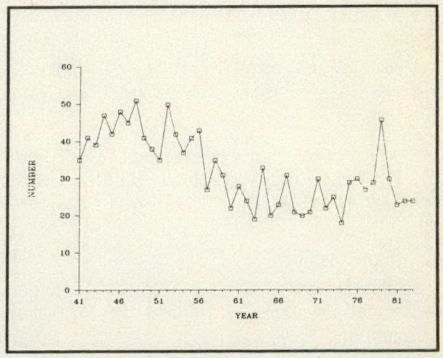

FIG. 1—Incidence of gastric carcinoma at Royal Victoria Hospital, by year, 1941 to 1983.

the type of operation in the five patients who lived longer than 1 year are set forth in Table I.

Sex

Of the 1030 patients, 678 (65.8%) were men (Fig. 2). In the first and second decades, the women constituted 34.2% and 29.2% of the total group. However, in the third decade, the proportion of women had risen to 41.3% ($p < 0.01$).

Age

The youngest patient was 21 years of age and the oldest 90 years. There were 68 patients between the ages of 20 and 39 years (Table II), and 54 between 40 and 44 years of age. The incidence of gastric carcinoma continued to increase with advancing age without reaching a plateau, with 186 cases in the 65 to 69-year age group. Patients 70 years of age and older made up 21.8% of the total. Forty-two patients were 35 years of age or younger and 35 (83%) of those died within 1 year of diagnosis.

Signs and Symptoms

Signs and symptoms in order of frequency are noted in Table III. All but two patients presented with symptoms of gastrointestinal disturbance. In one, the disease was discovered during the course of a "check-up". The second patient was investigated for prostatic obstruction and found to have an epigastric mass. Symptoms were present for 3 months or less in 339 patients, while 122 had symptoms for 2 or more years. Of the 120 patients who survived 5 years or more, 29 (24.2%) had had symptoms for 3 months or less, while 37 (30.8%) had a symptom-duration time of 2 or more years. Weight loss was present in 688 (67%) patients. Of these, 141 (20.5%) underwent subtotal resection for cure. They made up over half of the 244 patients who underwent resection for cure. An epigastric mass was present in 73 (8.4%) of the 874 patients who were operated upon and 28 of these underwent a subtotal resection for cure, with 18 patients surviving 5 years or longer.

Nausea and vomiting as a symptom of obstruction occurred in 98 (9.5%). The tumour was located in the prepyloric area in 74 of these patients, at the cardia in 20 and in the body of the stomach in 1 patient. Three patients had colonic obstruction due to tumour spread.

Forty-five of the 58 patients admitted with acute bleeding were operated upon. Twenty-six (44.8%) had subtotal resection and 5 underwent total gastrectomy. Fourteen patients survived 1 year, 10 patients 2 years and 4 patients survived 5 years. One patient lived for 12 years. All of the patients who were not operated on died within 1 year.

Perforation occurred in 19 (1.8%) patients. Suture closure was used in 13 and 6 underwent subtotal resection. The longest survivors were two patients who had subtotal gastrectomies and who lived 2 years. Twenty-four patients had a documented history of duodenal ulcer before the gastric carcinoma developed. Surgery for peptic ulcer had been performed on eight previously. A subtotal resection had been carried out in four patients at 3, 6, 7 and 24 years before the gastric carcinoma was diagnosed.

Diagnostic Investigations

One hundred and fourteen patients (44.2%) of 258 whose blood group was recorded were of blood group A. Eighty-seven (33.7%) were of blood group O. Gastric analysis, done in 494 instances, revealed 332 (67.2%) who were achlorhydric. The blood protein level was recorded in 170 patients; in 65 (38.2%), the albumin-globulin ratio was reversed, in 49 (28.8%), the serum albumin level was below 30 g/L and in 56 (32.9%) it was normal. Pernicious anemia was present in 10 (1.7%) of 603 patients whose records included sufficient data to establish the diagnosis.

The findings of an upper gastrointestinal barium examination were recorded in 843 patients. The examination was unsatisfactory or incomplete in four patients (0.5%). The malignant lesion was diagnosed in 762 (90.4%); no lesion was seen in 51 (6.0%). In 26 patients (3.1%) the findings, although not conclusive, indicated that operation was necessary, during which the diagnosis of gastric carcinoma was made.

In the decade 1941 to 1950, endoscopy was done in 21 (4.9%) of the 427 patients, in 33 (9.1%) of 363 in the following decade, and in the last decade there were 85 (35.4%) endoscopic examinations in 240 patients. The diagnostic accuracy increased from 71.4% to 72.7% in the second decade and 78.8% in the final decade. Overall, 139 endoscopic examinations were carried out with a positive diagnosis in 106 (76.2%).

Operations

Operability increased significantly ($p < 0.05$) during the last two decades (Table IV), in which there was also a

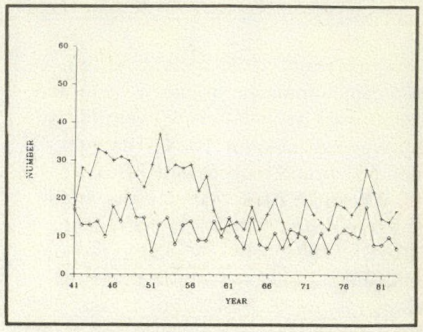

FIG. 2—Distribution by sex of gastric carcinoma at Royal Victoria Hospital, 1941 to 1983. + = men, ◇ = women.

Table II—Age Distribution of the 1030 Patients

Age group, yr	No.	%
20–24	2	0.2
25–29	11	1.1
30–34	17	1.7
35–39	38	3.7
40–44	54	5.2
45–49	82	8.0
50–54	106	10.3
55–59	151	14.7
60–64	158	15.3
65–69	186	18.1
≥ 70	225	21.8

Table III—Signs and Symptoms in Order of Frequency of Occurrence

Sign/symptom	No.	%
Weight loss	688	67
Abdominal pain	650	63
Weight loss and abdominal pain	422	41
Nausea and vomiting	412	40
Anorexia	335	33
Abdominal tenderness	293	28
Weakness	272	26
Abdominal fullness	171	17
Pallor	166	16
Epigastric mass	165	16
Cachexia	129	13
Constipation	119	12
Nausea (without vomiting)	115	11
Gaseous eructations	68	7
Acute bleeding	58	5.5
Dysphagia	56	5
Ascites	11	1

Table I—Data on Five Patients With Linitis Plastica Who Survived Longer Than 1 Year

Type of operation	Nodal involvement	Duration of survival, yr
Exploratory only	Negative	1
Subtotal resection	Negative	1.1
Laparotomy only	No gross involvement	2.8
Hemigastrectomy	Positive	3.5
Subtotal resection	Negative	8

small, but significant ($p < 0.05$), increase in the resectability rate (Table IV). The rate for all decades was 53.3% of patients operated on or 45.2% of all patients in the series. Exploration only was done in 238 (27.2%) of the 874 patients. The incidence of exploration without resection fell significantly ($p < 0.001$), from 34.7% in the first decade to 29.4% in the second decade to 11.2% in the third. Subtotal gastrectomy was performed on 410 (46.9%) of the patients operated upon (Table V), 39.8% of the total series. The increase in the last two decades was significant ($p < 0.05$).

Subtotal resection was carried out for cure in 244 (59.5%) patients operated upon and for palliation in 166 (40.5%) (Table V). This relationship did not change significantly during the three decades, relative to either the number of patients operated upon or the total population of the series (Table V). Gastroenterostomy was done in 90 (10.3%) of 874 instances. In the years 1941 to 1950, the rate was 12.9%. In the following two decades, it was 8.1% and 9.3% respectively. These differences were not statistically significant.

Survival

The overall 5-year survival rate was 11.7%. Although it increased in the consecutive decades (Table VI), the increase was not significant. Of the patients who underwent subtotal resection, 108 (26.3%) survived for 5 years or longer, and 61 (14.9%) were alive at 10 years (Table VII). There was no significant difference between decades. Of the 244 patients who had subtotal resection for cure, 93 (38.1%) survived 5 years, and 50 (20.5%) lived for 10 years or longer. The operating surgeon described the resection as palliative in 166 of the 410 resections and 25 (15.1%) of these patients lived for 5 years or longer, while 11 (6.6%) survived for more than 10 years. The operative death rate for patients who underwent subtotal resection was 8.8% (36 patients). A proximal subtotal gastrectomy with distal esophagectomy was performed in 34 patients, with an operative death rate of 23.5% (8 patients). Only two patients survived longer than 5 years; one for 7 years and the other for 9 years.

Of 56 patients (6.4% of those operated on) who underwent total gastrectomy, 37 died within 1 year, 5 lived 5 or more years and 3 lived 19 years. Four of the patients living longer than 5 years had positive nodes.

Pathological Features

Thirty-eight (35.2%) of the 5-year survivors following subtotal resection had positive nodes. In 59 (54.6%) patients, there was no lymph-node involvement. There was no record of nodal disease in 11 patients.

Table VIII describes the gross pathological features of the lesions in 701 patients. A papillary lesion was present in 46.2% and these tumours usually showed some degree of ulceration. There was a primarily ulcerative tumour in 33.1%.

The peripheral nodes were occasionally involved. Fourteen patients had a Virchow's node, and 14 had positive neck nodes. The axillary nodes were the site of metastases in eight. One patient had a positive right supraclavicular node.

Discussion

For unknown reasons, the incidence of gastric carcinoma in the United States began to decrease in the early 1930s.[2] That this decrease has continued has been well documented.[3,4] Except for a slight increase between 1941 and 1949, and between 1975 and 1980, there was a downward trend in our series. There was a preponderance of men except in the decade from 1961 to 1970, although the relative number of women in the last two decades of the study has increased significantly.

Gastric cancer is primarily a disease of the elderly, but a sufficient number of cases occur in young people to make one wary of symptoms of gastrointestinal tract disease. The 83.3% death rate at 1 year in those 35 years old or younger, which corresponds exactly with the figure of Bloss and associates,[5] makes for a particularly discouraging outlook in this age group.

Special emphasis should be given to weight loss as a symptom. It is frequently a late occurrence in other malignant conditions, indicating an advanced stage of disease. In gastric lesions, however, it is often among the initial complaints or findings. Constipation is another symp-

Table IV—Operability and Resectability by Decade

	Operability		Resectability	
Years	No.	%*	No.	%†
1941–50	349	81.7	163	46.7
1951–60	320	88.2	170	53.1
1961–70	205	85.4	133	64.9
1941–70	874	84.9	466	53.3

*Percentage of total series.
†Percentage of patients operated on in the respective decade.

Table V—Number of Subtotal Gastrectomies Performed by Decade

	Cure			Palliation			Total		
Years	No.	% of operations	% of total series	No.	% of operations	% of total series	No.	% of operations	% of total series
1941–50	81	55.1	19.0	66	44.9	15.5	147	42.1	34.5
1951–60	92	62.2	25.3	56	37.8	15.4	148	46.2	40.7
1961–70	71	61.7	29.6	44	38.3	18.3	115	56.1	47.9
1941–70	244	59.5	23.7	166	40.5	16.1	410	46.9	39.8

Table VI—Overall 5-Year Survival

Patients available for follow-up	Years	No.	%
427	1941–50	44	10.3
360	1951–60	44	11.6
237	1961–70	32	13.5
1024	1941–70	120	11.7

Table VII—End Results After Subtotal Resection

		Alive 5 yr		Alive 10 yr	
Years	No.	No.	%	No.	%
1941–50	147	39	26.5	26	17.6
1951–60	148	39	26.4	18	12.2
1961–70	115	30	26.1	17	14.7
1941–70	410	108	26.3	61	14.9

Table VIII—Gross Pathological Features

Type	No.	%
Papillary	324	46.2
Ulcerative	232	33.1
Local infiltration	92	13.1
Linitis plastica	53	7.6

tom deserving emphasis since it was the chief complaint of 12% of the patients in our series. A finding of interest is that an epigastric mass did not always preclude resectability. Eighteen 5-year survivors had a palpable abdominal tumour.

The number of patients in blood group A so closely approximates the usual number in that blood group in the general population that it was of no prognostic importance, in keeping with the findings of Hartmann and Stavem.[6]

Some[7-9] believe that there is a risk factor for "stump carcinoma" following remote subtotal resection for duodenal or gastric peptic ulcer. Recently, however, Fischer and associates[10] concluded that individuals previously subjected to Billroth II resection for duodenal ulcer were at no higher risk for gastric carcinoma than the general population. Also, Schafer and colleagues[11] found that their group of patients who had surgical treatment for benign peptic ulcer disease had no evidence of gastric cancer during the subsequent 5 years. Only four patients in our series had had subtotal resection for duodenal ulcer previously. Although the development as a carcinoma usually occurs after a 15-year interval, in three cases it occurred within 8 years. Nicholls[9] in his large series, however, encountered cancers that appeared as early as 3 years later. A rather surprising finding was the well-documented history of duodenal ulcer in 24 patients.

When the duration of symptoms was correlated with 5-year survival, it was found that 24.2% of patients who underwent subtotal resection had had their symptoms for 3 months or less, while 30.8% had a symptom-duration time of 2 or more years. This is not surprising since it has been demonstrated by others[12-14] that patients with gastric carcinoma — including those who do not undergo resection — who had the longest duration of symptoms had the longest survival.

Although gastric cancers may occur in patients who have normal acid production,[15] the finding of achlorhydria must certainly raise the possibility of carcinoma — more than half of the patients tested in our series had no free acid.

Diagnostic accuracy by barium contrast roentgenography remained in the vicinity of 92%, while that of the endoscopy was 76%. The increased accuracy for the latter procedure as well as an increase in its use is probably due to the introduction and more frequent use of fiberoptic endoscopic instruments and biopsy.

Although there was a small significant increase in operability and resectability in the second and third decades of this study, there was no significant change in the survival rates following subtotal gastrectomy. The long-term survival at present attained after resection is due mainly to subtotal gastrectomy, either proximal or distal, depending on the site of the lesion. This routinely includes resection, in continuity, of the greater omentum and adjacent lymph nodes. A 30% 5-year survival rate for patients operated on for cure correlates well with the operator's assessment at the time of resection.

An important correlation exists with node involvement. Following subtotal resection, the 5-year survival was 54% for those without involved nodes and 35.2% for those with involved nodes.

When the operation was described as palliative by the operating surgeon, 15% of the patients were alive 5 years later and 6.6% 10 years later. Palliative resection is worthwhile because it provides better palliation than a bypass operation for a potentially bleeding or obstructive lesion. Also, nodes originally thought to be metastatic may, in fact, not be.

Gastroesophagectomy for lesions of the cardia invading the esophagus results in a disappointingly low survival rate, as Dupont and colleagues[16] found. The real value of the resection of the tumours may well be the palliation it provides. This was the conclusion reached by Ellis and Gibb,[17] and is supported by the findings in our series. In addition, debulking of the tumour mass may be of value should chemotherapy be used.

Total gastrectomy is still associated with poor survival. Only 18 of our 56 patients survived 1 year, and only 5 lived 5 years or longer. This procedure should be used selectively and only when there is a reasonable chance of resecting all diseased tissue. Because of its high morbidity and risk of early mortality, it has little place as a palliative procedure.

Linitis plastica, an uncommon type of diffuse infiltrating tumour, had some features that differ from the more usual types of adenocarcinomatous lesions. It occurred with almost equal frequency in men and women. Weight loss was the chief symptom in a high percentage (86%) of the patients. Operability and resectability rates were lower and the 90.6% death rate at 1 year was particularly discouraging.

The overall survival rate for patients with gastric adenocarcinoma in North America has changed little for many years. The results from subtotal gastrectomy have also reached a plateau as is shown in this and other series.[18-21] Whether future improvement will depend on the use of chemotherapy, radiotherapy or a combination of these, remains to be seen.

I am indebted to Dr. H.M. Shizgal for significance testing, and to Drs. H.M. Shizgal and J.L. Meakins for reviewing the manuscript.

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Telangiectatic Osteosarcoma: Unusual Behaviour

The telangiectatic variant of osteogenic sarcoma is rare. Its biologic behaviour, treatment and prognosis are controversial. The case of a 15-year-old girl with this tumour is described. Both the location and clinical behaviour of the tumour were unusual. The tumour, which involved the distal ulna, was initially treated by a limited resection of the distal 8 cm of ulna. Sixty-nine months later the tumour recurred locally; there was no evidence of metastases. The forearm was amputated and the patient was then treated aggressively by chemotherapy. She was well 42 months later.

This case illustrates the tendency for telangiectatic osteosarcoma to recur locally if it is not radically excised.

Le sarcome ostéogène de type télangiectasique est rare. Son comportement biologique, son traitement et son pronostic font l'objet de controverse. On en décrit un cas chez une fille de 15 ans. La localisation et le comportement clinique de la tumeur furent inhabituels. La tumeur affectant la partie distale du cubitus fut tout d'abord traitée par résection limitée de 8 cm du cubitus distal. Une récidive locale apparut 69 mois plus tard; il n'y avait pas de signes de métastase. L'avant-bras fut amputé et on ajouta une chimiothérapie agressive. Quarante-deux mois plus tard, la patiente demeurait en bonne santé.

Ce cas illustre la tendance que montre l'ostéosarcome télangiectasique de récidiver localement s'il n'est pas excisé complètement.

Despite the early recognition of the telangiectatic variant of osteogenic sarcoma by Paget in 1854[1] and its subsequent classification as a variant of osteogenic sarcoma by Ewing in 1922,[2] there is still disagreement regarding the incidence, clinical behaviour, optimal treatment and prognosis of this entity.[3-10] We report a case of telangiectatic osteosarcoma in which the site of the lesion and clinical course were unusual. The tumour developed in the ulna and the patient's course was complicated by local recurrence. This case has therapeutic implications concerning the use of limited resection for the treatment of this condition.

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Case Report

A previously healthy 15-year-old girl was admitted to hospital with a 3-month history of progressive pain in the right wrist. Movement was so limited that she could no longer type or play the piano. Initial roentgenograms revealed a lytic, 5.0-cm expansile defect involving the distal epiphysis and metaphysis of the right ulna. The cortical margin was irregular and there was an associated pathologic fracture (Fig. 1). Diagnostic possibilities included an aneurysmal bone cyst with fracture, a benign or malignant giant cell tumour and osteogenic sarcoma. Biopsy showed cystic blood-filled spaces separated by trabeculae of cellular tissue containing polygonal and spindle-shaped cells with anaplastic nuclear features (Fig. 2, a and b). There were many mitotic figures (Fig. 2c). Scant, lacy osteoid was present in a few areas (Fig. 2d). Benign giant cells and hemosiderin containing histiocytes were also noted. Outside consultation (D.C. Dahlin) confirmed the diagnosis of telangiectatic osteosarcoma. Results of investigation for metastatic involvement were negative.

A limited resection of the distal 8 cm of ulna was performed. This decision was based in part on the family's wishes and in part on the conflicting information available in the literature at the time (1976) — one group indicating a uniformly grave prognosis and recommending radical excision[8] and the other group indicating that results of local resection combined with systemic chemotherapy paralleled those of amputation.[11] Examination of the operative specimen revealed a soft, hemorrhagic mass (5.0 × 2.5 × 2.0 cm) replacing the distal ulna and extending to the articular surface of the wrist. The proximal surgical margin of excision was free of tumour. Postoperatively, Adriamycin (30 mg/m^2 for 3 consecutive days every 4 weeks) was given over a period of 6 months.

The patient remained well for 69 months, when pain developed at the previous resection site. Roentgenograms showed bone resorption of the distal end of the ulnar stump (Fig. 3) and bone scans revealed increased activity in the same region. There was no evidence of metastatic disease. Biopsy and subsequent disarticulation through the elbow confirmed recurrence of the tumour. The tumour mass (3.0 × 2.5 × 2.5 cm) involved the distal ulnar stump and surrounding soft tissue and extended into the medullary cavity of the ulna for 6.5 cm (Fig. 4). No skip lesions were present.

Postoperatively, a modified Rosen regimen (high-dose methotrexate and vincristine with citrovorum factor recovery)[11,12] was followed at 6 weeks by a protocol comprising bleomycin, cyclophosphamide and actinomycin D. At 9, 10, 14 and 15 weeks she received methotrexate with citrovorum factor recovery, then, at 20 weeks, two cycles of cisplatinum followed by another course of bleomycin, cyclophosphamide and actinomycin D. To date, 42 months after her second operation, there is no evidence of recurrence and her biochemical findings are normal. Clinically, she is doing well and has been fitted with a myoelectric prosthesis.

Discussion

The clinical features of telangiectatic osteosarcoma have been well defined. As with the standard form, the tumour is more common in men (60%), but the telangiectatic form occurs in a slightly younger person (mean age 20 years). With

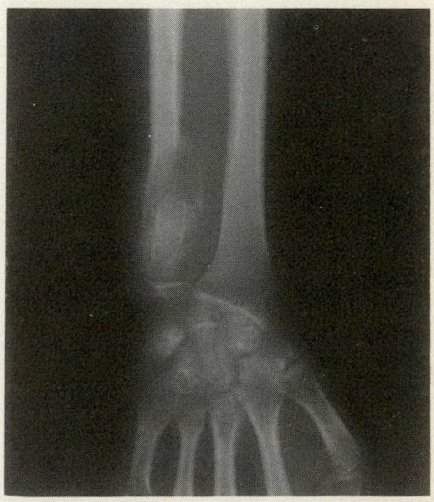

FIG. 1—Primary tumour showing lytic destructive lesion involving distal end of ulna.

the exception of the proximal femur and tibia, which are less frequently involved, the distribution of this neoplasm is generally similar to that of standard osteogenic sarcoma: most tumours involve the metaphysis of major tubular bones.[7,9] Symptoms are nonspecific, consisting of local pain and swelling. Roentgenographic findings show a large, lytic lesion with cortical erosion and an occasional "blown-out" appearance. A permeative pattern of destruction may also be seen.[13] Extension to the epiphysis and pathologic fracture occur more frequently with telangiectatic osteosarcoma than with the standard type.[8] To establish the diagnosis, some authorities require that the lesion be purely lytic throughout, but others accept a predominantly lytic lesion with minimal sclerosis.[9] The roentgenographic picture is frequently less specific than that of standard osteogenic sarcoma. The differential diagnosis includes aneurysmal bone cyst and benign or malignant giant cell tumour.

The tumour in our case fulfilled the diagnostic criteria used by Dahlin:[13,14] radiologically, the tumour appears to be a lytic destructive lesion with no appreciable areas of sclerosis; grossly, the tumour forms a cavity with little solid tumour tissue and no apparent sclerosis; and, histologically, the tumour consists of single or multiple cystic cavities containing blood and necrotic tumour, often traversed by septae composed of anaplastic cells.

Our case is unusual in several respects. First, telangiectatic osteosarcoma of the ulna has seldom been reported. In a series of 124 cases,[7] 2 involved the distal forearm, but whether these primarily involved the radius or ulna is not clear. In other series, involvement of the ulna has not been reported. Second, this patient's clinical course was unusual in that it was characterized by late local recurrence and prolonged survival (9 years). Local recurrence is an infrequent finding in standard osteogenic sarcoma but has been noted in approximately 20% of cases of telangiectatic osteosarcoma, usually as a terminal event.[8] Had disarticulation, rather than limited resection of the distal ulna, been carried out initially, local recurrence might have been prevented. The initial decision favouring local resection over disarticulation was based on the family's wishes and conflicting information in the literature at the time. The distal location of the tumour suggested that it would be possible to excise tissue proximal to the lesion and eradicate the tumour by local resection as

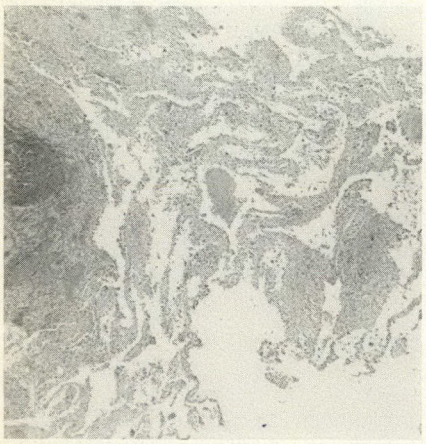

Fig. 2a

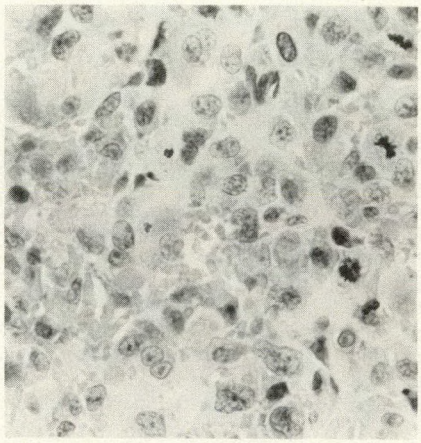

Fig. 2c

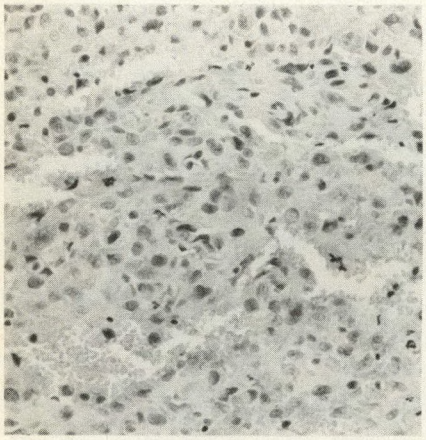

Fig. 2b

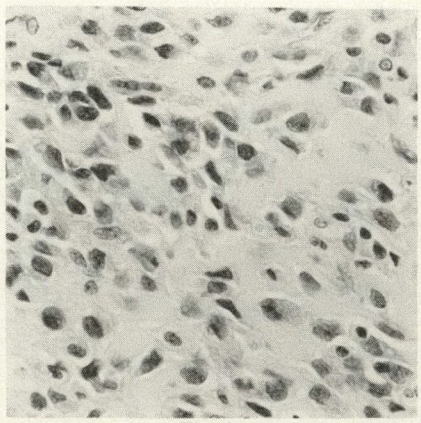

Fig. 2d

FIG. 2—(a) Cystic filled spaces separated by trabeculae of cellular tissue (hematoxylin and eosin, original magnification × 25). (b) Cellular area composed of polygonal and spindle-shaped cells with frequent mitotic figures (hematoxylin and eosin, original magnification × 100). (c) Higher magnification showing pleomorphic cellular features with high mitotic rate (hematoxylin and eosin, original magnification × 400). (d) Neoplastic cells separated by scant lace-like osteoid (hematoxylin and eosin, original magnification × 400).

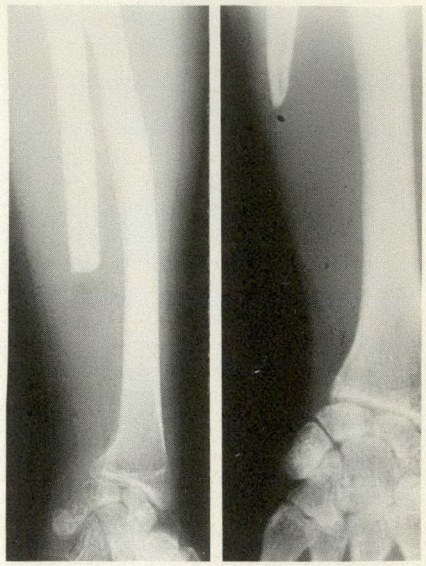

Fig. 3a Fig. 3b

FIG. 3—(a) Appearance immediately postoperatively. Border of ulna is sharply defined at resection line. (b) With local recurrence there is resorption of distal ulna.

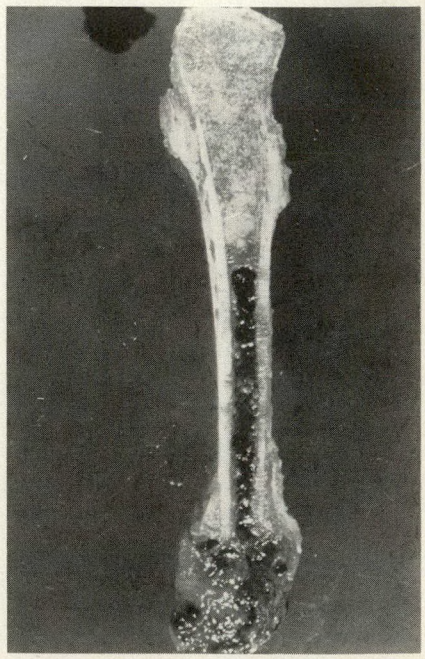

FIG. 4—Surgical specimen showing locally recurrent tumour involving ulna. Hemorrhagic mass is present at previous resection line and extends proximally within medullary canal for 6.5 cm.

effectively as by amputation. The clinical course, however, confirmed the previously reported tendency for this tumour to recur locally and illustrates the potential danger of performing limited resection.

The clinical importance and prognosis of telangiectatic osteosarcoma are controversial. In the Memorial Hospital series,[7] in which focal minimal sclerosis was accepted in an otherwise lytic lesion, 124 (11%) of 1129 osteogenic sarcomas were classified as telangiectatic and these were associated with a similar or even better prognosis than that for conventional osteogenic sarcoma. In the same study, when only 43 purely lytic tumours were analysed, the survival was the same as that of standard osteogenic sarcoma. By contrast, in other series[8] in which the criteria outlined in our case were used, the relative incidence was lower (2.5%) and was associated with a much worse prognosis, 23 of 25 patients dying of the disease with a mean survival of 16 months. In other reports,[10,15] the relative incidence of telangiectatic osteosarcoma to standard osteogenic sarcoma ranged from 0.4% (1 out of 242 cases) to 12% (21 out of 170 cases).

Although it is a rare entity and questions still remain about the precise criteria for diagnosis, incidence relative to standard osteogenic sarcoma and prognosis, the telangiectatic variant has sufficiently distinctive clinical and histologic features to warrant recognition as a separate clinicopathologic entity. The radiologic and pathological findings are notorious for mimicking benign bone tumours, particularly aneurysmal bone cyst.[16-18] Compared with standard osteogenic sarcoma, the telangiectatic variety more frequently involves the epiphysis, has a higher incidence of pathologic fracture and tends to recur locally more often. Our case illustrates this last feature and emphasizes the potential risk of performing limited resections of high-grade osteosarcomas.

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Loop Ileostomy for Anorectal Crohn's Disease

The treatment of symptomatic Crohn's disease of the anorectum can be challenging. Medical therapy may fail and local surgery may be complicated by delayed healing or incontinence. The authors report the clinical course of 12 patients with this condition treated by fecal diversion with a loop ileostomy.

Seven patients had a rectovaginal fistula. At the time of review, one of them had restored intestinal continuity following successful fistula repair, three had minimal or no symptoms, one had an active perianal fistula after closure of the ileostomy and two had undergone a proctocolectomy for recurrent symptoms. Five patients with Crohn's proctitis or anorectal sepsis were treated by loop ileostomy. One was asymptomatic, one had recurrent symptoms and three underwent a proctocolectomy.

From their experience the authors conclude that construction of a loop ileostomy will temporarily improve the symptoms of anorectal Crohn's disease. Fecal diversion does not appear to alter the long-term course of the disease, and successful restoration of intestinal continuity is uncommon.

Le traitement de la maladie de Cröhn symptomatique avec atteinte de l'anus et du rectum représente tout un défi. Le traitement médical peut échouer et la chirurgie locale peut se compliquer d'un retard de guérison ou d'incontinence. Les auteurs décrivent l'évolution clinique de 12 patients souffrant de cette maladie qui ont été traités par détournement de l'évacuation fécale à l'aide d'une boucle d'iléostomie.

Sept patientes souffraient d'une fistule rectovaginale. Au moment de préparer ce rapport, une d'entre-elles avait eu un rétablissement de la continuité intestinale après réparation réussie d'une fistule, trois présentaient peu ou pas de symptômes, une avait une fistule périanale active après fermeture de l'iléostomie et deux avaient subi une proctocolectomie après récidive des symptômes. Cinq patients présentant une rectite de Cröhn ou une infection anorectale ont été traités par boucle d'iléostomie. Un était asymptomatique, un montrait des signes de rechute et trois avaient subi une proctocolectomie.

Suite à leur étude, les auteurs concluent que la construction d'une boucle d'iléostomie améliore temporairement les symptômes de la maladie de Cröhn anorectale. La dérivation de l'écoulement fécal ne semble pas modifier l'évolution à long terme de la maladie et le rétablissement de la continuité intestinale réussit rarement.

Crohn's disease involving the anorectum may present with a variety of lesions including hemorrhoids, edematous skin tags, anal fissures and simple or complex fistulas. The treatment of symptomatic patients can be challenging. Medical therapy may be unsuccessful, and surgery may be complicated by delayed healing or incontinence,[1] prompting surgeons to consider alternative methods of treatment. External diversion of the fecal stream by means of a split or loop ileostomy appears theoretically to offer several advantages: to relieve the symptoms of diarrhea and anal discomfort, to reduce anorectal sepsis and to prevent or delay proctocolectomy.

In 1965, Truelove and associates[2] reported on five patients with Crohn's colitis treated by split ileostomy. Subsequent papers have suggested that up to 90% of patients with Crohn's colitis are temporarily improved after external fecal diversion.[3-5] The effect of an ileostomy on the long-term course of anorectal Crohn's disease is less clear. Although Harper and colleagues[6] found initial improvement in 72% of patients with perianal Crohn's disease treated by a split ileostomy, intestinal continuity was restored in only 20%.

We undertook the present review to analyse our own experience with loop ileostomy in patients with anorectal Crohn's disease.

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Patients (Table I)

Twelve patients (3 men, 9 women) with anorectal Crohn's disease were treated by loop ileostomy. They ranged in age from 21 to 46 years. The clinical diagnosis was confirmed by a combination of endoscopic, radiologic and histopathologic examinations. The average duration of Crohn's disease until the loop ileostomy was done was 6 years.

Seven women (group 1) had rectovaginal fistulas associated with Crohn's disease. All complained of the passage of stool or flatus through the vagina. Two had perineal pain and four had abdominal pain, diarrhea or anorexia. Rectovaginal fistulas were associated with Crohn's disease of the small intestine in two patients, the colon in one and both the small intestine and colon in four. The rectum was uninvolved macroscopically or was minimally diseased in all the women. All had received prednisone or sulfasalazine and five had completed at least one course of metronidazole without improvement. In three women, the loop ileostomy was combined with small-bowel resection.

Three patients (group 2) had anorectal sepsis due to complex fistulas. Symptoms in these patients included crampy abdominal pain, severe perianal pain and diarrhea. All had colonic disease, which was associated with small-bowel disease in two. In addition to prednisone or sulfasalazine, two had previously been treated with metronidazole with only minimal improvement.

The remaining two patients had severe proctitis (group 3). Both had crampy pain, diarrhea, tenesmus and weight loss. Radiologic and endoscopic investigations revealed severe Crohn's disease confined to the colon and rectum. In addition to sulfasalazine and prednisone, one patient was treated with metronidazole without improvement.

Surgical Technique

Preoperatively, the site of the proposed ileostomy is marked appropriately in the right lower quadrant. Under general anesthesia, a laparotomy is performed

and the small bowel examined. A loop of normal bowel closest to the ileocecal valve is chosen for the ileostomy. A stomal aperture is made that will admit two fingers. The ileum is delivered through the abdominal wall and secured over a small plastic ileostomy rod to prevent retraction of the stoma (Fig. 1). After the abdominal incision has been closed, an eccentric opening is made in the distal portion of the ileal loop (Fig. 1). The stoma is matured by everting the distal end towards the proximal end and suturing the ileum to the skin with interrupted absorbable sutures as described by Turnbull and Weakley[7] (Fig. 2). An ileostomy appliance is placed, although the ileostomy usually does not begin to function for several days postoperatively. The ileostomy rod is removed 5 to 7 days after operation. The stoma functions as if it were an end ileostomy and patients use standard ileostomy appliances.

Results

Complications

The mean hospital stay after loop ileostomy was 14 days (range from 10 to 25 days). Five patients had complications postoperatively that responded to medical management; they included incomplete small-bowel obstruction in two and high ileostomy output in three. One patient had wound dehiscence requiring reoperation.

Two patients suffered late complications. One had peristomal skin irritation due to mucous discharge from the distal limb of the loop ileostomy. This problem was eventually solved by converting the loop to a split ileostomy. The other patient had a bowel obstruction caused by a loop of small intestine that became twisted about the undersurface of the ileostomy site. She required laparotomy, at which time the loop ileostomy was closed.

Only one group 1 patient had the loop ileostomy successfully closed. Three still have the loop ileostomies but have minimal or no symptoms from the rectovaginal fistula. One patient is symptomatic with a perineal fistula that developed after the loop ileostomy was closed. Two patients required proctocolectomy.

One month after loop ileostomy, the three group 2 patients had reduced their medications and were free of perineal pain. On examination, however, the fistulas remained unhealed and endoscopy showed active rectal disease. At the time of review only one patient in this group is asymptomatic, 30 months postoperatively. One patient required a proctocolectomy 4 months after construction of the ileostomy because of recurrent perianal infection, frequent bowel movements and crampy abdominal pain. The third patient had similar complaints 21 months after construction of the loop ileostomy. He remains symptomatic but

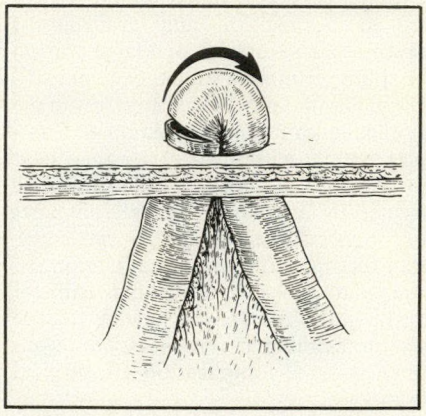

FIG. 1—Loop of distal small bowel is brought through stomal aperture in right lower quadrant. It is maintained in position by plastic ileostomy rod. Enterotomy is made in distal portion of this loop of bowel. Stoma is matured by everting distal end toward proximal end.

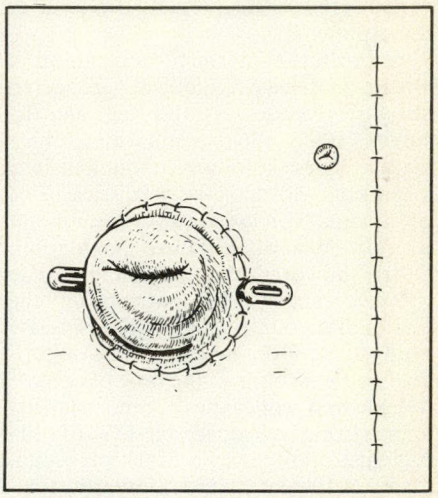

FIG. 2—At completion, proximal limb of ileum forms protruding stoma while distal limb is flush with skin.

Table I—Patient Data and Clinical Course After Treatment of Anorectal Crohn's Disease by Loop Ileostomy

Group	Sex	Age, yr	Site of disease	Previous treatment	Subsequent surgery (mo after loop ileostomy)	Current status (mo after loop ileostomy)
1 – rectovaginal fistula	F	34	SB	Metronidazole, small-bowel resection	Repair RVF (10) Closure loop ileostomy (13)	Asymptomatic (13)
	F	26	SB/LB	Sulfasalazine, prednisone, small-bowel resection (X 2)	Repair RVF (12) Repair loop ileostomy (16) Repair RVF (18) Proctocolectomy (26)	
	F	46	LB	Sulfasalazine, prednisone, metronidazole	–	Asymptomatic (29)
	F	23	SB/LB	Prednisone, metronidazole	Proctocolectomy (6)	
	F	26	SB	Sulfasalazine, prednisone, small-bowel resection	Ileostomy revision (18)	Asymptomatic (20)
	F	37	SB/LB	Metronidazole, small-bowel resection (X 2)	–	Asymptomatic (14)
	F	27	SB/LB	Metronidazole, small-bowel resection	Closure loop ileostomy (22)	Active anorectal disease (fistula) (25)
2 – anorectal sepsis	F	27	LB	Prednisone	–	Asymptomatic (30)
	M	27	SB/LB	Sulfasalazine, prednisone, metronidazole, small-bowel resection	–	Active anorectal disease (fistula) (21)
	M	28	SB/LB	Prednisone, metronidazole	Proctocolectomy (4)	
3 – severe proctitis	M	21	LB	Sulfasalazine, prednisone	Proctocolectomy (6)	
	F	19	LB	Sulfasalazine, prednisone, metronidazole	Proctocolectomy (18)	

SB = small bowel, LB = large bowel, RVF = rectovaginal fistula.

has so far refused a proctocolectomy.

The two patients in group 3 had less pain and were able to reduce their medications 1 month after operation. Sigmoidoscopy still showed active disease. At 6 and 18 months, they required a proctocolectomy for recurrent abdominal pain, frequent bowel movements and tenesmus despite the fecal diversion.

Discussion

The anorectal manifestations of Crohn's disease include edematous skin tags, fissures, abscesses, fistulas, strictures and proctitis. Large painless anal ulcers, multiple fistulas and edematous indurated perianal skin with a dusky colour are typical perianal findings in these patients.[8]

Anorectal involvement is common in Crohn's disease. Fielding[9] reported abscesses, sinuses, fistulas, tags and fissures in 109 of 156 patients with Crohn's disease. These lesions were found in 76% of patients with small-bowel disease, 94% of patients with large-bowel disease, but in only 38% of a control population. Others, however, have found a lower rate of involvement. Of patients in the National Crohn's Cooperative Disease Study, only 36% gave a history of perianal complications at the time of entry.[10] Marks and colleagues[11] reported that anal fistula occurred in 112 of 329 patients followed at St. Mark's Hospital during a 10-year period. Similarly, Heuman and associates[12] reported that 40% of their patients suffered from perianal manifestations during a 6-year follow-up. These differences are likely owing to the variable criteria used to diagnose perianal Crohn's disease. Most authors do agree, however, that the prevalence of perianal disease is higher in patients with colonic and rectal involvement.[9,10]

No treatment is required if the anorectal disease is asymptomatic. The initial management of symptoms should include a full assessment of proximal disease and institution of appropriate medical or surgical therapy. If this is effective, the anorectal disease may resolve spontaneously.[13]

Brandt and colleagues[14] found that metronidazole was effective in 26 patients with persistent anorectal Crohn's disease that failed to respond to conventional medical or surgical therapy. The only major side effect was paresthesia that developed in 50% of the patients, and this resolved when the dose was reduced. However, when the drug was discontinued, the disease recurred in 72%. Metronidazole has been reported to be a carcinogen in animals,[15] so prolonged use by humans may be hazardous. This risk should be considered when prescribing the drug in large doses and for long periods. Eight of our patients had been treated with metronidazole in doses ranging from 750 mg to 1000 mg daily for at least 1 month, including five patients with rectovaginal fistulas, two patients with complex fistulas and one with severe proctitis. All failed to improve and one patient had to discontinue the medication because of paresthesia.

The surgical treatment of symptomatic anorectal Crohn's disease that has not responded to medical therapy is challenging. Wound healing may be delayed and radical local surgical treatment may cause fecal incontinence. Thus, experienced surgeons[9,13] have advocated a conservative approach. Two principles guide the surgical management of anorectal Crohn's disease — sepsis should be controlled by incision and drainage of abscesses, and division of a large portion of sphincter muscle should be avoided.[16] Fistulas with internal openings low in the anal canal can safely be laid open. Complex fistulas with internal openings near the top of the anorectal ring should be treated by laying open the external parts of the fistula to establish drainage, curetting the tract to remove granulation tissue and perhaps instituting catheter drainage. This approach may relieve symptoms and minimize the risk of incontinence as a complication of surgical drainage.

External diversion of the fecal stream by means of an ileostomy is an alternative surgical treatment for Crohn's disease.[2-5] Unfortunately, relapse after loop ileostomy is common, and it is difficult to restore intestinal continuity. Burman and associates,[17] Zelas and Jagelman,[3] and McIlrath[4] found that colitis recurred in one third to one half of patients after construction of a loop ileostomy and that intestinal continuity was restored in less than one third. Six of 22 patients in the series of Zelas and Jagelman[3] who underwent loop ileostomy for anorectal disease remained well for 3 to 5 years. Harper and colleagues[5] reported that 21 (72%) of 29 patients with anorectal Crohn's disease treated by split ileostomy had early improvement. However, only 6 patients had intestinal continuity restored, 8 had undergone a proctocolectomy and 15 remained defunctioned.

Our results following the treatment of anorectal Crohn's disease with a loop ileostomy have been disappointing. One quarter of the patients had early or late complications requiring reoperation. Although all initially improved after fecal diversion, this was often a transient response. At the time of review (average follow-up of 17 months), intestinal continuity has been successfully restored in only one patient and five are asymptomatic following construction of a loop ileostomy. Five patients have subsequently required proctocolectomy.

In patients with proctitis or anorectal sepsis, loop ileostomy should be viewed as a temporary measure since it does not appear to alter the course of the disease. Nevertheless, there may be some merit in constructing a loop ileostomy. Perianal sepsis may become quiescent, at least temporarily, so proctectomy is easier to perform. Consequently, perineal wound complications may be reduced. In this series, three of five patients had primary wound healing after proctectomy. Although this is a small group, satisfactory results were achieved in these high-risk patients. The second benefit is that it may allow patients to adjust psychologically to an ileostomy. Some patients will agree to a temporary ileostomy whereas they would be reluctant to undergo a definitive procedure initially.

Rectovaginal fistulas due to Crohn's disease can be extremely difficult to manage. Although patients are usually distressed by their symptoms, few will readily agree to proctocolectomy and ileostomy or proctectomy and colostomy. Again, construction of a loop ileostomy may temporarily alleviate symptoms and enable the patient to adjust to life with an ileostomy. However, patients should be advised that successful restoration of intestinal continuity is uncommon. In our experience, spontaneous healing of the fistula is rare and symptoms usually recur once continuity is restored. Most patients with rectovaginal fistulas have associated rectal involvement, making local repair of the fistula possible in only a few selected patients. Local repair should be attempted only when the disease is in remission, the rectum is apparently healthy and meticulous surgical technique is used.[18,19] The addition of a loop ileostomy to divert stool may improve healing and the outcome after surgery.

Conclusions

Our experience with a loop ileostomy to manage anorectal Crohn's disease suggests that this procedure will provide temporary relief of symptoms. Fecal diversion does not appear to alter the long-term course of the disease and successful restoration of intestinal continuity is uncommon.

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NOTICES

Laser Surgery in Gynecology and Dermatology

This postgraduate course will be held Feb. 20–22, 1986, at the Hyatt Lake Tahoe, Lake Tahoe, Calif. It will provide a comprehensive review of the biophysical basis for carbon dioxide laser surgery in gynecology, and for argon, neodymium-YAG and carbon dioxide laser surgery in dermatology. The course is designed for physicians and nurses and will offer separate programs for each specialty. The range of applications and surgical techniques will be detailed. The course will consist of lectures, video demonstrations and hands-on training sessions with the surgical lasers under faculty supervision. There will be an extensive commercial exhibition in conjunction with the course.

For further information on the scientific program and registration contact the course directors: Dr. V.C. Wright, Department of Obstetrics and Gynecology, The University of Western Ontario, 887 Richmond St., London, Ont. N6A 3J1, tel. (519) 438-1411; or Dr. Alex Ferenczy, Department of Pathology, The Sir Mortimer B. Davis-Jewish General Hospital, 3755 Côte Ste-Catherine, Montreal, PQ H3T 1E2, tel. (514) 342-3111.

Neurovascular Surgery

The 3rd annual meeting of the Neurovascular Society of North America and the Society for Neurovascular Surgery will be held in Chicago, Ill., Apr. 17–19, 1986.

General sessions will strive to identify problems affecting the heart, blood vessels and brain, pathologic mechanisms, and methods of diagnosis and management. Special sessions will address in detail such topics as vertebral artery surgery, ultrasonography, headaches, nerve repair and anticoagulation. The meeting will be open to all diagnostic, medical and surgical specialties.

For further information write the Executive Director, Neurovascular Society of North America/Society for Neurovascular Surgery, PO Box 679, Oak Park, IL 60302; or call (312) 482-3950.

continued on page 53

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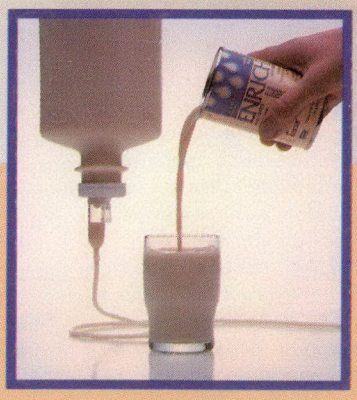

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Tube Cecostomy Revisited

A retrospective review of 59 tube cecostomies, performed between 1971 and 1981, was undertaken to evaluate current operative indications, outcome and associated morbidity. Tube cecostomy was performed as a complementary procedure in 81.4% of cases; in the other 18.6%, it represented either the only operative intervention or the initial stage of a two-stage procedure. Complications included local infection in 32% of cases, peri-catheter leak in 25%, skin excoriation in 24% and pain in 12%. Catheters remained in place an average of 14 days, but function was adequate in only 40% of cases. Cecal drainage persisted from 24 hours to 90 days after the tube was removed. Two additional procedures were required to close persistent cecal fistulas. The authors conclude that the high morbidity associated with this procedure militates against its routine use. Decompression by cecostomy may be inadequate for treating acute colonic obstruction.

Une étude rétrospective de 59 caecostomies tubaires effectuées entre 1971 et 1981 a été entreprise dans le but d'évaluer les indications opératoires courantes, les résultats et la morbidité reliés à cette opération. La caecostomie tubaire avait été pratiquée en tant qu'intervention secondaire dans 81,4% des cas; dans les autres 18,6%, il s'agissait soit d'une opération unique, soit de la première étape d'une opération en deux temps. Parmi les complications, on compte 32% d'infections locales, 25% de fuites péricathéters, 24% d'excoriation cutanée et de la douleur dans 12% des cas. Le cathéter est demeuré en place pendant une moyenne de 14 jours mais il n'a fonctionné adéquatement que dans 40% des cas. Un drainage caecal a persisté de 24 heures à 90 jours après le retrait du cathéter. Deux opérations additionnelles ont été nécessaires pour refermer des fistules caecales persistantes. Les auteurs jugent que le haut taux de morbidité relié à cette intervention milite contre son emploi systématique. Une décompression par caecostomie peut s'avérée insuffisante dans le traitement de l'obstruction aiguë du côlon.

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Pillore of Rouen in 1776 performed the first recorded cecostomy to relieve colonic obstruction.[1] Once widely practised and accepted, tube cecostomy is less frequently performed as indications for its use have narrowed. Even when its practice was widespread, the procedure had its detractors.

Since the turn of the century, tube cecostomy has been advocated mainly as a decompression procedure for acute colonic obstruction[2-5] and as a safety valve for colonic resection.[4,6,7] It has also been suggested for perforation or impending perforation of the cecum,[8,9] for cecal volvulus,[8] adynamic ileus of the colon[10] and toxic dilatation in inflammatory bowel disease.[11] Because of the controversy concerning tube cecostomy, we undertook to evaluate retrospectively the current operative indications, operative outcome and associated morbidity in relation to tube cecostomy in order to determine the place of the procedure in modern surgery.

Patients and Methods

We reviewed 59 tube cecostomies performed between 1971 and 1981 at the Sir Mortimer B. Davis-Jewish General Hospital in Montreal. There were 36 women and 23 men, ranging in age from 18 to 91 years (average 68 years).

The decision to perform a tube cecostomy was made for either of two reasons: to provide a safety vent, as a complementary procedure, performed with another operation or to provide therapeutic decompression for colonic obstruction or dilatation.

A Malecot catheter was most frequently used for the tube. Five procedures were performed as appendicostomies during elective surgery. In each case, operation included placing two purse-string sutures in the wall of the cecum, securing the cecum to the peritoneum, and fixing the tube to the skin. Drainage through the catheter was by gravity into a collection bag.

Results

Indications for the operation are listed in Table I. In 48 patients (81.4%) the cecostomy was performed as a complementary procedure. Therapeutic cecostomy was carried out in 11 patients (18.6%); these represented the only operative intervention or the first step of a multistage procedure.

Three patients died at 2, 11 and 48 days postoperatively. All deaths were related to cardiac arrest in poor-risk patients with cardiovascular disease.

There was no routine regarding type of anesthesia, skin closure or antibiotics given.

The tube remained in place an average of 14 days. By the end of the third postoperative week 87% of the catheters had been removed and all were out within 4 weeks of operation.

Tube drainage was adequate in only 24

Table I—Indications for Tube Cecostomy

Disease	No. of patients
Therapeutic	
Carcinoma	7
Diverticulitis	1
Cecal volvulus	2
Adhesions	1
Complementary	
Carcinoma	22
Diverticulitis	8
Ischemic colitis	1
Sigmoid volvulus	1
Hirschsprung's disease	1
Colotomy and polypectomy	8
Adhesions	2
Ogilvie's syndrome	2
Colovaginal fistula	2
Crohn's disease	1

patients; in the other 35, there was either scant or no catheter drainage. For patients who had a complementary cecostomy it was impossible to determine if there was beneficial siphoning off of intestinal gas. In two patients a therapeutic cecostomy did not relieve abdominal distension, but the distal obstruction cleared, and when bowel movements began the distension resolved. There was no record of whether bowel preparation for subsequent operations was adequate or effective.

Catheter care appeared to be a decision of the individual surgeon. Some catheters were not irrigated, but others were irrigated when necessary or once per shift. Mineral oil (30 mL) was most often used for irrigation. Catheter function appeared unrelated to the type of catheter care, the underlying disease or the surgical procedure.

Complications

Wound infection was the most frequent complication (Table II), occurring in 14 of 48 complementary procedures and in 5 of 11 therapeutic procedures. Appendicostomy was associated with a higher infection rate than simple tube cecostomy (40% versus 31%).

Persistent cecal fistula (lasting 2 weeks or more after catheter removal) occurred in five patients. The time between tube removal and cecostomy closure ranged from 24 hours to 90 days. Two persistent fistulas required reoperation to achieve closure.

Peri-catheter leak, in 15 patients, was not related to the manner in which the cecostomy was fashioned. Skin excoriation, in most instances, was related to peri-catheter leakage.

Table II—Complications Associated With Tube Cecostomy

Complication	No. of patients (%)
Infection	19 (32)
Leakage around tube	15 (25)
Skin excoriation	14 (24)
Fistula (> 2 wk)	5 (8)
Pain	7 (12)
Premature dislodgement	2 (3)

Comment

A protective diversionary cecostomy or transverse colostomy is now rarely warranted for left-sided colon procedures since these can be safely performed without diversion as a recent review[12] from our institution has shown. Not only are complementary vents unnecessary but they add the possibility of sepsis and many other complications.

The relative value of various diverting procedures for obstructing lesions of the left side of the colon has been debatable. Study of the pertinent surgical literature does not resolve this issue. The virtues of tube cecostomy, as cited by its proponents, are as follows: it is easy to perform and can be carried out under local anesthesia, the cecum is the portion of colon most likely to perforate, it does not interfere with subsequent resection of the left side of the colon and it may eventually close spontaneously. In cases of extreme obesity of the abdominal wall and when gross distension of the bowel has "used up" the leaves of the transverse mesocolon, transverse colostomy may be impossible. Under these circumstances cecostomy may be the only method of relieving obstruction.[13]

The use of cecostomy has frequently been criticized and has lost favour with many surgeons.[13-15] Detractors point out that it provides less-effective decompression than does a transverse colostomy and does not allow complete diversion. Clark and Hubay[16] reported that of 37 patients with acute large-bowel obstruction, two distal perforations occurred after proximal decompression by a cecostomy. Balslev and colleagues[17] reported that three patients died of perforation because cecostomy did not adequately relieve distension. Aseptic decompression of a distended cecum can be difficult, and peritonitis after a cecostomy has been reported as the cause of death.[18] Welch and Donaldson[18] reported that the operative death rate after preliminary cecostomy was 10 times that after transverse colostomy for lesions of the left side of the colon. Balslev and associates[17] attributed 22% of the deaths in their series to cecostomy. Wangensteen[19] deplored the use of cecostomy and stated: "A second year surgical house officer can relieve an obstructed colon by an aseptic transverse colostomy with less risk to the patient than can an experienced surgeon who favors performance of cecostomy." Yet surgeons still cling to its use.[3,5,8,16]

Tube cecostomy fails to decompress the bowel adequately in as many as 50% of cases.[20,21] Albers and Smith[20] and Hunt[15] found tube cecostomy an inadequate emergency decompression procedure and suggested that transverse colostomy resulted in fewer deaths, more effective decompression, less metabolic disruption and earlier and better preparation of the colon (i.e., irrigation) for definitive surgery. Most importantly, poor tube function has been shown[8,17,22,23] to be responsible for a substantial number of deaths (Table III[4,5,8,16,17,24,25]).

A growing number of surgeons advocate primary resection for an obstructing carcinoma lying in the proximal or transverse colon or even the splenic flexure. This obviates the need for decompression.[13,23,26,27] If there is a perforation associated with a left-sided carcinoma, a cecostomy is inadequate.

Table III—Cecostomy Related Morbidity

Series	No. of patients	Infection	Intraperitoneal leak	No function	Premature dislodgement	Hematoma/ bleeding	Fistula	No. of perioperative deaths (cecostomy related)	Secondary closure
King and associates, 1966[8]	153	5	1	–	–	1	22	14 (5)	17
Jackson and Baird, 1967[24]	102	–	3*	5	1	–	–	10 (4)	5
Westdahl and Russell, 1969[5]	93	7	0	1	–	–	–	20 (0)	41†
Balslev and associates, 1970[17]	76	10	–	8	2	–	–	5 (5)	20
Clark and Hubay, 1972[16]	161	6	1	3	–	–	16	5 (1)	6
Stainback and associates, 1973[4]	235	2	2	1	–	1	3	5 (2)	0
Hoffmann and Jensen, 1984[25]	57	18	0	0	1	1	–	8 (1)	11
Present series	59	19	0	2	1	0	5	3 (0)	2

*All died.
†16 of 48 with tube cecostomy required secondary closure. Patients with mucosa-to-skin suturing required secondary closure.

In our study, catheter plugging with stool, despite irrigation, was a constant problem. Reports addressing the issue of tube patency vary widely. Some report successful decompression,[22,28] but failure rates as high as 20%[24] and 50%[20,21] have been reported. It is not surprising that such tubes do not function well. Their inefficiency can perhaps be explained partly by the principles governing the flow of fluid through cylindrical tubes. Poiseuille's law relates flow directly to the fourth power of the radius and inversely to both tube length and viscosity of the fluid. Conversely, resistance to flow is directly related to fluid viscosity and tube length and inversely proportional to the fourth power of the tube radius. Malecot catheters were used in our study but they varied in diameter. In some cases it could be argued that a catheter of inadequate size was used. However, it must be remembered that the effluent is a non-homogeneous fluid of low viscosity and there is usually a large non-fluid component. Poiseuille's law is operable only under special conditions and should be applied to the steady, laminar flow of a homogeneous fluid. All of these considerations could be eliminated by suturing cecal mucosa to skin primarily, but this would require another operation for closure.[29-31]

Morbidity associated with cecostomy, exclusive of tube function, has been extensively described in the literature (Table III). These reports cannot be compared, as some are a series of complementary cecostomies and others are therapeutic cecostomies performed for obstruction; some are tube cecostomies while others are mucosa-to-skin suturing and some are combinations of the two. Nevertheless, the reports clearly point out the serious morbidity associated with cecostomy.

Inadequate function of the tube can be fatal.[17,22,24] Death has been attributed directly to the cecostomy in up to 40% of patients who died perioperatively.[24]

In comparing cecostomy and transverse colostomy to treat obstruction of the left side of the colon by carcinoma, Goligher and Smiddy[32] declared that cecostomy was a much more dangerous operation, the respective death rates being 50% versus 17%. Moreover, analysis of the causes of death after the two operations revealed that of 36 deaths after cecostomy, 22 were due to septic complications; none of the 8 deaths after transverse colostomy were attributable to infection. This constitutes a grave indictment of the former operation.

In addition to the complications listed in Table III, many other problems have been reported. These include severe skin excoriation,[5,25] wound dehiscence requiring resuturing under general anesthesia,[25] recurrence of a fistula after closure of the cecostomy,[5,25] subcutaneous emphysema,[4] prolapse of omentum,[17] stitch granuloma,[25] evisceration,[5] retraction[5] and hernia formation at the cecostomy site.[8,25]

Infection was the commonest complication in our study. Inflammation and skin excoriation often occurred in the region of the cecostomy after the tube had been in place for a number of days but these problems were not considered as infection. King and colleagues[8] stated that almost all their patients suffered minor wound infections along the tube tract. These problems have also been addressed by others (Table III). Rates for secondary closure are reported to vary from 0% to 20%. It is notable that these secondary surgical procedures also carry an attendant morbidity and mortality.

Other indications for which cecostomy has been advocated include perforated cecum,[8,9] toxic dilatation associated with ulcerative colitis[11] and cecal volvulus.[8] Even for cecal volvulus some[33] advocate a right hemicolectomy rather than cecostomy. Patients with pseudo-obstruction of the colon may have tremendous dilatation of the colon and require decompression. Although cecostomy has been recommended in the past, recent reports suggest that colonoscopic decompression should be the first line of therapy.[34-36] Failing this, cecostomy may be considered.

From this study we conclude that the high morbidity rate related to tube cecostomy militates against its routine use. Furthermore, decompression of the colon by cecostomy is generally inadequate for acute obstruction and with our present understanding of preoperative bowel preparation, complementary cecostomy is rarely warranted. A comparison between tube cecostomy and transverse loop colostomy as the initial decompressive procedure for patients with obstructing lesions of the left colon is difficult since we are unaware of any controlled prospective trials comparing the two.

A review of the contemporary literature suggests that reasonable current indications for tube cecostomy include cecal volvulus, pseudo-obstruction (if an attempt at colonoscopic decompression has failed), cecal perforation in association with an obstructed left-sided lesion, and to relieve obstruction in morbidly obese patients when transverse colostomy is technically impossible.

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Nosocomial Gram-Negative Parotitis

Nosocomial parotitis is an uncommon postoperative complication, usually affecting elderly, debilitated, dehydrated patients. The preponderance of gram-positive pathogens has been emphasized. The authors present two cases of gram-negative parotitis and review the literature on this condition. Because the organisms producing nosocomial infection in patients receiving intensive care are commonly gram-negative bacilli, treatment should be based on the findings of Gram's staining of the pus obtained from Stensen's duct, altered when necessary by the final culture results.

La parotidite nosocomiale est une complication postopératoire peu fréquente qui touche habituellement les personnes âgées, fragilisées et déshydratées. On a souligné la prépondérance des organismes gram-positifs comme pathogènes. Les auteurs décrivent deux cas de parotidites à gram-négatifs et passent en revue les publications sur le sujet. Comme les micro-organismes responsables des infections nosocomiales chez les patients soumis à des soins intensifs sont souvent des bacilles gram-négatifs, le traitement devrait être orienté en fonctions des résultats de la coloration Gram sur le pus prélevé du canal parotidien, quitte à le modifier ensuite, si nécessaire, selon les résultats des cultures finales.

Acute parotitis, an uncommon disorder, usually affects the elderly, debilitated, dehydrated patient. Historically, the predominance of *Staphylococcus aureus* as the infecting organism has been emphasized, and the empirical treatment has been antistaphylococcal agents, until the results of definitive cultures are known. Recent reports have noted the presence of a widening range of pathogens, including gram-negative rods and anaerobes. We report two cases of nosocomial gram-negative parotitis that emphasize the increasing importance of these organisms.

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Case Reports

Case 1

A 46-year-old hypertensive man experienced the sudden onset of chest pain. Angiography demonstrated an ascending aortic dissection (type A). The ascending aorta was replaced with a Dacron graft at an emergency operation. As prophylaxis the patient received cephalothin intravenously, followed by cephalexin orally after he was extubated. Five days postoperatively, while he was still taking cephalexin, diarrhea developed. By day 7 he had pain, swelling and tenderness over the left parotid gland, a fever and leukocytosis. Examination of the mouth showed dry mucosa and creamy pus exuding from Stensen's duct. The cephalexin was stopped and cloxacillin begun intravenously. Gram's staining of the purulent exudate revealed abundant polymorphonuclear leukocytes and gram-negative rods. Final cultures grew *Escherichia coli* sensitive to ampicillin and gentamicin. Antibiotic therapy was changed to ampicillin. The parotitis resolved, but the diarrhea persisted. When *Clostridium difficile* cytotoxin was identified in the stool, the ampicillin was withdrawn and replaced by gentamicin. The colitis resolved after metronidazole was prescribed.

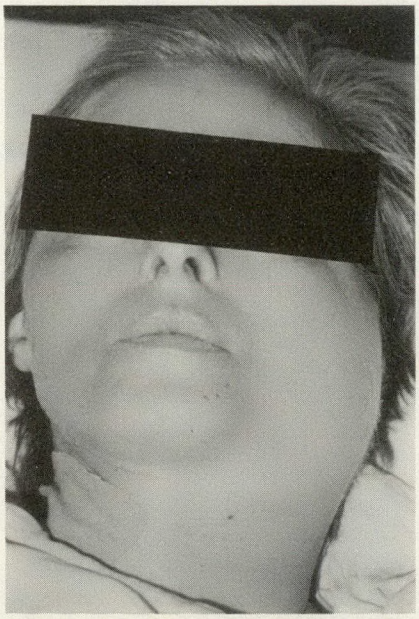

FIG. 1—Case 2 showing marked swelling of left parotid gland.

Case 2

A 50-year-old woman with chronic renal failure underwent renal transplantation. Immunosuppressive therapy consisted of cyclosporine and prednisone. Postoperatively she became hypotensive and acute tubular necrosis developed, which required hemodialysis. A bleeding diathesis developed 4 days after operation and she was started on cefoxitin for presumed sepsis. On day 11, swelling of the left parotid gland was noted and she had a fever and leukocytosis (Fig. 1). Thick creamy pus was seen draining from Stensen's duct and Gram's staining demonstrated abundant polymorphonuclear leukocytes but no bacteria. Cloxacillin and gentamicin were started intravenously. Cultures of the pus grew *Pseudomonas aeruginosa* and *E. coli*, sensitive to gentamicin. Blood cultures grew *P. aeruginosa*. The cloxacillin was stopped and the gentamicin was given for 10 days. The parotitis resolved.

Discussion

Inflammation in early parotitis is confined to an accumulation of cells within the larger ducts. The parenchyma and smaller ducts are spared until the epithelium of the larger ducts is destroyed, allowing the inflammatory process to invade the remainder of the gland. Once penetration of the parenchyma has occurred, multiple abscesses may form and coalesce. If the process is allowed to continue, pus may penetrate the capsule and invade the surrounding tissue, extending into the neck, the external auditory canal or the skin of the face.

Acute suppurative parotitis is often a nosocomial infection. It may develop a few hours or many weeks after surgery. Crile and Manning[1] first observed that poor oral hygiene and lack of oral intake

predispose to retrograde invasion of the parotid duct by virulent oral flora. Krippaehne and associates[2] emphasized that dehydration, malnutrition, advanced age, debilitation and the use of anticholinergic medication were predisposing factors.

Petersdorf and colleagues,[3] in their review of seven cases of staphylococcal parotitis, stressed the importance of *S. aureus* as the primary pathogen. In Spratt's[4] comprehensive review of 92 cases at one institution, all but 2 were due to gram-positive organisms. Similarly, Krippaehne and colleagues[2] found that 64 of 66 cultures grew staphylococci. However, the data for these three series were collected during the period when gram-positive cocci were the major nosocomial pathogens. Since the middle 1960s there has been an increasing proportion of gram-negative infections with a relative decrease in gram-positive infections.[5] Thus, more recent reports have implicated gram-negative rods as the infecting bacteria in acute parotitis.[6-9] Although gram-negative bacilli are found infrequently in the normal orpharynx, colonization occurs in patients treated with antibiotics in direct relation to the severity of the underlying illness.[10,11]

Initial treatment of acute parotitis should be directed against the staphylococci and any other organism identified on Gram's staining of the pus from Stensen's duct. In the very ill this treatment should include an aminoglycoside. Antibiotic therapy may be altered by the final culture results. Meticulous cleansing of the teeth and gums and maintaining moist oral membranes can minimize the complication. Finally, if the parotitis progresses despite adequate antibiotic therapy, surgical drainage is indicated.

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Inguinal Neuralgia: a Review of 50 Patients

Inguinal neuralgia, an uncommon condition, can readily be diagnosed if the anatomy of the sensory nerves of the lumbar plexus is understood. The authors review 50 patients with this condition, pointing out the importance of injury to these nerves, not only on the anterior abdominal wall but also in the retroperitoneal space on the posterior abdominal wall.

Successful treatment is achieved by surgical section of the nerves. First the inguinal region is explored; if this does not result in cure the authors recommend retroperitoneal section of the nerve.

La névralgie inguinale, une affection rare, peut être diagnostiquée rapidement quand on comprend bien l'anatomie des nerfs sensitifs du plexus solaire. Les auteurs ont étudié les cas de 50 patients souffrant de cette maladie. Ils soulignent l'importance d'une lésion de ces nerfs, non seulement sur la paroi abdominale antérieure mais aussi dans l'espace rétropéritonéal, sur la paroi abdominale postérieure.

La guérison suit la section chirurgicale des nerfs. On doit s'attaquer en premier lieu à la région inguinale et s'il n'y a pas de soulagement, les auteurs recommandent une section rétropéritonéale du nerf.

Inguinal neuralgia is an uncommon syndrome of chronic pain and paresthesia in the area served by each of the sensory nerves in the inguinal region. Typically the ilioinguinal, iliohypogastric or genitofemoral nerve is involved. The sensory findings vary because of overlap and communication among these nerves. The pain may be sharp, aching or burning in nature. Sharp pain characteristically arises along the inguinal canal and is felt in the scrotum or labium, or in the upper medial thigh. Rarely it may be referred to the sacroiliac joint or the hip area. The deep aching pain has a similar distribution. Sometimes there is a dull, hot, burning sensation in association with numbness. All types of pain are aggravated by hip extension, walking, exercise or pressure over the inguinal region. Often the pain is severely debilitating and results in drug dependency.

Injury to the inguinal nerves on either the anterior abdominal wall or posterior abdominal wall in the retroperitoneal space is often the cause of inguinal neuralgia. Anterior wall injury may occur during herniorrhaphy or appendectomy or may be associated with the irritation of inguinal hernias. Posterior wall injury may follow appendiceal abscesses and pelvic surgery.

An awareness of the existence of inguinal neuralgia and an understanding of the anatomy of the ilioinguinal and genitofemoral nerves will lead to its diagnosis and treatment.

Anatomy (Fig. 1)

The cutaneous branches of the lumbar plexus give rise to the iliohypogastric, ilioinguinal and genitofemoral nerves and the lateral cutaneous nerve of the thigh.

Iliohypogastric Nerve

This sensory and motor nerve is a branch of the T12 or L1 nerves. It emerges behind the psoas muscle just above the ilioinguinal nerve and pierces the transversus abdominis above the iliac crest. Its anterior branch runs forward between the oblique internal and external muscles and pierces the aponeurosis of the external oblique muscle to supply the skin above the pubis. Its posterior branch supplies an area of the buttock just posterior to the iliac crest.

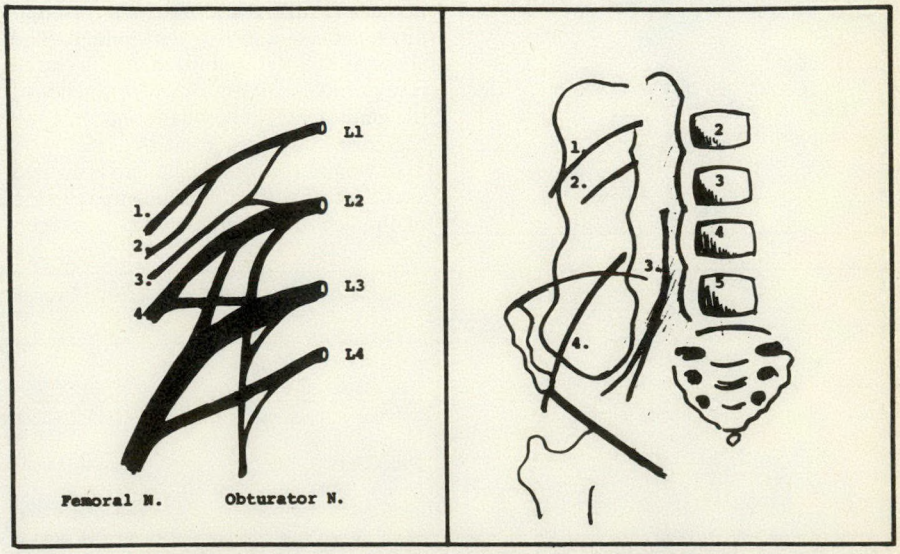

Fig. 1a Fig. 1b

FIG. 1—(a) Lumbar plexus and anatomic relations. (b) Genitofemoral nerve and its relations. 1. = iliohypogastric nerve. 2. = ilioinguinal nerve. 3. = genitofemoral nerve. 4. = lateral cutaneous nerve of thigh.

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Ilioinguinal Nerve

The ilioinguinal nerve, a branch of the lumbar plexus, L1, emerges from behind the psoas muscle just below the iliohypogastric nerve. It passes obliquely across the quadratus lumborum and iliacus muscles and perforates the transversalis near the anterior superior iliac spine. The nerve then pierces the internal oblique muscle and accompanies the spermatic cord within the inguinal canal; it emerges through the external ring. It provides sensation to the upper medial aspect of the thigh and the scrotum or labium.

Genitofemoral Nerve

This nerve arises from the L1 and L2 nerves. It travels obliquely through and over the psoas muscle, emerging in the vicinity of L4 in the retroperitoneal space. It divides into the genital and femoral branches, which then travel separately across the base of the broad ligament. The genital branch passes through the internal inguinal ring, descends in association with the spermatic cord or round ligament, supplying sensation to the scrotal or labial skin and medial upper thigh; it also supplies motor fibres to the cremasteric muscle. The femoral branches travel beside the external iliac artery and enter the femoral sheath lateral to the femoral artery, providing sensation to the upper anterior thigh.

Lateral Cutaneous Nerve of Thigh

This arises from the posterior roots of L2 and L3. It leaves the lateral border of the psoas muscle, traverses the iliacus muscle and emerges at or below the junction of the anterior superior iliac spine and the inguinal ligament. Sensation is provided to the lateral aspect of the thigh to a point just above the knee.

Meralgia paresthetica, entrapment of the lateral femoral cutaneous nerve of the thigh, is often the result of a congenitally aberrant path of this nerve around the anterior superior iliac spine through the fasciculi of the inguinal ligament. In contrast, inguinal neuralgia is often related to hernias or nerve injury secondary to previous surgery.

Table I—Etiology of Neuralgia (54 Operations)

Cause	No. of operations	
Inguinal canal disease		19
Indirect hernia	9	
Lipoma of cord	8	
Leiomyoma	1	
Endometrioma	1	
Entrapment on anterior abdominal wall		9
Scar	7	
Tented	2	
Previous pelvic surgery		16
Suspected anterior abdominal wall injury	10	
Suspected retroperitoneal injury	6	
Unknown		10

Surgery

Historically, the management of inguinal neuralgia has been either to identify the nerve at the site of entrapment or injury and to free it or to locate the genitofemoral nerve in the retroperitoneum overlying the psoas muscle and to transect it there. Because of the high proportion of inguinal lesions (entrapment, hernias) we advocate exploration of every groin. If the pain is not relieved, we later explore the retroperitoneum and divide the nerve through a separate flank incision. Surgery may therefore be done in two stages.

A standard groin incision is made superior and medial to the inguinal ligament. The external oblique muscle is incised at the external inguinal ring. The superficial branch of the ilioinguinal nerve is identified and followed throughout its course and is often divided. The spermatic cord is mobilized, and a search is undertaken for one or two branches of the genitofemoral nerve that accompany the cord.

In women the round ligament is divided at the internal ring. This ensures section of the genitofemoral nerve at this level.

In an effort to preserve cord structures from injury in men, the exploration and division is often incomplete. For this reason treatment by exploration of the inguinal canal alone in men is often unsuccessful. We therefore advocate a retroperitoneal approach and section of the genitofemoral nerve on the psoas fascia to assure division of the nerves.

Report of Cases

We reviewed 50 cases of inguinal neuralgia. The patients (42 women, 8 men) were seen by one surgeon between 1970 and 1984. The mean age of the patients was 41.4 years. Two patients had a bilateral procedure and two underwent a second operation for recurrent pain, giving a total of 54 operations. Follow-up was effected by clinic examination or mailed questionnaire. The mean follow-up was 3.9 years (range from 4 months to 14 years).

The 42 women had 46 operations; 38 considered they were either cured (36) or improved (2) and only 4 felt that the operation had failed. This represents an overall success rate of 90%. Eight men underwent eight operative explorations. Early in our series we limited the exploration to the inguinal canal alone. There were four failures in this group. Of the other four men, three have been cured of their disease and the condition of one has been improved by retroperitoneal division of the genitofemoral nerve. This represents an overall success rate in men of 50%.

Lipomas and small hernial sacs less than 3 cm in depth appeared to be the only causative factors in 17 patients. One leiomyoma and one endometrioma were found in the inguinal canal of two other patients. True entrapment was visualized in only 9 of 50 patients. Ten others had previously undergone surgery on the related lower quadrant, but this did not appear to involve the affected nerve.

In all, 16 women had previously undergone pelvic surgery that included tubal ligation, hysterectomy, cesarian section and appendectomy. Ten of the 16 had had anterior abdominal wall surgery that

Table II—Lumbar Cutaneous Entrapment Syndrome

Feature	Nerve			
	Iliohypogastric	Ilioinguinal	Genitofemoral	Lateral cutaneous of thigh
Injury site	Above inguinal canal	Posterior to anterior superior iliac spine Inguinal canal Femoral region	Posterior abdominal wall Inguinal region	Junction of inguinal ligament and anterior superior iliac spine
Pain distribution	Above pubis	Groin, scrotum, back	Groin, scrotum, upper thigh	Lateral anterior upper thigh
Point of maximum tenderness	Point of entrapment or where nerve emerges through external oblique muscle	Medial to anterior superior iliac spine or inguinal canal	Internal inguinal ring	Anterior superior iliac spine
Treatment	Neurolysis, neurectomy	Nerve block, neurolysis, neurectomy	Excision of portion of main trunk of nerve	Nerve block, excision of ligament and nerve

could not be ruled out as the source of their nerve pain. In 6 of the 16 the only underlying cause of inguinal pain was previous pelvic surgery. We believe strongly that injury to the genitofemoral nerve could have occurred at the base of the broad ligament or behind the cecum at the time of their operations. The cause of inguinal neuralgia was undetermined in 10 patients (Table I).

Discussion

Although lumbar plexus neuralgias were identified by E.J. Smith in Osler's Modern Medicine,[1] in 1910, it was not until 1942 when Magee[2] presented his paper to the "Gallie Club" in Toronto that these neuropathies were recognized as being surgically correctable. Three years later Lyon,[3] another Canadian, supported Magee's findings by reporting three more patients who were successfully treated by operation. Both authors divided the genitofemoral nerve in the retroperitoneum on the psoas fascia through a transperitoneal approach.

Since that time little has appeared in the surgical journals[4-7] regarding this condition.

Inguinal neuralgia is a poorly recognized and infrequently diagnosed entity. Differentiating ilioinguinal from genitofemoral neuralgia is often difficult (Table II). An understanding of the anatomy of these nerves is essential for a correct diagnosis. Many who suffer from this problem are inadequately treated in pain clinics or by family physicians.

Many patients in our series had a small undiagnosed inguinal hernia. We were impressed that many women who had no demonstrable inguinal condition had previously undergone pelvic surgery, such as tubal ligation, hysterectomy or cesarian section. We believe that injury to the genitofemoral nerve had occurred at the base of the broad ligament as a result of pelvic surgery. This syndrome was rarely associated with true entrapment. Only a small proportion of our patients had obvious entrapment within the anterior abdominal wall.

Treatment of this condition is mainly surgical. We recommend first an exploration of the inguinal canal and resection of both the genitofemoral and ilioinguinal nerves. This is usually successful. If pain persists then we recommend retroperitoneal section of the genitofemoral nerve.

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Erosive Silicone Synovitis

Although erosive silicone synovitis is an unusual complication of implant arthroplasty, its recognition is important. The authors describe three patients in whom this complication occurred after Silastic replacements of the carpal scaphoid and trapezium bones. Intercarpal arthrodesis is suggested as a form of stress shielding for the implants. Regular, long-term follow-up of patients with these Silastic implants is recommended.

Bien que la synovite érosive causée par le silicone soit une complication rare des arthroplasties par implants, il est important de savoir la reconnaître. Les auteurs décrivent trois cas de cette complication après remplacement par implants de Silastic d'os trapézoïde, scaphoïde ou du carpe. On recommande une arthrodèse intercarpienne afin de protéger les implants du stress. On suggère également une surveillance régulière au long cours des patients qui ont reçu ces implants de Silastic.

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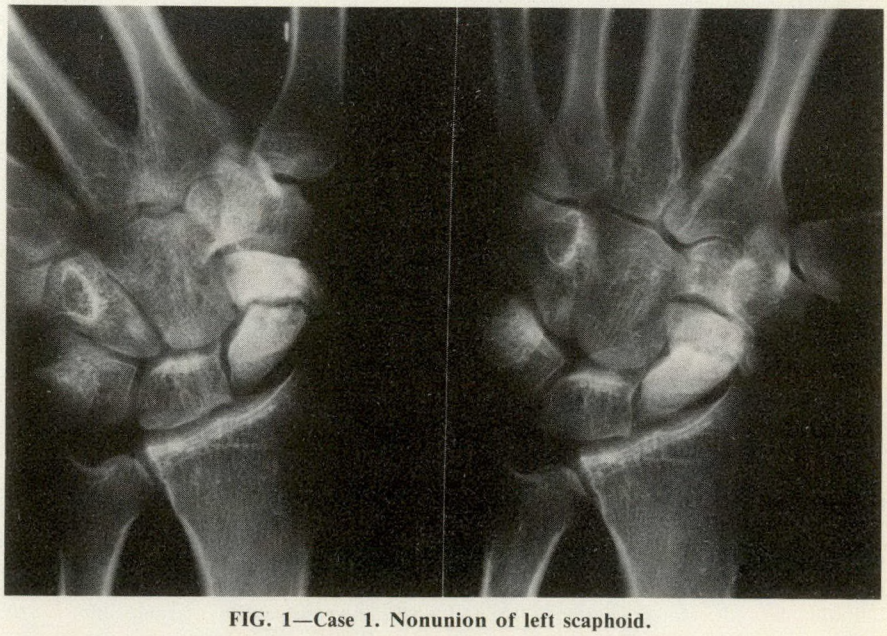

FIG. 1—Case 1. Nonunion of left scaphoid.

In the past 20 years, several hundred thousand Silastic joint prostheses have been implanted in the upper extremity. These have included interphalangeal, metacarpophalangeal and wrist joints as well as the trapezium, scaphoid and lunate, and radial and ulnar heads. Their use in the treatment of rheumatoid arthritis, osteoarthritis and osteonecrosis has been very successful in relieving pain and improving joint function.

Complications of these joint replacements are fracture or dislocation of the prostheses, lymphadenopathy,[1,2] infection (less than 1%)[3,4] and detritic synovitis.[5-8] During the past 10 years, approximately 15 cases of foreign-body, giant cell reactive synovitis have been reported. They have been associated with the trapezium,[7] metacarpophalangeal joint,[1,2,5,6] trapezoid,[7] lunate,[9] radial head[7,8] and great toe.[7] In only three of these cases was there a destructive arthritis secondary to silicone and all were with lunate replacements. To date there have been no reports of problems with the scaphoid prosthesis or of erosions of the distal radius. This report deals with three cases of erosive silicone synovitis. The first involved a scaphoid replacement. The other two patients had undergone trapezial replacement.

Case Reports

Case 1

A 35-year-old right-handed engineer who had nonunion of his left scaphoid (Fig. 1) presented with wrist pain, unresponsive to nonoperative measures. He underwent a Silastic scaphoid replacement (Fig. 2). Five months later he began to have pain and swelling in the region of his radiocarpal joint. Synovitis was evident but there was no indication of sepsis. Within 9 months of replacement a large subcortical cyst was present in the distal radius (Fig. 3) and there was an increase in the synovitis. The pain and swelling continued. The cyst was biopsied a year later. The synovial tissue was hyperplastic with multinucleated giant cells. Silastic particles were recovered from the cyst and identified by energy dispersive x-ray analysis and oil red O staining (Fig. 4). These studies were done at the Armed Forces Institute of Pathology in Washington, DC.

The prosthesis was not removed nor was the cyst bone grafted. The patient's symptoms continued (Fig. 5) for another 16 months when he underwent wrist arthrodesis. The prosthesis was removed and further synovial biopsies were obtained. There was considerable wear of the prosthesis particularly on its proximal surface. Once again foreign-body granulomas and synovial reaction to a foreign body were seen. Polarizing light examination failed to show any foreign material that polarized light.

Case 2

A 62-year-old right-handed housewife with osteoarthritis in the carpometacarpal joints of both thumbs underwent a right trapezial Silas-

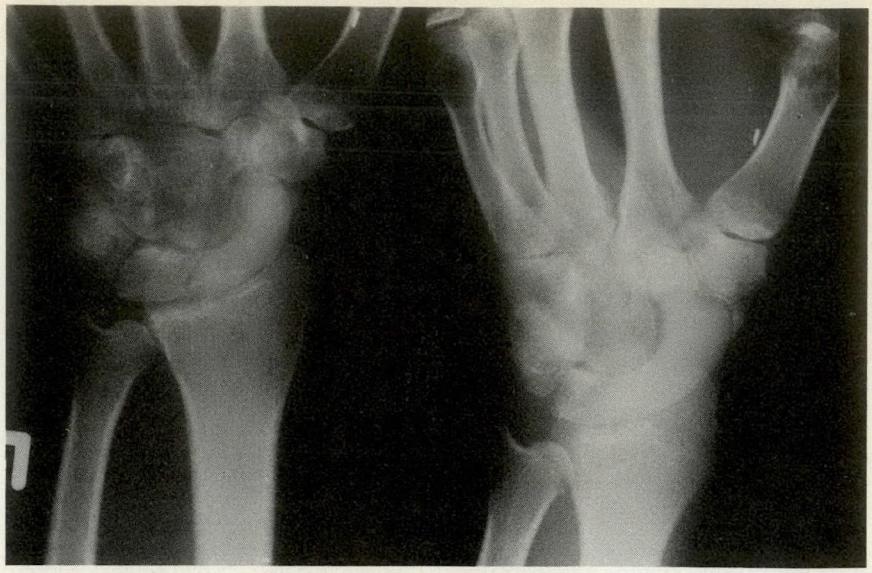

FIG. 2—Case 1. Silastic replacement of left scaphoid.

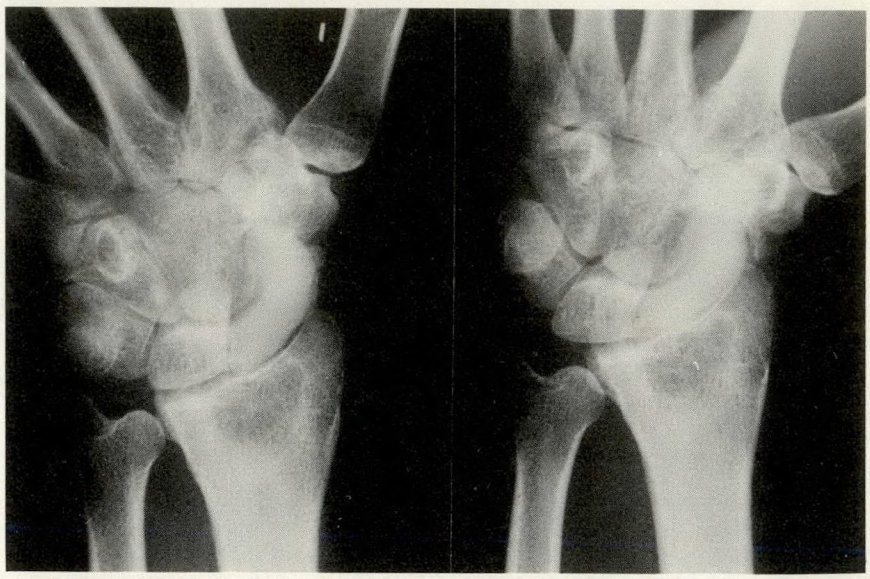

FIG. 3—Case 1. Large cyst in distal radius 11 months after scaphoid replacement.

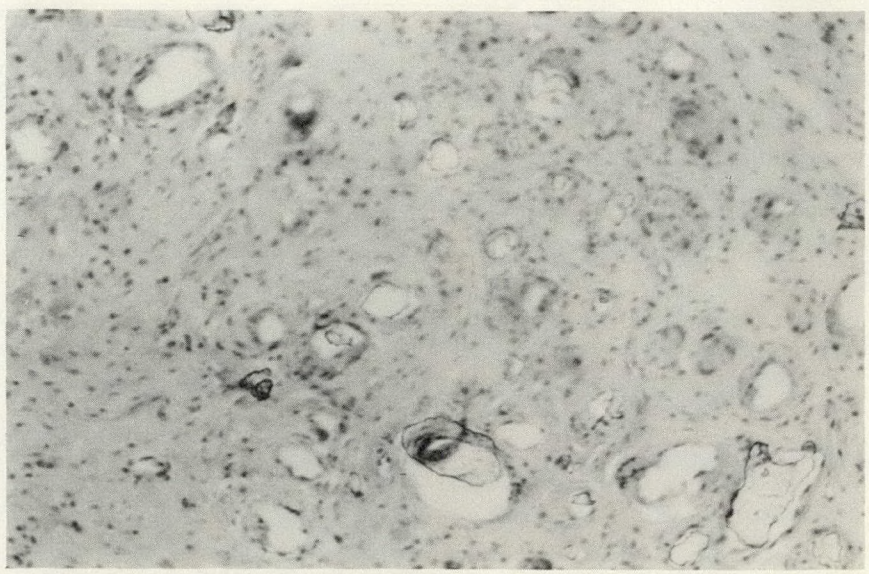

FIG. 4—Case 1. Biopsy from cyst in distal radius. Note silicone particulate matter (hematoxylin and eosin, original magnification × 200).

tic arthroplasty. There was no history of infection but approximately 1 year after replacement, she experienced swelling and pain in the carpometacarpal joint. Follow-up films showed wear of the prosthesis on its ulnar side and erosion of the adjacent carpal bones (Fig. 6). The prosthesis was removed 3 years postoperatively and the resulting excision arthroplasty relieved the patient's pain.

Considerable wear was noted on the volar surface of the excised implant and there were several loose bodies in the joint. There was moderate synovitis on the volar aspect of the joint and the stem of the prosthesis was fractured. Bacteriologic cultures were negative.

Specimens obtained from the joint and from the metacarpal shaft both showed fibrous connective tissue with abundant foreign-body material. This did not polarize light and was interpreted as consistent with silicone particles.

Case 3

A 58-year-old woman underwent a right trapezial Silastic replacement because of painful osteoarthritis of the carpometacarpal joint. Forty months later she was seen because of pain and swelling in the region of the carpometacarpal joint of her right thumb. There was no suggestion of infection but roentgenograms showed cystic changes in the adjacent carpal bones (scaphoid and trapezoid) (Fig. 7).

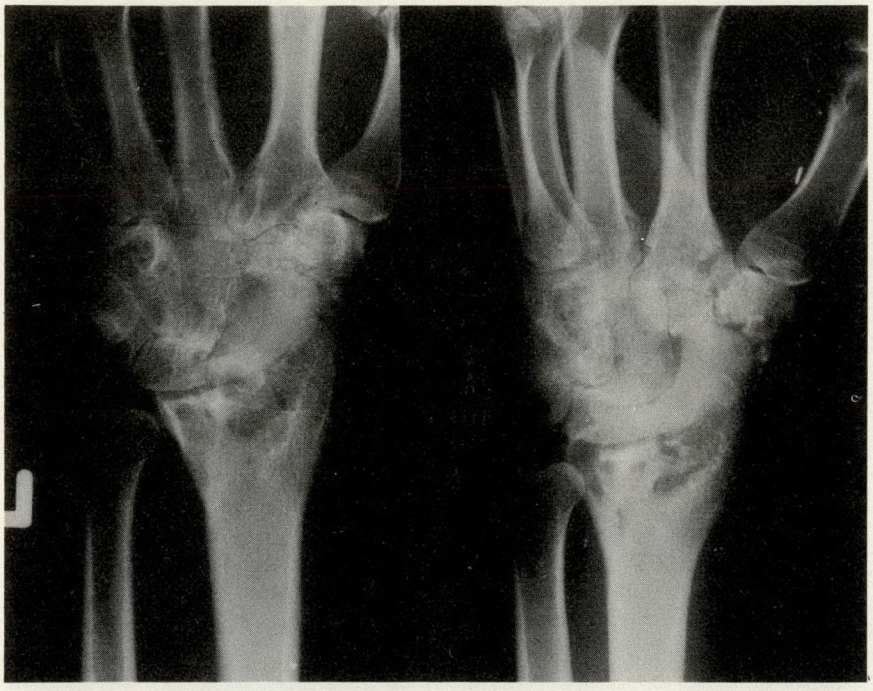

FIG. 5—Case 1. Three years after scaphoid replacement there is deterioration of radial cyst, changes in trapezium and thinning of prosthesis.

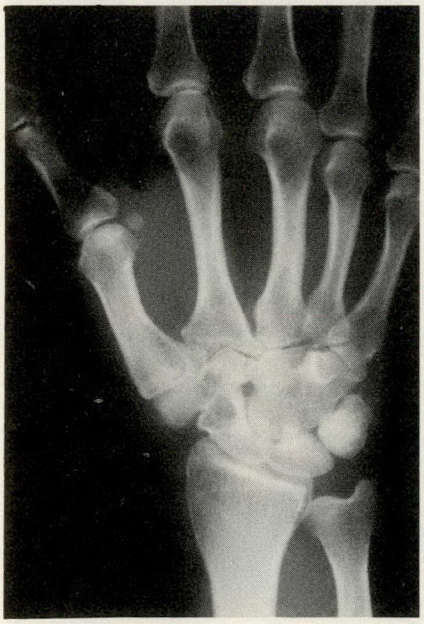

FIG. 6—Case 2. Trapezial replacement with erosive changes in scaphoid and trapezoid.

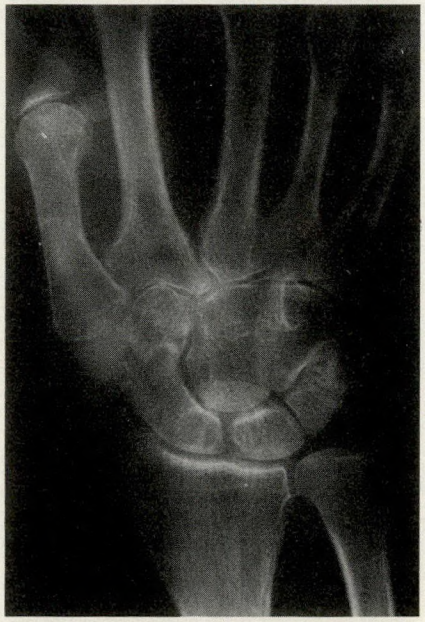

FIG. 7—Case 3. Trapezial replacement. Note cystic changes in scaphoid and lunate as well as wear of prosthesis on ulnar side.

To date she has declined further surgery.

This woman also had a left trapezial replacement in January 1980 but to date has had no problems associated with it.

Discussion

The exact etiology of the erosive changes in these cases is not fully understood. It may represent an idiosyncratic response in susceptible individuals. On the other hand, it may be the end result produced when the Silastic prosthesis articulates with degenerated, incongruous joint surfaces, giving rise to microscopic particles of silicone elastomer. The amount of wear seen in the two removed prostheses would support the latter theory. Fibrillation of the implants is likely due also to the prolonged intermittent compression they receive with across-the-wrist load. It is our belief that some stress shielding is necessary to protect the prosthesis; intercarpal arthrodesis is recommended (e.g., triscaphium fusion with lunate replacements and capitolunate with scaphoid replacements).[10,11]

As experience is gained with any implantable prosthesis, so will potential complications be identified. Wear of and local reactions to prostheses are inevitable as long as man-made materials are used. We do not wish this report to be a condemnation of implant arthroplasty, using Silastic, as immeasurable good has resulted from the use of such implants. We do believe, however, that it is important for patients and surgeons to be aware of the potential complications of a prosthetic device and that further surgery may be necessary should a complication occur. It is suggested that Silastic carpal bone replacements be reassessed clinically and radiologically every year.

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Fracture of a Polyethylene Acetabular Cup: a Case Report

Fracture of a polyethylene acetabular cup is rare. Current theories of its cause emphasize wear of the component.

The case reported illustrates the presence of a loosening membrane in association with cup fracture. Histologic study of the loosening membrane indicated a foreign-body reaction to polyethylene and acrylic wear particles. The authors propose a theory relating micromotion of the acetabular component to the production of particles of wear with a subsequent foreign-body reaction followed by further loosening. The erosion of bony support leads to the concentration of stress at the junction of the supported and unsupported segments. This may ultimately result in fracture of the cup.

Les fractures des acétabules de polyéthylène sont rares. Les théories actuelles sur leur cause insistent sur l'usure de la pièce.

Le cas que l'on décrit ici montre la présence d'une membrane de décollement en association avec la fracture de l'acétabule de polyéthylène. L'examen histologique de cette membrane de décollement suggère une réaction contre un corps étranger, en l'occurrence des particules d'érosion de polyéthylène et d'acrylique. Les auteurs suggèrent une théorie reliant une microdislocation de la prothèse acétabulaire à la production de particules d'érosion qui provoquent subséquemment une réaction tissulaire responsable d'un relâchement plus important. L'érosion du support osseux mène à une concentration du stress sur la jonction des segments soutenus et non soutenus. A la limite, ceci entraîne la fracture de la prosthèse acétabulaire.

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Fracture of the ultra high-density polyethylene acetabular cup after total hip replacement is a rare clinical occurrence. Current theory emphasizes that wear of the component is the main cause of its failure.[1,2] We present a case to illustrate the presence of a loosening membrane and osteolysis as a consequence of foreign-body reaction to wear particles, and we propose a theory relating aseptic loosening to the cup fracture.

Case Report

A 58-year-old white man underwent a right Charnley–Muller total hip replacement in March 1973 and a similar procedure on the left side in March 1977 for degenerative arthritis secondary to alcohol-induced avascular necrosis. The intra- and postoperative courses were uncomplicated.

In November 1984 the patient was seen with severe left hip pain caused by a fall while intoxicated 1 week earlier. He could not bear weight on the affected leg. He admitted that he had experienced some left groin discomfort on initiating ambulation for several months before the fall but he had not attended a clinic for review since 1977.

The patient weighed 109 kg and was 1.70 m tall. He had an antalgic gait with restricted range of motion of the left hip due to pain. Roentgenograms of the left hip showed a grossly displaced acetabular cup with discontinuity of the metal ring (Fig. 1), confirmed by push–pull and abduction–adduction films. Lucent lines wider than 2 mm were noted at the cement–bone interface surrounding the cup in zones I, II and III as well as in the ischium.[3] The femoral component did not appear to be loose.

Through a Smith-Peterson anterior approach to the hip the acetabular cup was found to be fractured, with a large free posterolateral fragment adjacent to a fracture of the posterior acetabular rim. The superomedial portion of the cup was stable and firmly cemented. The cement mantle was excised, and inspection of the cup revealed severe eccentric wear (Fig. 2). The fracture had occurred through the thinned wall of the cup. An area of osteolysis associated with abundant loosening membrane was noted deep to the fractured portion of the cup and along the medial wall of the acetabulum extending distally into the ischium. Because of superior and posterior acetabular bone loss the acetabulum was reconstructed using a Muller reinforcement ring and an autogenous bone graft. The femoral component was found to be stable.

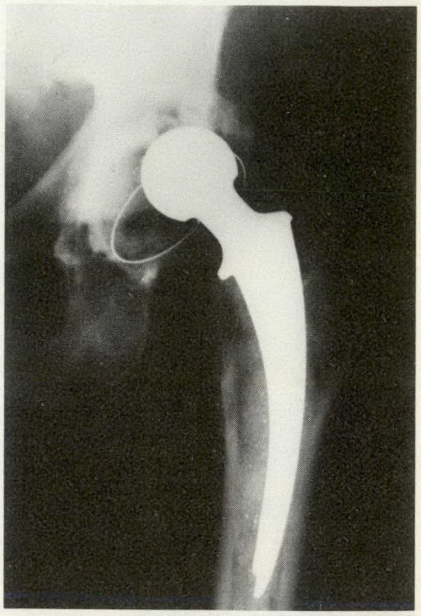

FIG. 1—Anteroposterior roentgenogram showing acetabular cup loosening and fracture with femoral subluxation.

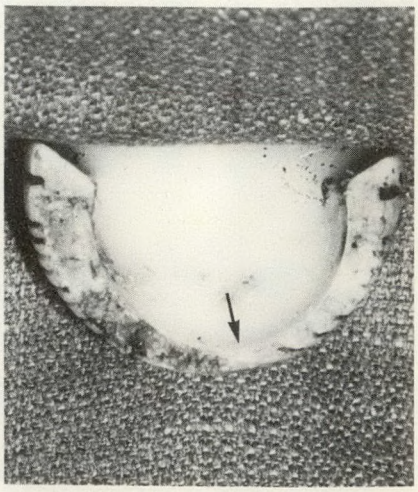

FIG. 2—Fracture of 50 mm outside diameter 32 mm inside diameter acetabular cup. Arrow indicates area of eccentric wear.

Results

Aspirated joint fluid was examined under polarized light microscopy revealing many birefringent wear particles previously identified as polyethylene fragments (Schatzker J, Goodman SB, Sumner-Smith G: Unpublished data, 1983).

Histologic sections of the loosening membrane revealed large numbers of histiocytes and multinucleated giant cells in fibrous tissue. Examination under polarized light showed many needle-like birefringent particles located within the cells (Fig. 3). Sections through specimens of synovium showed a similar cellular reaction around particles of cement and polyethylene (Fig. 4).

The findings were interpreted as demonstrating evidence of a foreign-body reaction to polyethylene and cement debris produced as a result of wear.

Discussion

Reports in the literature discussing the cause of polyethylene fracture have emphasized component thinning due to wear.[1,2] Salvati and colleagues[1] reported two cases of fractured acetabular cups. They noted that poor cementing technique may allow increased motion of the acetabular cup and a greater tendency to fracture through the superior grooves. Weightman and associates[2] reported a case in which a polyethylene tibial component of ultra high molecular weight fractured. They suggested that the lack of bony support led to increased bending of the component and eventual fracture due to tensile failure.

Histologic examination of the cement–bone interface in clinically loose total hip replacements has demonstrated the existence of a foreign-body membrane composed of histiocytes and giant cells containing acrylic and polyethylene debris.[4-7] Experimental evidence in dogs has related the degree of membrane formation to poor cement–bone interlock and micromotion.[8]

Our observations lend credence to the following theory: micromotion of the deformable acetabular cup results in cement and polyethylene debris secondary to shear stresses at the cement–bone interface. The acrylic and polyethylene particles stimulate a foreign-body membrane. This membrane is capable of osteolysis,[6] leading to further abnormal motion of the component due to undermining of the bony support. This produces more acrylic and polyethylene debris, initiating a cycle that leads to clinical loosening of the prosthesis.

We have noted that a portion of the cup can be well cemented and stable while the adjacent segment can be loose and subject to increased bending and shearing forces. Stress concentration at the junction of these segments may predispose to polyethylene cup fracture.

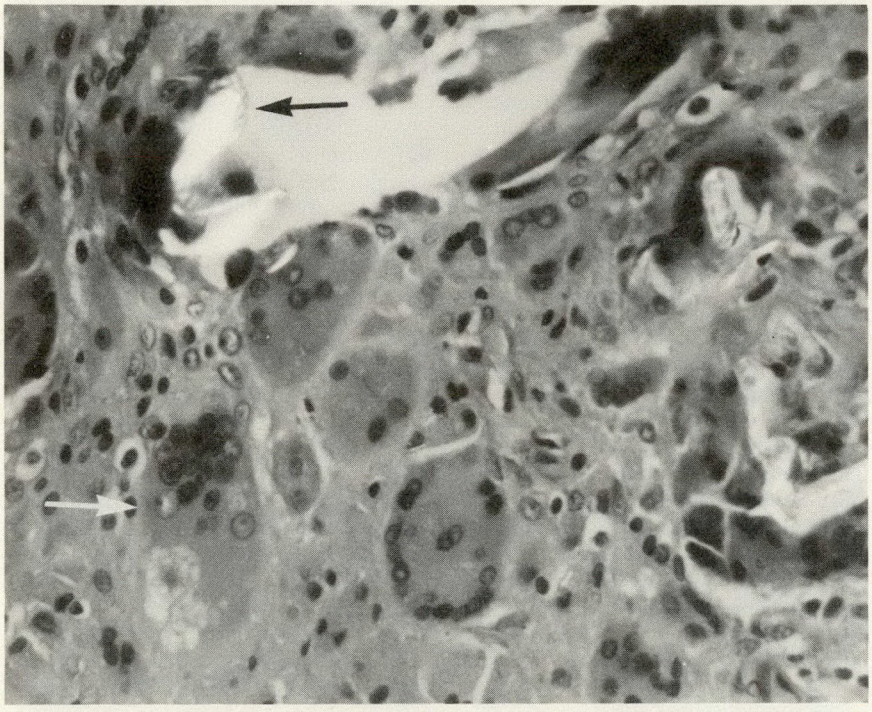

FIG. 3—Polarized light microscopy of loosening membrane with giant cells (light arrow) and histiocytes surrounding polyethylene particles of wear (dark arrow) (hematoxylin and eosin, original magnification × 400).

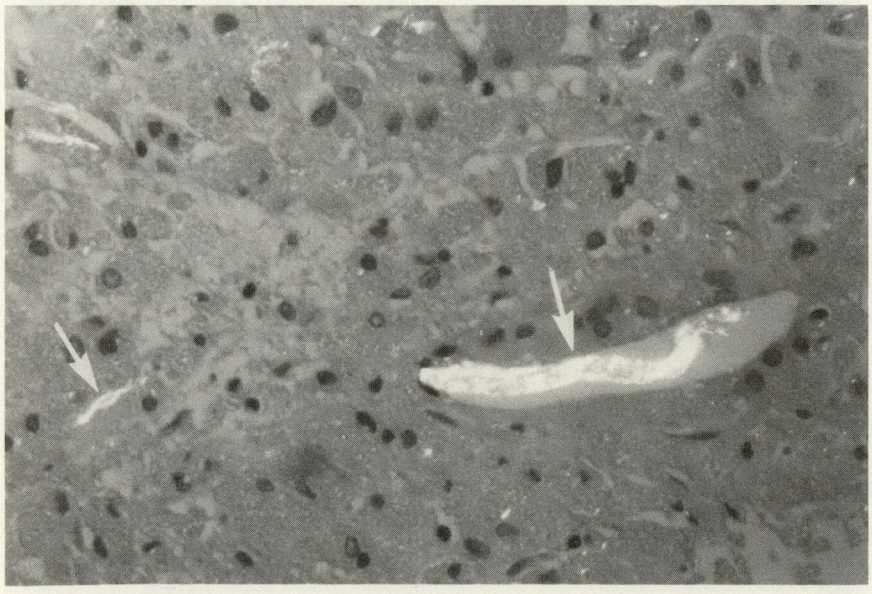

FIG. 4—Polarized light microscopy of synovial membrane with histiocytes surrounding polyethylene particles of wear (arrows) (hematoxylin and eosin, original magnification × 160).

We thank Dr. J. Delaney for his assistance in the histologic studies.

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Inflammatory Abdominal Aortic Aneurysm

The inflammatory abdominal aortic aneurysm has received little attention in the literature. To date only four reports have addressed the subject specifically. Controversy remains as to whether this is a variant of the usual atherosclerotic aneurysm or a separate entity. The operative reports of 24 patients with inflammatory abdominal aortic aneurysms are reviewed; 21 were intact and 3 ruptured. Intact aneurysms ranged in diameter from 5 to 12 cm and the ruptured ones from 5 to 10 cm. Nine patients with intact aneurysms had symptoms of abdominal or back pain. Of 13 patients who underwent excretory pyelography before operation, only 3 had evidence of obstruction. Nine patients had tube grafts placed, 10 had aortoiliac grafts and 5 aortofemoral grafts. There was one intraoperative duodenal injury and in another patient it was necessary to divide the left renal vein for proximal exposure. No attempt was made to expose the ureters at operation. All patients were discharged from hospital.

The authors believe that the inflammatory aneurysm is a variant of the abdominal aortic arteriosclerotic aneurysm. Intraoperative complications can be avoided by the recognition of the pathological features.

L'anévrisme inflammatoire de l'aorte abdominale occupe peu de place dans la presse médicale. A ce jour, seulement quatre articles ont touché spécifiquement ce sujet. On discute toujours s'il s'agit d'une variante de l'anévrisme athéroscléro-tique habituelle ou d'une entité distincte. On étudie ici les résultats opératoires chez 24 patients présentant un anévrisme inflammatoire de l'aorte abdominale; 21 étaient intacts et 3 étaient rupturés. Le diamètre des anévrismes intacts variait entre 5 et 12 cm et celui des anévrismes rupturés, entre 5 et 10 cm. Neuf patients porteurs d'anévrismes intacts se plaignaient de douleur abdominale ou lombaire. Des 13 patients qui ont subi une pyélographie descendante avant l'opération, seulement 3 montraient des signes d'obstruction. Neuf patients ont reçu une greffe tubaire, 10 une greffe aorto-iliaque et 5 une greffe aorto-fémorale. On a enregistré une lésion duodénale opératoire et, chez un autre patient, il a été nécessaire de séparer la veine rénale gauche afin d'exposer la partie proximale. Aucun essai d'exposer les uretères fut tenté en cours de chirurgie. Tous les patients ont reçu leur congé de l'hôpital.

Les auteurs croient que l'anévrisme inflammatoire est une variante de l'anévrisme artériosclérotique de l'aorte abdominale. Quand on reconnaît ceci, des complications opératoires peuvent être évitées par reconnaissance des traits pathologiques.

In 1972 Walker and associates[1] described the inflammatory abdominal aortic aneurysm and suggested that it was a different clinical entity from the atherosclerotic variety. Recently, Baskerville and colleagues[2] used the term perianeurysmal fibrosis to describe the lesion. Inflammatory abdominal aortic aneurysms constitute 2.5% to 10% of all infrarenal abdominal aortic aneurysms.[1,3-5] The diagnosis is often not suspected preoperatively, and intraoperative complications have led to increased morbidity and death. The etiology, diagnosis and appropriate surgical management, particularly in relation to the aneurysm repair and associated ureteric obstruction, are controversial. Our experience with this complicated aneurysm forms the basis of this report.

Patient Material

Retrospectively, we reviewed the charts of all 255 patients who underwent repair of abdominal aortic aneurysms at the Health Sciences Centre in Winnipeg between 1977 and 1983. In 21 (9%) patients (19 men, 2 women) the aneurysm was considered inflammatory. Of 197 intact aneurysms, 18 were inflammatory, as were 3 of 58 ruptured aneurysms. Patients ranged in age from 52 to 82 years (average 67 years).

The diagnosis was made by the gross appearance of the lesion and biopsy examination of the aneurysm wall. About one half of the patients had tissue removed at operation and the typical microscopic findings of fibrosis and chronic inflammation were present. Three patients with intact inflammatory aneurysms treated before 1977 are included in this report, giving a total of 24 patients with inflammatory aneurysms.

Clinical and Laboratory Findings

Of the 21 patients with intact inflammatory aneurysms, 9 complained preoperatively of abdominal or back pain, which is commoner than in noninflammatory aneurysms. The size of the aneurysm was assessed preoperatively by clinical examination, abdominal roentgenography or ultrasonography or was measured at operation. Aneurysms varied in size from 5 cm to 12.5 cm in diameter (average 7.5 cm). The smallest aneurysm was one that had ruptured. Thirteen of 21 patients with intact aneurysms underwent excretory pyelography preoperatively. Ureteral obstruction was present in three patients. Bilateral ureteric involvement, probably secondary to prostatic hypertrophy, was present in one. In the remainder the pyelograms were reported as normal. Only 2 of 10 patients with an abnormal serum creatinine value preoperatively had ureteric obstruction. Fifteen of 21 patients with intact inflammatory aneurysms had erythrocyte sedimentation rates measured preoperatively. The values ranged from normal to

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very high (Table I). Although symptomatic patients with extensive perianeurysmal inflammation tended to have the highest sedimentation rates, there was no reliable correlation.

Pathological Features

The gross pathological appearance at operation is the most important thing for the surgeon to recognize. The characteristic features are the dense, white, fibrotic tissue and adherent duodenum (Fig. 1). All our patients had gross findings of perianeurysmal fibrosis, and adjacent structures were involved to varying degrees. The fibrosis extended from the left renal vein to the common iliac bifurcations in some instances. Biopsies of the aortic wall revealed extensive periadventitial fibrosis and destruction of the internal elastic lamina and most of the media (Fig. 2). There were foci of lymphocytes, plasma cells and eosinophils. Lymph follicles and giant cells were sometimes present. The histologic appearance can resemble that of syphilis.

Table I—Erythrocyte Sedimentation Rate in 15 Patients With Inflammatory Abdominal Aortic Aneurysm

Level, mm/h	No. of patients
< 20	4
20–40	5
41–60	4
> 60	2

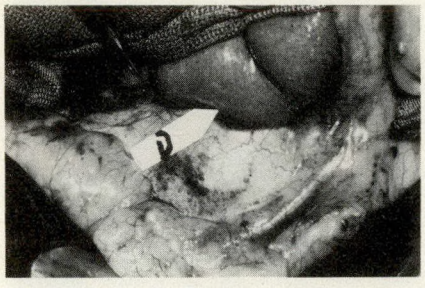

Fig. 1a

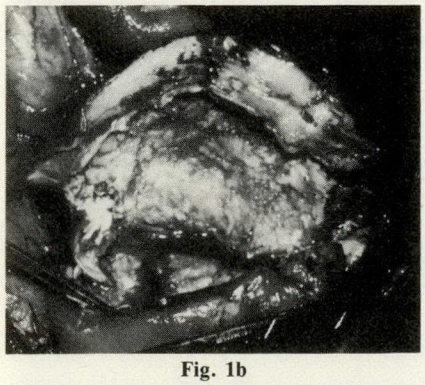

Fig. 1b

FIG. 1—(a) Inflammatory aneurysm with adherent duodenum (arrow). Note white mass with overlying vascularity. (b) Aneurysm opened. Note thick anterior wall.

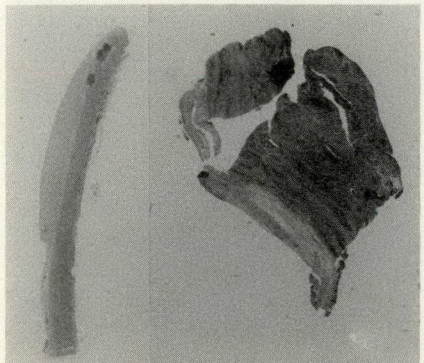

FIG. 2—Photomicrograph showing, on left, normal aortic wall and on right greatly thickened wall with marked inflammation (original magnification × 1).

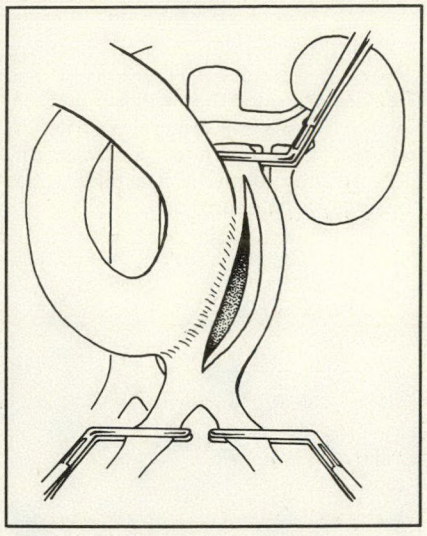

FIG. 3—Incision of aorta to allow adherent duodenum to retract.

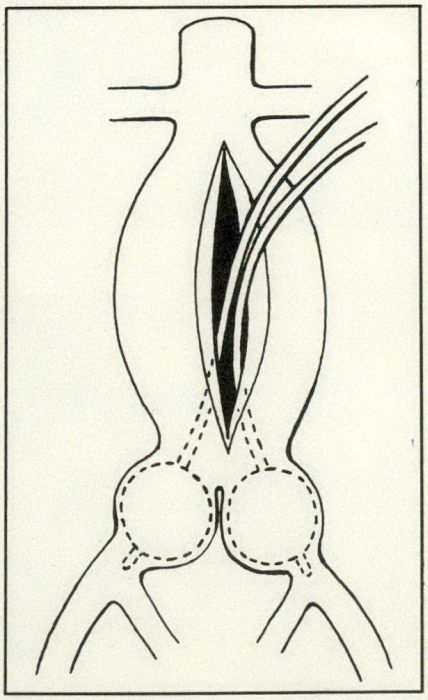

FIG. 4—Intraluminal control of iliac arteries.

Table II—Type of Graft Repair

Graft	No. of patients
Tube graft	9
Aortoiliac	10
Aortofemoral	5
Total	24

Operative Management and Results

It is most important for the surgeon to be aware of the gross appearance of the inflammatory aneurysm so that adjacent structures will not be injured inadvertently. Most serious complications result from injuries to the duodenum or adjacent veins during ill-advised dissection of these structures.[1,3,6] It is essential to avoid the adherent duodenum by first obtaining proximal control of the aorta. Division of the left renal vein may give better proximal exposure. It may be preferable to gain temporary control of the aorta at the level of the diaphragm, especially when the aneurysm has ruptured, as suggested by Crawford and associates.[5] With proximal control the aneurysm is opened, allowing the duodenum to retract to the right with the wall of the aneurysm (Fig. 3). If the inflammatory process involves the iliac arteries, no attempt should be made to dissect or clamp them. It is preferable to obtain intraluminal balloon control of the vessels through the open aneurysm (Fig. 4). The iliac arteries are oversewn from inside the sac and the limbs of the graft anastomosed to the external iliac or common femoral arteries. Likewise, the proximal anastomosis is made inside the sac. The aneurysm wall is then approximated over the prosthesis. A knitted Dacron graft is used for elective reconstruction and a woven graft for ruptured aneurysms (Table II). By these techniques, it was possible to repair all inflammatory aneurysms in this series with minimal morbidity and no deaths. One duodenal perforation occurred but it was repaired successfully, and the patient's recovery was uneventful following graft replacement.

Discussion

The etiology of the perianeurysmal fibrosis and inflammation, which is associated with up to 10% of abdominal aortic atherosclerotic aneurysms, remains obscure. An attractive hypothesis and one we support is that of an autoimmune reaction with protein breakdown in the aortic wall. Although unproven, the histologic features and response to steroid therapy as reported by Baskerville and associates,[2] lend support to this hypothesis. Rose and Dent[6] have demonstrated

that the inflammatory process is present in most atherosclerotic abdominal aortic aneurysms but varies in extent. The 12% incidence associated with extensive fibrosis in their series is in keeping with that reported by others.[1,3,4] Further studies may confirm these pathological findings. Although Walker and colleagues[1] suggested that this entity differs from the standard atherosclerotic aneurysm, the majority support the concept that it is an exaggerated inflammatory process that accompanies atherosclerosis.[3,5,6] Undue back pain, weight loss and a markedly elevated erythrocyte sedimentation rate are suggestive of an inflammatory aneurysm. Excretory intravenous pyelography should be done in all patients who undergo abdominal aortic surgery, to delineate the anatomy of the kidneys and ureters. When involved, the ureter characteristically is displaced medially by the fibrosis at the level of the pelvis (Fig. 5). However, ureteric displacement or obstruction neither confirms nor excludes the existence of perianeurysmal fibrosis. Aortography is of no benefit in the diagnosis of the inflammatory component. Ultrasonography[7] of the aorta may show a thickened wall, but recent reports indicate that enhanced computed tomography may be the most reliable method of assessment.[2,5,7,8] Since this perianeurysmal fibrosis may be present in the absence of any unusual clinical features, the surgeon must be familiar with the gross pathological features so that the potential dangers of standard repair are recognized at operation and modified appropriately. Management of an obstructed ureter remains controversial.[9-11] The urologic literature favours ureterolysis[9] and Darke and colleagues[10] have suggested simultaneous aneurysm repair and ureterolysis as their treatment of choice. If normal drainage is demonstrated preoperatively, no attempt should be made to mobilize the ureters since there is no evidence that obstruction occurs later. When unilateral ureteral obstruction is present preoperatively, the surgeon will have to decide whether to perform ureterolysis. In one patient in this series, spontaneous resolution of ureteric obstruction occurred 6 months after repair of the aneurysm (Fig. 6). Since ureterolysis may complicate the aneurysm repair, it would seem preferable to await spontaneous resolution and perform follow-up excretory pyelography. It has been demonstrated that with steroid therapy the fibrosis and ureteral obstruction may resolve without aneurysm resection. Delayed ureterolysis is advisable when conservative measures fail.

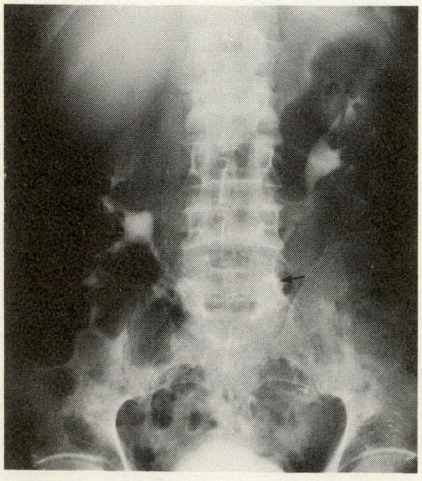

FIG. 5—Excretory pyelogram demonstrates medial deviation of ureter (arrow) due to inflammatory aneurysm.

Summary

Twenty-four patients with inflammatory abdominal aortic aneurysms were reviewed; 21 were intact and 3 ruptured. The erythrocyte sedimentation rate was elevated in a number of patients and three had ureteric obstruction. The diagnosis was rarely made preoperatively, although it was occasionally suspected because of pain, elevated sedimentation rate and ureteric involvement. The operative approach must be modified to avoid injury to the duodenum. All aneurysms were successfully replaced with a prosthesis and there were no operative deaths. The management of associated ureteric

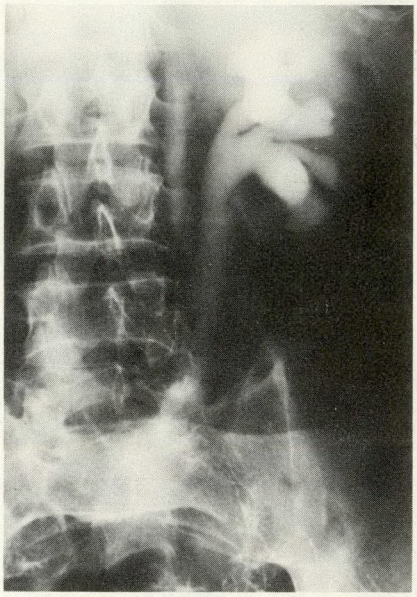

Fig. 6a

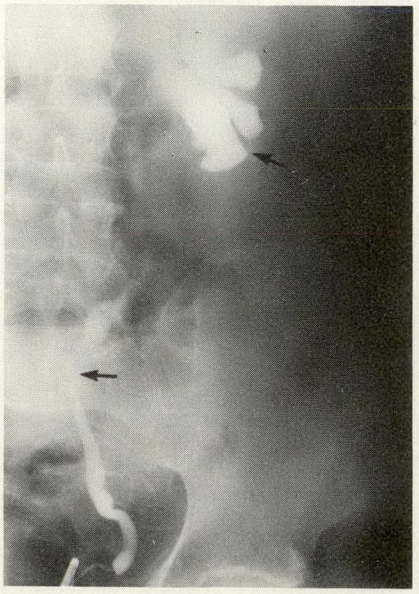

Fig. 6b

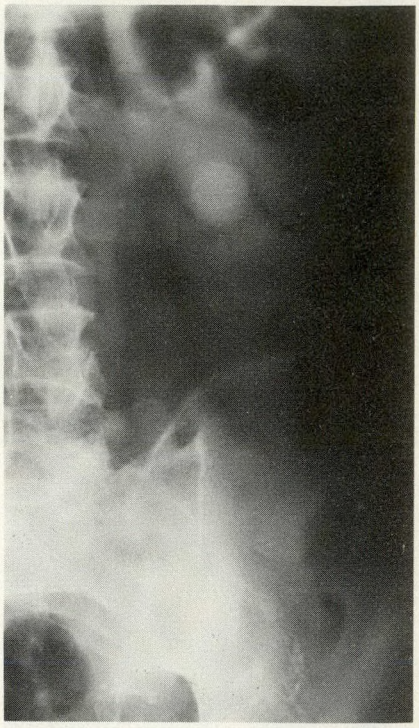

Fig. 6c

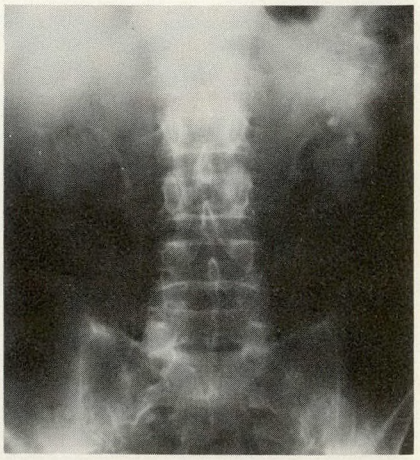

Fig. 6d

FIG. 6—(a) Preoperative excretory pyelogram showing left hydronephrosis. (b) Preoperative retrograde pyelogram showing medial deviation of ureter (arrow) which is patent. (c) Excretory pyelogram 3 months after repair of aneurysm without ureterolysis. (d) Excretory pyelogram 6 months after operation showing resolution of hydronephrosis.

involvement remains controversial but our present approach is to repair the aneurysm, then follow-up the ureteric obstruction and perform ureterolysis later if necessary.

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NOTICES
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Surgery at Wimbledon

A course on various surgical topics will be held in London, England, from June 28 to July 5, 1986. Topics to be discussed include what's new in liver surgery, gastric inlet obstructions, vascular surgical emergencies, inflammatory bowel disease, thyroid surgery and progress in the treatment of burn injury.

For further information contact Dr. Paul Ross, 490 Old Dock Rd., Kiawah Island, SC 29455; (803) 768-1033.

Otolaryngology

The University of California School of Medicine at San Francisco will be presenting a symposium on otolaryngology to be held Feb. 1–9, 1986 in Grindelwald, Switzerland. Designed for otolaryngologists, otologists, head and neck surgeons, and plastic and reconstructive surgeons, this symposium will evaluate recent developments and future directions in related areas.

For more information contact Extended Programs in Medical Education, The University of California School of Medicine, Rm. 569-U, San Francisco, CA 94143; or call (415) 666-4251.

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ORI D. ROTSTEIN, M SC, MD, FRCSC;* FRANK S. RHAME, MD;
ERNESTO MOLINA, MD; RICHARD L. SIMMONS, MD

Mediastinitis After Whiplash Injury

The authors describe a rare complication of whiplash injury. Diffuse mediastinitis resulted from extension of a whiplash-induced retropharyngeal abscess into the thorax. Early diagnosis of the cervical infection was masked by the simultaneous presence of infectious mononucleosis. Aggressive surgical management including bilateral thoracotomy was required to resolve the septic course.

A review of the literature discusses the pathogenesis of this complication including the route of extension into the mediastinum and supports the use of aggressive surgical therapy to reduce the associated mortality.

Les auteurs décrivent une complication rare des lésions traumatiques de la colonne vertébrale: une médiastinite diffuse qui a résulté de l'extension dans le thorax d'un abcès rétropharyngé consécutif à un coup de fouet cervical. Le diagnostic précoce d'infection cervicale a été masqué par la présence surimposée d'une mononucléose infectieuse. Un traitement chirurgical agressif avec thoracotomie bilatérale a été nécessaire pour venir à bout de la sepsie.

Une revue de la littérature permet d'élaborer sur la pathogénèse de cette complication, dont la voie d'extension dans le médiastin. Elle soutient le recours à un traitement chirurgical agressif comme moyen de réduire la mortalité qui y est rattachée.

Acute mediastinitis caused by extension of infection from the cervical region is extremely rare. It is usually a complication of an odontogenic infection or esophageal perforation during instrumentation.[1-3] We report a case of acute mediastinitis that occurred after a whiplash injury sustained in a minor motor vehicle accident.

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Case Report

A 19-year-old man sustained a whiplash injury in a minor motor vehicle accident. At the local hospital's emergency department he complained of minor neck and back pain. Neck films were normal and he was discharged. Five days later, a sore throat and fever developed. The patient's family physician prescribed amoxicillin. Over the next 5 days he experienced fatigue, increasing fever, chills, jaundice and a tender swollen neck due to lymphadenopathy. The monospot test was positive and he was admitted to hospital with a diagnosis of infectious mononucleosis complicated by hepatitis. After 2 days of intravenous fluid and prednisone therapy he was discharged but was readmitted 2 days later with a sore throat, dysphagia, an elevated temperature (39.4°C), weakness, dyspnea, a diffuse erythematous rash and increased neck swelling. Repeat neck roentgenograms were normal. The leukocyte count was 20.0×10^9/L. Over the next 24 hours, pleuritic chest pain and diffuse abdominal pain with tenderness developed. At a laparotomy for presumed ruptured spleen no abnormalities were found. Postoperatively he became hypoxemic and had bilateral pleural effusions (Fig. 1); 800 mL of purulent fluid drained from the left pleural cavity. Staining of the fluid revealed gram-positive diplococci and gram-negative rods. The patient was transferred to the university hospital 17 days after injury.

On admission, he complained of fever, dyspnea, chest discomfort and left-sided abdominal pain. A diffuse erythematous maculopapular rash was seen. The blood pressure was 160/50 mm Hg, heart rate 132 beats/min, respiratory rate 32/min and his oral temperature 38.3°C. The pharynx was mildly erythematous with no exudate. There was diffuse, tender, cervical lymphadenopathy, particularly in the left supraclavicular fossa. Chest examination revealed reduced breath sounds in the left base with bilateral basilar rales. Heart sounds were normal and the findings on abdominal examination were unremarkable except for a well-healed incision.

Roentgenograms of the neck revealed air in the subcutaneous tissues and slight swelling of soft tissues (Fig. 2). The leukocyte count was 11.3×10^9/L (53% neutrophils, 18% band forms, 18% lymphocytes). No atypical lymphocytes were noted. Total serum bilirubin level was 34.2 μmol/L with a normal alkaline phosphatase level and mildly elevated serum aspartate aminotransferase level. An echocardiogram showed a small posterior pericardial effusion, and the roentgenogram after a Gastrografin swallow was normal. A left chest tube was inserted and drained purulent material.

A diagnosis of high esophageal perforation was made. Cefamandole, clindamycin and amikacin sulfate therapy was started. At operation examination of the pharynx revealed multiple punctate holes and a small laceration in the left posterior hypopharynx just above the laryngeal inlet. Purulent material could be expressed by pressure on the posterior pharyngeal wall. The neck was explored through an incision along the anterior border of the left sternomastoid muscle. Purulent material was found in the retroesophageal space and was drained with Penrose drains. A right thoracostomy tube was placed to drain the right-sided empyema and the pericardial cavity was drained through a transxiphoid approach. Three substernal mediastinal drains were

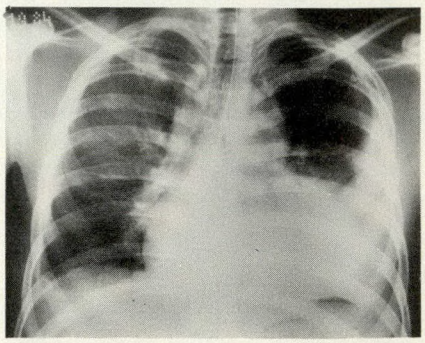

FIG. 1—Diffuse widening of mediastinum and bilateral pleural effusions.

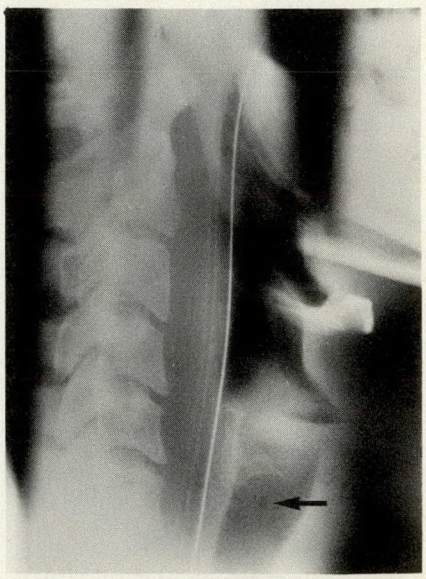

FIG. 2—Lateral neck roentgenogram shows air in subcutaneous tissues (arrow), loss of cervical lordosis and mild soft-tissue swelling. These are findings compatible with retropharyngeal abscess.

inserted through a subxiphoid incision and advanced to the base of the neck. Culture of the pleural fluid grew *Eikenella corrodens, Streptococcus intermedius* and *Peptococcus magnus*. Cefoxitin replaced cefamandole in the antibiotic regimen to cover the *E. corrodens*.

Postoperatively, the patient remained septic with fever, tachycardia, an increased cardiac output and reduced systemic vascular resistance. On postoperative day 6, a swelling in the right supraclavicular region was incised and drained 30 mL of purulent material that cultured *S. intermedius* and *Propionibacterium acnes*. Repeat computed tomography revealed a widened mediastinum, an appearance consistent with the presence of undrained pus (Fig. 3). Eight days after the first operation, the patient underwent a left thoracotomy with decortication of the left lung, replacement of the substernal drainage system and bilateral neck explorations. The mediastinum was entered through an incision anterior to the aortic arch and a small amount of purulent material was drained. Cultures again grew *E. corrodens* and *S. intermedius*. The patient became afebrile for several days but sepsis again developed. Right pleural decortication was undertaken and the mediastinum was opened both anteriorly and posteriorly and drained with chest tubes. There was no large collection of pus. The mediastinal fluid grew methicillin-resistant coagulase-negative staphylococci.

The patient remained febrile with leukocytosis but the fever gradually resolved over 3 weeks. He was treated with vancomycin, clindamycin and gentamicin for 2 weeks, then with vancomycin alone for another week. Amphotericin B (0.5 mg/kg daily) was added empirically 6 days after operation for 21 days because of his persistent febrile state. His recovery was somewhat delayed by nausea, abdominal discomfort and food intolerance but this resolved and he was discharged home 36 days postoperatively.

Discussion

It has been reported[1,4] that 22% of mediastinal infections originate in the neck. Three major routes of communication allow spread of infection from the cervical region into the mediastinum:[5] the retropharyngeal space, the perivascular space and the pretracheal space. Pearse[1] reported that the retropharyngeal space was involved in 71% of cases of mediastinitis that occurred after cervical suppuration while spread by way of the pretracheal and perivascular spaces was found in 8% and 21% of instances respectively. Most of the cases in the literature are due to spread of an odontogenic infection or extension of a retropharyngeal abscess caused by traumatic perforation of the oropharynx.

Our patient represents one of the rare cases of mediastinitis following cervical flexion-hyperextension injury.[4,6-10] These injuries may cause perforation of the pharynx or cervical esophagus by one of the following three mechanisms:[6-8] pinching of the posterior wall between adjacent vertebral bodies as they snap back during the flexion phase; breakdown of the posterior pharyngeal tissues contused during hyperextension; and direct injury by being impaled on a cervical osteophyte or fracture dislocation. Our patient likely bruised the posterior pharynx and sustained a small mucosal laceration during hyperextension. The resulting inflammation progressed to a retropharyngeal abscess and subsequently extended by way of the retroesophageal space into the mediastinum. Although it is possible that the posterior pharynx was injured during endotracheal intubation, this is unlikely since our patient's symptoms began before his laparotomy and the attending anesthetist noted that intubation was uncomplicated. Although two groups[4,8] have warned that the onset of fever and neck swelling after a whiplash injury should alert the physician to the possibility of this complication, the diagnosis in our patient was masked by the simultaneous presence of infectious mononucleosis. This was diagnosed initially by monospot test and confirmed by viral serology.

The bacteriologic features of the mediastinitis and neck abscess were consistent with an oropharyngeal source for this infection.[11] *Eikenella corrodens, S. intermedius* and *P. magnus* are all components of the normal oral flora of man. *Eikenella corrodens* has previously been reported only once in mediastinitis,[12] probably because its frequency in mouth flora is low and because it is a fastidious microorganism that may be overlooked with routine culture methods.[13] The *E. corrodens* isolated in our case was resistant to clindamycin and aminoglycosides and sensitive to cefoxitin. This is the typical pattern for this microorganism[14] and was the basis for adding cefoxitin to the antibiotic regimen. An aminoglycoside was continued through most of the patient's stay in the intensive care unit, even though a sensitive facultative gram-negative bacillus was never isolated. Its use was probably unnecessary but it was continued because of the prolonged manifestations of sepsis.

Mediastinitis after cervical suppuration is associated with a high death rate. Standard therapy consists of antibiotics, supportive hemodynamic and nutritional care and surgical drainage. Death almost always occurs when the surgeon attempts to drain a diffuse mediastinal infection originating in the neck by a cervical incision. Although the posterior mediastinum can be exposed through the neck down to the level of T4–6, this approach is clearly inadequate when diffuse mediastinitis is present. Our case demonstrates this point. After a failed attempt to drain the mediastinum by neck exploration and substernal irrigation tubes, a right thoracotomy with anterior and posterior mediastinal drainage reversed our patient's persistent septic course. The literature also supports this contention. Thirty case reports[1,4-10,12,15-24] in which mediastinitis followed cervical infection were available for review. Death occurred in 40% (12) of these cases and was due to sepsis in all. Eleven of the 12 patients were treated by cervical exploration alone without thoracotomy. Among the 18 survivors, 9 had thoracotomies for drainage, usually after a neck exploration failed to improve the patient's status. The other nine survived with neck exploration and transcervical drainage of the superior mediastinum. Interestingly these patients usually had well-loculated collections as defined by computed tomography, roentgenography with contrast or operation. This differentiation between a well-defined "mediasti-

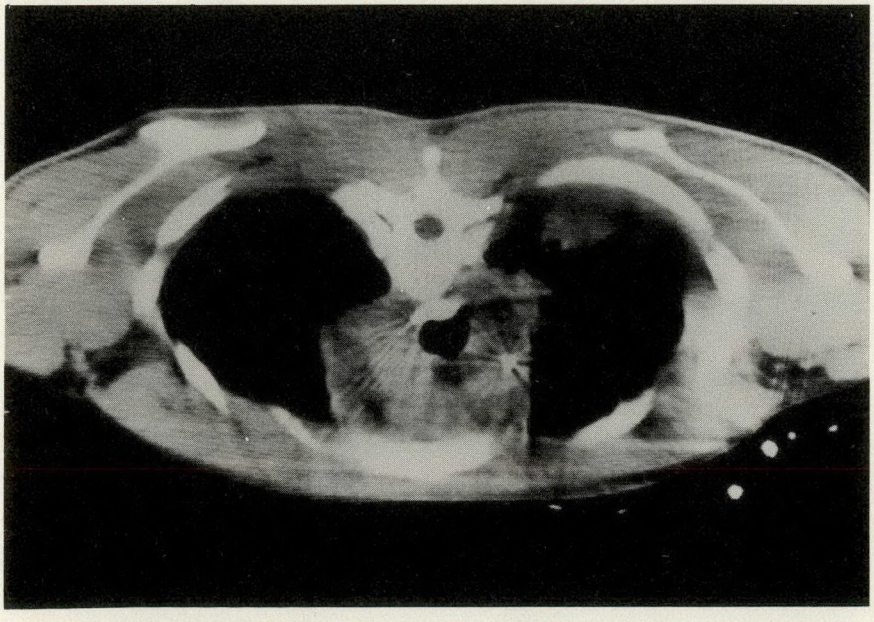

FIG. 3—Computerized tomogram of upper chest revealing markedly abnormal mediastinum and bilateral pleural effusions.

nal abscess'' and a more diffuse ''phlegmonous mediastinitis'' has been previously made by Neuhof.[2] As a general approach to these patients, we believe that if a well-defined superior mediastinal collection is found by computed tomography or contrast radiography, transcervical drainage of this collection at the time of neck exploration may be attempted. Failure of the patient's sepsis to resolve, or progressive mediastinal involvement demonstrated radiologically, indicates the need for thoracotomy and open mediastinal drainage. Diffuse mediastinal involvement when the patient presents initially is an indication for early thoracotomy.

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Manuscripts of original articles and other contributions, including a limited number of case reports, should be submitted, in triplicate, *in English or French, with a covering letter requesting consideration for publication. Authors must also include a statement indicating that the manuscript is not under consideration by any other journal and has not been published previously. The manuscript should be typed on one side of plain paper, double spaced with wide margins. Measurements should be expressed according to the* Système international d'unités.

Illustrations (e.g., photographs of clinical material, roentgenograms, photomicrographs, graphs and diagrams), in triplicate, *should be in the form of glossy, unmounted and untrimmed prints, not larger than 20 × 25 cm. A legend must be supplied for each; the legend(s) should be typed on a page separate from the text of the article. For a roentgenogram submit a print rather than the original; for a photomicrograph include details of the stain used and the magnification in the legend. Lettering identifying parts of the illustration should be large enough to remain visible when the illustration is reduced in size for publication. A patient must not be recognizable unless written consent has been obtained; otherwise facial features may require blocking. Colour work can be published only at the author's expense. If an illustration is taken from a source other than the author's, letters of permission to reproduce must be obtained from the original publisher and author.*

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An abstract in English, and in French if possible, about 125 words long, should accompany each article, on a separate page.

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Toute communication initiale doit être adressée aux corédacteurs, le Journal canadien de chirurgie, *CP 8650, Ottawa, Ont. K1G 0G8.*

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Impact on Surgery of Preoperative Localization of Parathyroid Lesions With Dual Radionuclide Subtraction Scanning

In an effort to localize parathyroid lesions preoperatively, scanning with radioactive thallium and technetium was performed in 20 patients considered clinically to have hyperparathyroidism. In the 11 found at surgery to have single parathyroid adenomas, scanning correctly localized the lesion in 10; in the other patient the lesion was in the unscanned mediastinum. Preoperative scanning was not as rewarding in the seven patients with parathyroid hyperplasia. A thyroid lesion was the source of an abnormality seen on the parathyroid scan in one patient, while neck scanning and surgical exploration were negative in another. Comparison of the patients who had parathyroid adenomas localized in the neck with a control group of similar patients who did not undergo preoperative scanning showed that the average surgical time was reduced by 50% with preoperative localization and there was a decrease in the number of non-parathyroid tissue biopsies.

Dans une tentative pour localiser des lésions parathyroïdiennes en préopératoire, une scintigraphie au thallium et au technetium radioactifs a été pratiquée chez 20 patients présentant des signes cliniques d'hyperparathyroïdie. Sur 11 patients chez qui la chirurgie a révélé un adénome parathyroïdien unique, la scintigraphie avait correctement localisé la lésion dans 10 cas; chez le dernier patient, la lésion se trouvait dans le médiastin non examiné par scintigraphie. Dans les sept cas d'hyperplasie parathyroïdienne la scintigraphie préopératoire n'a pas connu des résultats aussi satisfaisants. Chez un patient, une lésion thyroïdienne était à l'origine de l'anomalie observée à la scintigraphie parathyroïdienne alors que dans un autre cas, la scintigraphie et l'exploration chirurgicale du cou se sont avérées négatives. La comparaison des patients qui souffraient des adénomes parathyroïdiens localisés dans le cou avec un groupe témoin composé de patients similaires mais qui n'ont pas eu de scintigraphie préopératoire a révélé que le temps moyen de chirurgie a été réduit de 50% grâce à la localisation préopératoire. On a constaté également une diminution du nombre des biopsies de tissu non parathyroïdien.

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There are usually four parathyroid glands in humans, located close to or within the thyroid gland. However, the number and location can vary. It may be difficult to recognize parathyroid from other tissue and a normal from an abnormal gland by gross inspection during operation. Intraoperatively, sampling of tissues for histologic proof is frequently required. It is not surprising, therefore, that surgery for hyperparathyroidism can be very tedious, sometimes requiring considerable cervical dissection and mediastinal exploration.

Preoperative localization of parathyroid lesions would greatly simplify the surgical management. Recently, a new dual radionuclide imaging procedure that uses radioactive thallium and technetium has been described and reported to be successful in localizing parathyroid lesions, particularly adenomas.[1-3]

Intravenously administered radioactive thallium is taken up by both the thyroid gland and the parathyroid lesion, hence differentiation is difficult. The parathyroid lesion becomes apparent when a sodium pertechnetate Tc 99m thyroid image is subtracted by computer from the combined thyroid and parathyroid thallium image.

In this paper, we describe our scanning technique and the results obtained in patients who underwent surgery for hyperparathyroidism. The impact on the surgical procedure of the correct preoperative localization of parathyroid adenomas is also discussed.

Methods

The study comprised 20 patients with a clinical diagnosis of hyperparathyroidism who were subjected to surgery after parathyroid scanning. Preoperatively, the condition was considered to be primary hyperparathyroidism in 13 patients and secondary in 7. Only one patient did not have hypercalcemia, but primary hyperparathyroidism was suspected because of recurrent renal calculi and hypercalciuria.

The scanning procedure used in the first four cases was similar to that described by Young and associates.[2] Only the neck was scanned in these patients. Subsequent patients were imaged by a modified technique currently in use. After the intravenous administration of 80 to 100 MBq of sodium pertechnetate Tc 99m, 20 minutes are allowed for the radionuclide to accumulate in the thyroid gland. The patient then lies supine under the pin-hole collimator of the scintillation camera and 100 to 120 MBq of thallous chloride Tl 201 is given intravenously. Immediately afterwards, alternate 1-minute thallium and technetium images are obtained for the neck to a total of 20 minutes. Subsequently, images of the upper mediastinum are obtained in a similar manner. All images are recorded digitally by computer using 64 × 64 matrix frames. During the procedure, the patient must remain perfectly still. For the neck, the technetium group of images are summed up and likewise the thallium images. The total technetium image is subtracted from the total thallium image.

Correction for technetium comptom scatter is unnecessary as the contribution of compton to the thallium image with these amounts of radioactivity is small. The mediastinal images are subsequently processed in the same manner. Focal residual activity on the subtracted image is interpreted as a parathyroid lesion.

For proper subtraction, there should be perfect alignment of the thyroid gland on the thallium and technetium images, as motion creates artefacts. Gross motion can be corrected by computer repositioning of the images if necessary. By adopting the alternate imaging technique, we strive to obtain a perfect anatomical alignment on the two sets of images.

One patient had negative neck and mediastinal scans and a negative surgical exploration of the neck. Before mediastinal exploration was attempted, repeat mediastinal scanning was performed using thallium alone, because a substernal thyroid gland was not present and subtraction of thyroid activity would not have been necessary.

The effect of correct localization on the surgical procedure was evaluated. The operative time and the number of intraoperative nonparathyroid tissue biopsies performed were obtained retrospectively from the clinical records. The findings in the patients who had preoperative scan localization of parathyroid adenomas in the neck were compared with those in a control group of nine consecutive patients in whom similar surgery was performed before scanning was available.

Results

Primary Hyperparathyroidism

The correlation between the scans and surgical findings in 13 patients who were considered preoperatively to have primary hyperparathyroidism are summarized in Table I. At surgery, single parathyroid adenomas were found in the neck in nine patients and in the thymus in two. In one patient a follicular adenoma of the thyroid with an occult sclerosing papillary adenocarcinoma was discovered, and in another no neck lesion was detected.

The scans correctly localized all nine single parathyroid adenomas in the neck (Fig. 1).

In one patient with a parathyroid adenoma located in the thymus, the initial scans of the neck and mediastinum were negative. Surgical exploration of the neck was also negative. A repeat mediastinal scan with thallium alone showed a focal area of uptake, 5 cm below the suprasternal notch, immediately to the right of the midline (Fig. 2). The focal uptake had almost completely disappeared 25 to 30 minutes after thallium administration (the initial mediastinal scan was started after the neck scan was completed but the repeat scan was started immediately after the intravenous administration of the ^{201}Tl). At operation the parathyroid adenoma was resected from the thymus, at the site identified on the scan.

In the second patient with a parathyroid adenoma located in the thymus, the neck scan was negative and mediastinal scanning was not done. At surgery, neck exploration in itself was negative but the parathyroid adenoma was found and resected from the thymus through the neck incision.

The neck scan showed a large focal abnormality in the lower part of the right thyroid lobe of one patient. The lesion was cold on the ^{99m}Tc thyroid scan, but it accumulated thallium. Because of its large size and the lack of hypercalcemia, a thyroid lesion was suggested, although the possibility of a parathyroid adenoma could not be ruled out. The patient was under investigation for recurrent renal calculi and hypercalciuria. At surgery, a thyroid adenoma with an occult sclerosing papillary adenocarcinoma was resected, but no parathyroid lesion was found.

Both neck scan and surgical exploration were negative in one patient. The mediastinum was neither scanned nor surgically explored. Here, as in the two patients with parathyroid adenomas in the thymus, neck exploration verified the normal scan results obtained for the neck.

Secondary Hyperparathyroidism

In seven patients who were thought preoperatively to have secondary hyperparathyroidism, the scan results were not as helpful. Parathyroid hyperplasia was found at neck surgery and no patient had mediastinal exploration.

A scan correctly localized all four hyperplastic parathyroid glands in one patient (Fig. 3). In another in whom three glands and part of the fourth had previously been resected, the remaining segment was localized on the scan (in retrospect). In a third patient, a scan localized two of four hyperplastic glands. In another, one of three hyperplastic

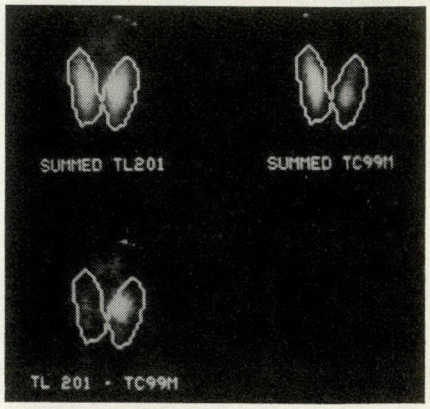

FIG. 1—Images obtained in patient with parathyroid adenoma in neck. Upper left is summed thallium image (TL201), upper right is summed technetium image (TC99M) and lower left is difference between them. Subtracted image shows parathyroid adenoma located in region of left thyroid lobe, medially above level of isthmus.

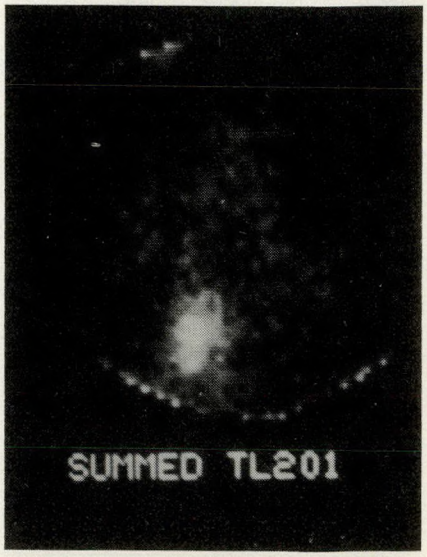

FIG. 2—Summed thallium image of upper mediastinum showing area of focal uptake, located 5 cm below suprasternal notch and immediately to right of midline; at surgery, parathyroid adenoma was readily identified in thymus in exactly that position.

Table I—Scan Correlation With Surgical Findings

Surgical results	No.	Scan results
Single parathyroid adenomas	11	
In neck	9	Correct localization in all cases
In thymus	1	Correct localization*
	1	Mediastinum not scanned†
Follicular adenoma of thyroid with occult sclerosing papillary adenocarcinoma	1	False positive
Negative neck exploration	1	Negative neck scan‡

*Initial neck and mediastinal scans were negative. Subsequent surgical exploration of neck was also negative. Repeat mediastinal scan with thallium only was positive.
†Neck scanning was negative. Mediastinum was not scanned. Surgical exploration of neck area was negative but parathyroid adenoma was resected from thymus through neck incision.
‡Mediastinum was neither scanned nor explored.

glands was identified but the fourth gland was not found in the neck during surgery. In a fifth patient, one of three hyperplastic parathyroid glands was localized; the fourth was histologically normal. A sixth patient had only one of four hyperplastic glands identified and in the last patient no glands were localized.

Length of Operation

The operative times in the nine patients with parathyroid adenomas in the neck, localized preoperatively, ranged from 40 minutes to 120 minutes (mean 61 minutes). In the control group the operative time ranged from 70 minutes to 220 minutes (mean 122 minutes).

The number of nonparathyroid samples examined by frozen section in each of the nine patients with parathyroid adenomas in the neck, localized by scanning, did not exceed one. In the control group the number ranged from zero to nine per patient.

Discussion

The results of parathyroid scanning with subtraction radionuclide imaging are excellent in patients with primary hyperparathyroidism, but not as rewarding, in our hands, in those with secondary hyperparathyroidism. Our results are in agreement with those reported elsewhere.[2] Normal parathyroid glands are not visualized by the method described.

When a diagnosis of primary hyperparathyroidism is made clinically, it is now possible to localize the parathyroid adenomas before surgery. In our patients whose parathyroid neck adenomas were localized preoperatively, the average time of surgical exploration of the neck was half that in a control group of patients whose neck adenomas were not localized.

During exploration, the surgeon usually biopsies tissue suspected of being parathyroid for examination by frozen section. The process is repeated until positive identification is achieved — quite a difficult task by gross inspection of the tissues during surgery. In our patients with parathyroid adenomas in the neck and preoperative localization, the adenomas were identified immediately at surgery. Nonparathyroid tissue was biopsied in some cases in an attempt to locate other parathyroid glands that were not involved and hence not localized on the scan. The present approach is to explore only the side on which the adenoma has been located preoperatively and not to biopsy normal glands. With preoperative localization, the task of the surgeon and pathologist is greatly simplified.

When primary hyperparathyroidism is diagnosed, negative neck scanning with a reliable imaging technique should be considered important. Neck exploration was negative in three of our patients with negative neck scans, although in one a parathyroid adenoma was found and resected from the thymus through the neck incision.

After neck scanning is completed, mediastinal scanning is usually performed at the same sitting. When the parathyroid adenoma is in the mediastinum, a false-negative scan could result because of delayed imaging if the washout of thallium from the lesion is fast. This fast washout occurred in one of our patients. Therefore, when routine neck and mediastinal imaging are negative, our present approach is to repeat the mediastinal scan, starting immediately after thallium administration. When a substernal thyroid is not present, the administration of sodium pertechnetate Tc 99m can be omitted, since subtraction of the thyroid from the image would not be necessary.

Cold thyroid nodules and vascular lesions can give false results because they can accumulate thallium but not technetium. Careful palpation of the thyroid gland and restriction of the scanning procedure to patients in whom a diagnosis of hyperparathyroidism is well established clinically would limit the incidence of false-positive results.

Why parathyroid lesions take up radioactive thallium is not clear. The thallous ion is an analogue of the potassium ion, and, like potassium, is extracted by cells upon perfusion. The high cellularity and vascularity present in parathyroid adenomas may be contributing factors.[2] These factors are nonspecific and could lead to uptake in nonparathyroid lesions. The failure to demonstrate some hyperplastic parathyroid glands is not understood.

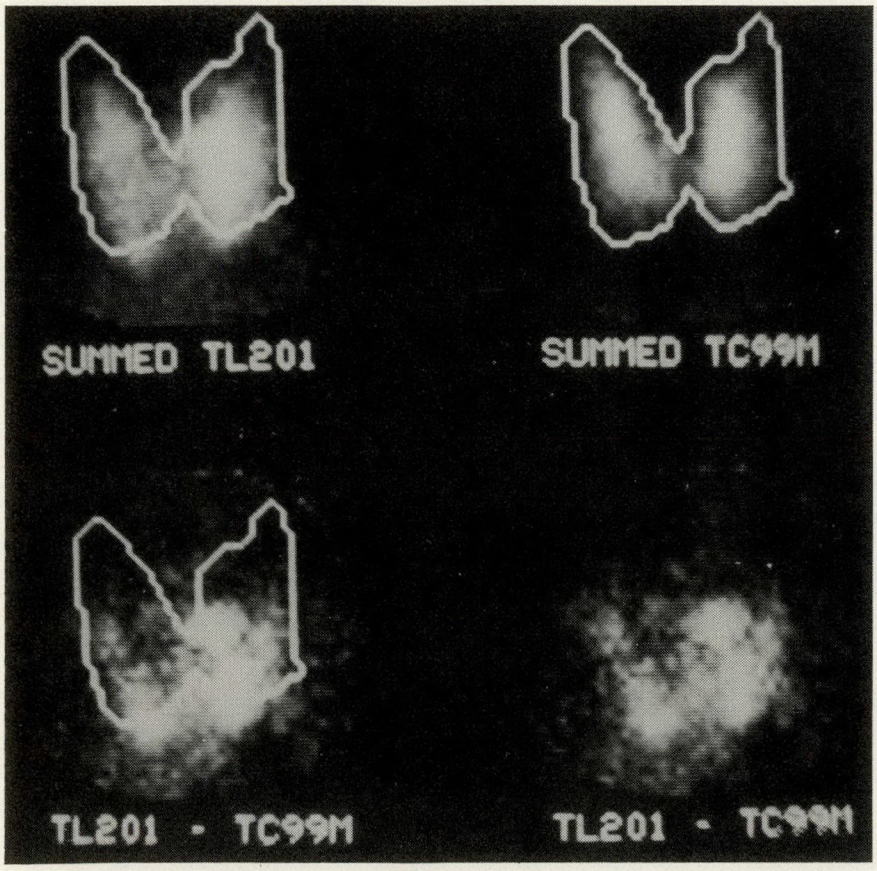

FIG. 3—Upper row shows summed thallium and technetium images. Lower row shows subtracted images with and without outline of thyroid gland. Four hyperplastic parathyroid glands are demonstrated on subtracted images as areas of increased thallium uptake.

Conclusions

The dual radionuclide technique with subtraction imaging is a reliable method of detecting parathyroid adenomas. The preoperative localization of parathyroid adenomas is beneficial in shortening the operative time and in reducing dissection and the number of frozen sections required.

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PETER A. SALMON, MD, PH D, FRCSC, FACS

Failure of Gastroplasty Pouch and Stoma Size to Correlate With Postoperative Weight Loss

At the University of Alberta hospitals patients who underwent gastroplasty — horizontal, vertical with multistranded nylon banding of the stomas and vertical banded with Teflon reinforced stomas — have been followed up for over 2 years. Pouch volume ranged from 25 to 30 mL. Pouch volume and stoma size were measured radiologically 2 years after operation and correlated with the percentage excess weight loss. Any patient failing to lose at least 40% of the excess weight was considered a failure.

There was no consistent correlation between pouch or stoma size and percentage excess weight loss for any of the three procedures studied. The failure rate for patients included in the study group was 33.3% for horizontal, 32.4% for vertical and 32.8% for vertical banded gastroplasty.

The probable reason for the lack of correlation is that some patients change their diets so as to subvert the restriction imposed by the gastroplasty.

Les patients des hôpitaux affiliés à l'Université d'Alberta qui ont subi une gastroplastie (horizontale, verticale avec bandage du stoma à l'aide de multifilaments de nylon, ou verticale avec bandage du stoma à l'aide de Teflon) on fait l'objet d'examens de surveillance sur une période de 2 ans. Le volume du sac variait de 25 à 30 mL. Le volume du sac et la taille du stoma ont été mesurés à la radiographie 2 ans après l'opération et étaient proportionnels au pourcentage de perte de poids excédentaire. Tous les patients qui n'ont pas réussi à perdre au moins 40% d'excès de poids ont été considérés comme un échec.

On n'a constaté aucune corrélation constante entre la taille du sac ou du stoma et le pourcentage de perte de poids excédentaire pour aucune des trois interventions étudiées. Les taux d'échecs ont été de 33.3% pour les patients traités par gastroplastie horizontale, 32.4% dans les cas de gastroplastie verticale et 32.8% pour les gastroplasties verticales avec bandage.

La raison probable du manque de corrélation est que certains patients changent leur régime, renversant les restrictions telles qu'imposées par la gastroplastie.

Gastroplasty, a method of inducing weight loss by limiting ingestion of food, is said to achieve its effect through the creation of a small pouch at the cardia of the stomach, emptying through a restricting stoma into the distal stomach. In our hands the operation, whether horizontal, vertical or vertical banded, has been successful initially. However, during the second postoperative year failures have become more frequent and a number of patients have regained a substantial amount of the lost weight. Surgeons who have measured pouch and stoma sizes in the postoperative period have noted an increase in both, especially after horizontal gastroplasty and vertical gastroplasty, although the increase was less marked in the latter. Failure to lose weight has often been attributed to these changes. The tendency, therefore, has been to reduce gastroplasty pouch and stoma size, the pouch being constructed on the minimally distensible lesser curvature and the stoma reinforced and lengthened.

It has been my observation that in horizontal gastroplasty pouches with nylon-reinforced stomas ranging in volume from 25 to 60 mL and followed up for 3 to 6 years, the initial pouch size did not correlate with initial weight loss or subsequent failure rate.[1] Some patients with larger stomas and pouches achieved satisfactory weight loss that was maintained, but others with a small pouch and stoma, although achieving initial weight loss, subsequently regained weight. The question is, What is the role of pouch and stoma size in the results achieved after restrictive operations for weight loss?

Patients and Methods

Both women and men were included in this survey, in a ratio of 8:1.

There were three separate groups: 54 patients who underwent horizontal gastroplasty, 61 patients who had a vertical gastroplasty and 34 patients who had vertical banded gastroplasty. In the first two groups, stomas were reinforced with multiple strands of no. 1 nylon and in the banded group with 6-mm polytetrafluoroethylene (PTFE). The operative techniques for these procedures have already been described.[2,3] Pouch volumes in all cases were between 25 and 30 mL.

All patients were followed up routinely. Weight loss was recorded as a percentage of excess weight lost. Films of the upper gastrointestinal system were obtained 60 days after operation and annually thereafter. This procedure was performed by

Table I—Patients Who Failed to Achieve Initial Loss of 40% Excess Weight

Gastroplasty procedure	No. of patients	Weight loss,%		% of total patients
		Mean	Range	
Horizontal	5	31.6	18–39	8.9
Vertical	5	28	22–39	8.0
Vertical banded	5	27	21–33	8.8

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a single radiologist, expert in the techniques of demonstrating the stoma and of distending the pouch with gas granules to determine its maximum size. Pouch size, as seen radiologically, is reported in centimetres squared and stomal diameter in millimetres. The number of patients in each group who had sequential roentgenography was less than the total: horizontal gastroplasty 38, vertical gastroplasty 45, vertical banded gastroplasty 21. Pouches that developed multiple stomas were not included in the main body of data but are presented individually.

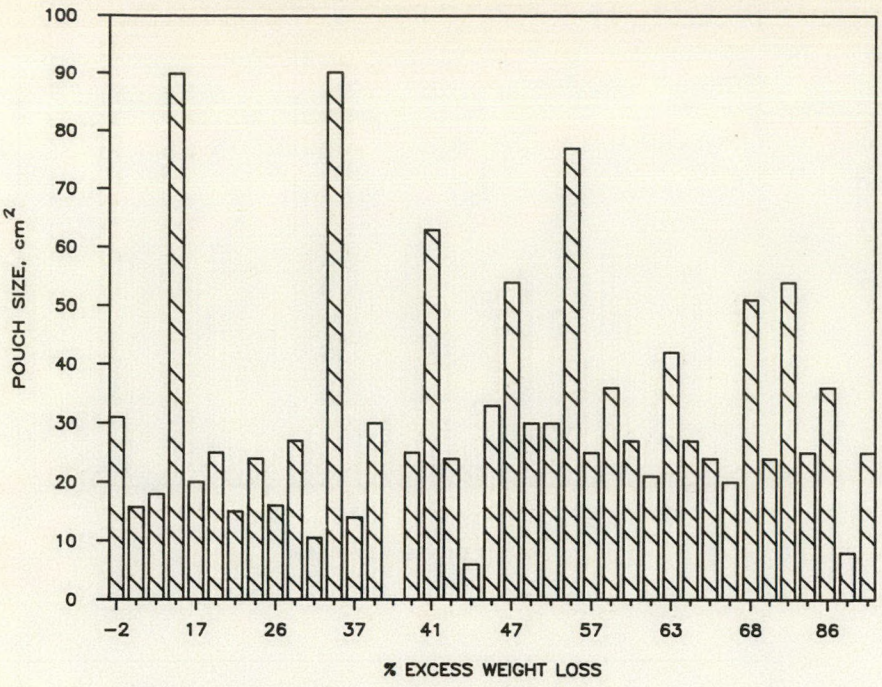

FIG. 1—Horizontal gastroplasty. Successes and failures related to pouch size.

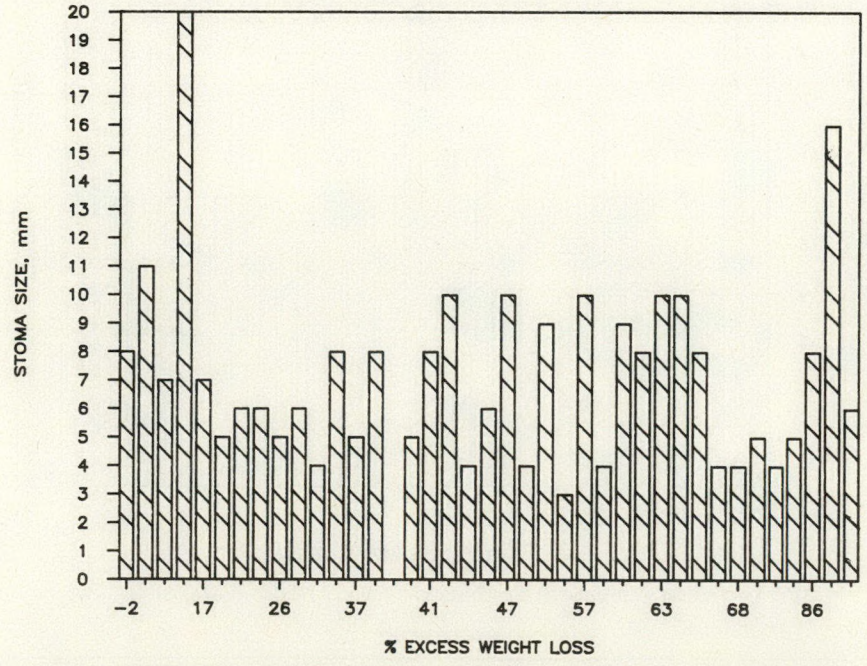

FIG. 2—Horizontal gastroplasty. Successes and failures related to stomal diameter.

Table II—Pouch and Stoma Sizes

	Gastroplasty procedure	Success, cm		Failure, cm	
		Mean	Range	Mean	Range
Pouches, cm^2	Horizontal	33.08	5–76	30.21	10–90
	Vertical	34.94	8–81	22.08	8–36
	Vertical banded	32.63	10–58	21.80	12–42
Stomas, mm	Horizontal	7.08	3–16	7.57	4–20
	Vertical	6.81	3–12	6.31	4–10
	Vertical banded	5.81	3–10	7.00	3–12

In this study, the percentage of excess weight lost was related to pouch and stoma sizes 2 years after operation. The results have been arbitrarily divided into two groups, success and failure. A patient was considered a failure if the excess weight loss achieved or maintained was less than 40%. This criterion was selected because all patients requesting further surgery to improve weight loss had excess losses near or less than 40%.

Our results were presented as a series of bar graphs with pouch and stoma sizes on the Y axis and percentage excess weight loss on the X axis. A space at 40% excess weight loss divides the successes from the failures.

Results

All patients lost weight, the maximum loss being achieved within 12 to 18 months. However, 8% of each group failed to lose at least 40% excess weight (Table I). Subsequently, all patients regained weight, some a minimal amount, and a small number approached preoperative weights. Figures 1 and 2 show that for horizontal gastroplasty there is little difference in pouch and stoma sizes between the successes and failures. This is also true for vertical (Figs. 3 and 4) and vertical banded (Figs. 5 and 6) gastroplasties.

It is obvious from the figures that some patients with relatively large stomas and pouches achieved and maintained a satisfactory weight loss, while others with a small stoma and pouch failed.

Table II compares mean sizes and ranges for each procedure. These data confirm the impressions obtained from the graphs. Mean pouch size is, if anything, larger in the successes than the failures for all three groups. Mean stoma sizes are almost identical within each group, the horizontal gastroplasties having the largest diameter and the vertical banded the smallest. The one larger diameter stoma (12 mm) in the latter small group of failures skews the mean, giving an artificially high value.

The failure of pouch and stoma size to correlate with weight loss was further emphasized when a few patients (Table III) acquired a second stoma due to staple-line failure. Of this group, six are still deemed successes and five failures.

The failure rates of patients followed

up roentgenographically and in the total groups are shown in Table IV. Percent failure rates are almost identical.

Patients in the failed group often return seeking further treatment for persistent obesity. In group 1, 11 have undergone gastric bypass and 2 intestinal bypass, and 1 had a vertical banded gastroplasty that failed and was subsequently converted to a gastric bypass (25% converted). Following vertical gastroplasty, five patients had conversion to gastric bypasses and two to intestinal bypasses (11% converted). Three patients had vertical banded gastroplasties that failed and were converted to gastric bypasses (8% converted).

Discussion

If one accepts the premise that gastric restrictive procedures induce weight loss by limiting intake of food, then the weight loss, other things being equal, should be directly related to the degree of restriction induced. Therefore, smaller, less-distensible pouches and small, well-supported stomas would appear to be the criteria necessary to produce a uniform and lasting weight loss. In a previous paper[1] I showed that reducing pouch volumes from 60 mL to 20 to 25 mL helped to reduce failure rates. Nevertheless, in this series of small-pouch horizontal gastroplasties, the failure rate was 33.3%. Seventy-seven percent of failures have been converted to other types of weight loss operations that have successfully induced further weight loss.

In the vertical gastroplasty group, 32.4% of gastroplasties failed and 35% of these have already been converted to other weight loss operations. The vertical banded gastroplasty group has a 32.4% failure rate and 27% of the gastroplasties have been converted to gastric bypass. It seems appropriate to ask, "What failure rate is acceptable?" A 32% rate for horizontal, vertical and vertical banded gastroplasties is high when compared with long-established intestinal bypass (1%).[3] Furthermore, with each year of follow-up the number of failures increases.

The following technical detail is worth noting. It had been anticipated that vertical gastroplasty, with a longer stoma channel associated with the PTFE band, might result in greater and more prolonged weight loss *vis-à-vis* the stoma banded with nylon suture. There appears to be little difference in results to date.

Why then are there conflicting results and a lack of correlation between weight loss and the imposed degree of restriction? The experience of this clinic indicates that patients ultimately learn to subvert the restriction on solid foods by ingesting semi-solid or high caloric liquids. Furthermore, chewed solid food

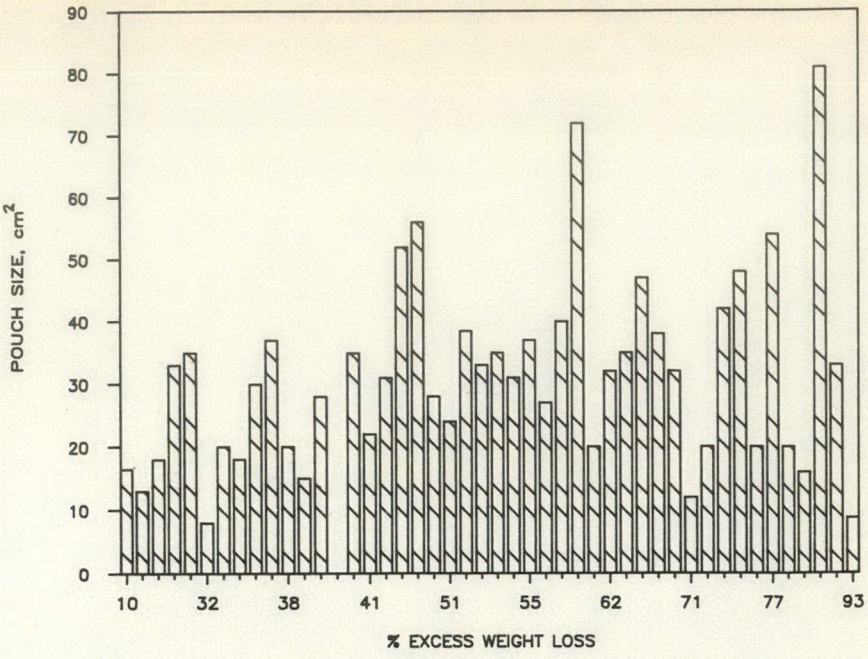

FIG. 3—Vertical gastroplasty. Successes and failures related to pouch size.

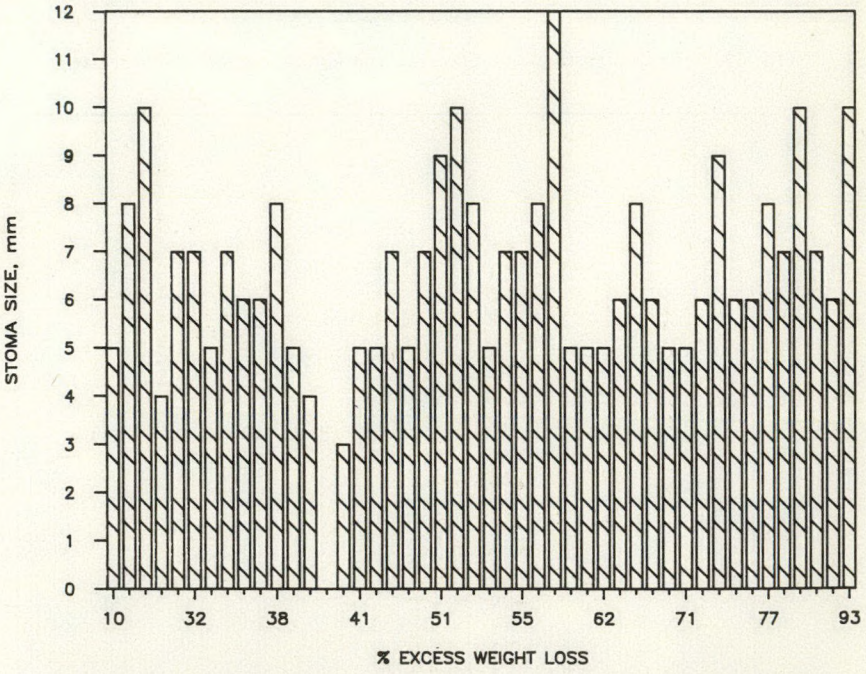

FIG. 4—Vertical gastroplasty. Successes and failures related to stomal diameter.

Table III—Patients With Two Stomas

Gastroplasty procedure	Success			Failure		
	No. of patients	% final excess weight loss	Days postop	No. of patients	% final excess weight loss	Days postop
Horizontal	3	72	1035	3	23	1062*
		43	1415		22	1055*
		72	1394		24	1349*
Vertical	1	44	1107*	1	35	786*
Vertical banded	2	51	660	1	-9	589*
		52	1021			

*Converted to gastric bypass.

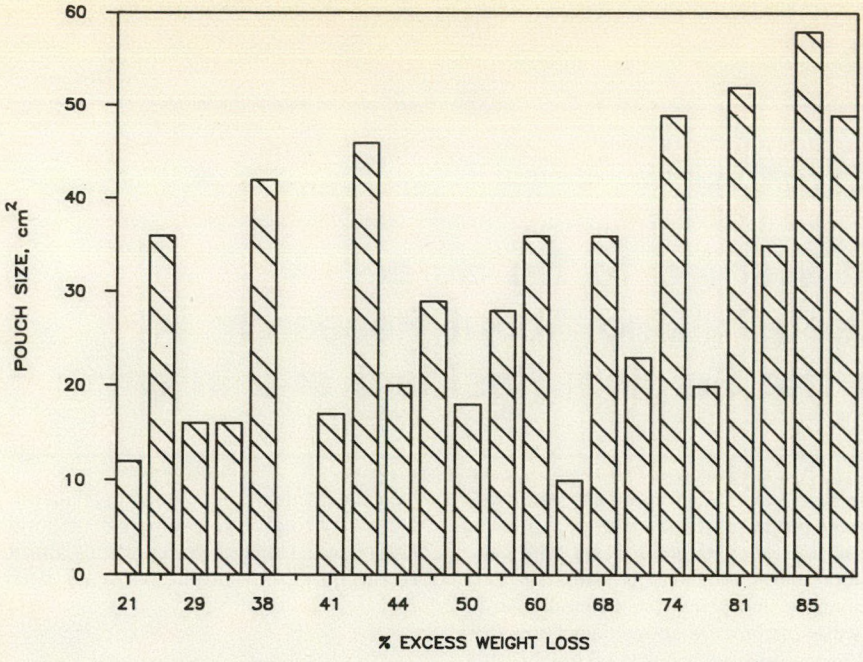

FIG. 5—Vertical banded gastroplasty. Successes and failures related to pouch size.

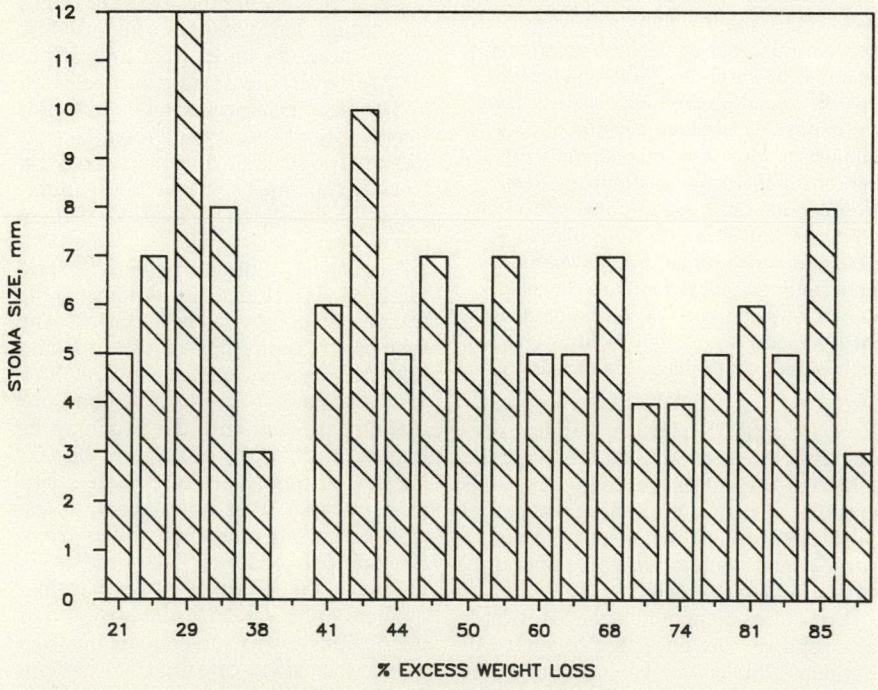

FIG. 6—Vertical banded gastroplasty. Successes and failures related to stomal diameter.

Table IV—Number of Failures in Patients Who Underwent Roentgenography Compared With Total Group

Gastroplasty procedure	Roentgenography		Total group	
	No. of patients	Failure, no. (%)	No. of patients	Failure, no. (%)
Horizontal	38	14 (37)	54	18 (33)
Vertical	45	13 (29)	61	20 (33)
Vertical banded	21	5 (24)	34	11 (32)

All patients followed up had upper gastrointestinal series. However, owing to the vagaries of clinical research, only part had a study at 2 years. The table indicates that the failure rate was essentially consistent across each group and that the patients who underwent roentgenography were not selected to favour success or failure.

may be flushed through the stoma by concomitant ingestion of fluids. Once this habit is established, few patients can be persuaded to return to the more rational eating habits that result in reversal of weight gain or further weight loss.

The high early failure rate and the number of patients requesting further surgery prompted me, some years ago, to give up horizontal, vertical and vertical banded gastroplasties as weight loss procedures.

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ERRATUM

Malliner Laboratories Inc. announces that advertising brochures distributed between the dates of September 16, 1981 and July 9, 1985 contain the following printing errors:

1 *Surgicel* should be referenced as the property of *Johnson & Johnson Inc.*

2 *Surgicel* should be referred to as *Oxidized Regenerated Cellulose* and not *Oxidized Cellulose.*

3 The reference to the scientific literature should be updated to read:
"+ Adapted from the following articles and other research performed at the University of Arizona Health Sciences Center, Department of Surgical Biology:

Silverstein, M.E., Keown, K., Owen, J.A., and Chvapil, M., Collagen Fibers as a Fleece Hemostatic Agent, The Journal of Trauma, Vol. 20, No. 8, (1980).

Silverstein, M.E., and Chvapil, M., Experimental and Clinical Experiences with Collagen Fleece as a Hemostatic Agent, The Journal of Trauma, Vol. 21, No. 5, (1981).

Chvapil, M., Owen, J.A. and DeYoung, D.W., A Standardized Animal Model for Evaluation of Hemostatic Effectiveness of Various Materials, The Journal of Trauma, Vol. 23, No. 12, (1983)."

S.M. STRASBERG, MD, FRCSC*

So You Wanted to Do Surgery and They Keep Talking About Research: a Discussion for the Surgical Resident and Intern

Surgical residents and interns frequently misunderstand the relation between surgery and research, and the contribution of surgical research to clinical practice. The problem is that the effects of research must be viewed in the long term. Once the resident can do this, the importance of research to surgery is evident and surgical research can be seen for what it is, the growing surface of surgery. Training to do surgical research has many parallels with clinical training. A core-training period in investigation provides the resident with the right mental approaches to investigation so that training in a specific area of research may be done later. Surgical scientists must be excellent clinicians as well as scientists and so long training periods are required. Four years of clinical practice training and 3 of research training are probably ideal. Shorter periods of research training may be valuable for many surgical residents, particularly those who have had little research experience. Training should be tailored to the trainee's desired role in surgery.

Les résidents et internes en chirurgie se méprennent souvent sur le rapport qui existe entre la pratique de la chirurgie et la recherche en ce domaine, ainsi que sur la contribution de la recherche à la pratique clinique chirurgicale. Le problème résulte de ce que les effets de la recherche doivent être envisagés à long terme. Une fois que le résident a appris à penser de cette façon, l'importance de la recherche pour la chirurgie devient pour lui évidente et la recherche chirurgicale se révèle alors pour ce qu'elle est: l'élément progressif de la chirurgie. La formation en recherche chirurgicale offre plusieurs similitudes avec la formation clinique. Une période de formation en recherche procure au résident l'ouverture d'esprit qu'il faut pour la recherche et le prépare à entreprendre ultérieurement une formation dans un secteur spécifique de la recherche. Le chirurgien scientiste se doit d'exceller en clinique comme en science, de sorte que de longues périodes de formation sont nécessaires. Quatre années de pratique clinique et 3 années de formation en recherche présentent probablement l'équilibre idéal. Une période de formation plus courte en chirurgie peut être utile pour plusieurs résidents en chirurgie, particulièrement pour ceux qui possèdent peu d'expérience en recherche. La formation devrait être modelée au rôle que le futur chirurgien entend jouer dans sa spécialité.

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You are a clerk, intern or surgical resident. You are in surgical training, are about to enter it or are giving it serious consideration. You like surgical problems, you like the direct approach of surgery and you certainly like operating or know that you will.

Your plans seem quite straightforward, although you are uncertain of what will happen at the end of your training. The word research comes up and then keeps coming up. On the residency application form some schools ask you if you are interested in research. In interviews, they ask "What are your long-term plans in surgery?" Your friends say that what they are looking for is a "research" answer. The word is that if you want to get into training, you must say you are interested in research. Already there are some programs in which you have to do a year of research. There's talk that residents who do research during their training have a better chance of getting a job after.

Why is there all this talk about research when all you want to do is surgery? It's annoying and confusing. If you have or have had some of these thoughts, read on. I shall try to give you some background and answer some of the questions about research that interns and residents often raise.

What's Research — What's Surgery?

Research is a word that everyone thinks they should know. So it's often used by those who don't know what it means at all. Moreover, the time scale of research and its place in surgery is not understood. People talk of surgery and research as if they are two separate disciplines. To begin to clear the confusion, we must understand the meaning and relation of these terms.

Surgery is a discipline with several facets. One is patient care. Another is the training of doctors to be surgeons. The final part of our discipline is the one that asks and answers questions about how good our patient care is, how good our teaching is, and how the two may be improved. That part of surgery, the asking and answering part, is research — surgical research. It is not a separate discipline, but an integrated, interwoven, essential part of surgery. It is the growing plate, the remodeller, the changer.

There are several reasons why this is not obvious. Many surgeons are involved only in the patient-care aspect of surgery. It is easy to slip into the error of generalizing about the person who is your role model to the discipline. That is somewhat like the story of the blindfolded man feeling the elephant. The entire structure was never perceived but was conceived variously depending on the part felt.

Failure to appreciate the existence of different time scales also inhibits understanding of the role of surgical research in the discipline of surgery. We tend to think in short time scales. The longest time scale experienced by a young person is the residency training period of 4 to 7 years. But the time scale of research is often decades. For example, 1928 was a notable year in the history of gallbladder

surgery since it was then that oral cholecystography was described and gallstones could at last be diagnosed with certainty on a routine basis. But the death rate in that year for cholecystectomy was 60 patients per 1000 operations; today, it is only 1 to 2 patients per 1000 operations. The change was the result of asking and answering questions about clinical practice (i.e., research). This is just one example. To fully appreciate the role and time scale of research within surgery, take an hour off, go to the library and examine standard surgical texts of the 1920s and the 1950s and compare them to a modern text. It's eye-opening. There were no useful implantable prostheses, there was no transplantation and no nutritional support, only rudimentary evaluation and treatment of shock and cardiopulmonary failure, no or limited antibiotics...and on...and on. The list is long: the change is surgical research. Oh, by the way, oral cholecystography itself was developed by a surgeon, Evarts Graham. There was a real problem in the diagnosis of cholelithiasis before 1928. Many people had cholecystectomy for biliary colic-like pain, but at operation were found to have no stones. In most cases, patients were not improved by such operations. Instead of accepting the state of the art, Graham asked and answered the question of how surgical practice might be improved. The point is that to understand the effect of research in surgery, you must consider the time scale of research. It is relatively long, but its effects are far-reaching and long-lasting.

Definition and Classification of Surgical Research

Research means to look deeply into a question (not to look "again"). It means to answer a question using a group of rules collectively referred to as the scientific method. There are many ways of knowing. The scientific method is a way of knowing about the physical world; its advantage is that it results in conclusions that can be accepted universally provided its rules have been adhered to. If operation A gives superior results to operation B in Winnipeg, then, as long as the method has been properly applied, this will be true in Halifax, Toronto, Medicine Hat or Dawson or anywhere else. It will be found to be so if it is tested again. The advantages to patients of this way of knowing over opinion or dogma are obvious. Core training in research involves learning this scientific method. Learning the method is really training in thinking or, if you like, mind training. Scientists refer to this type of thinking as critical thinking, as opposed to uncritical or biased thinking.

What follows is my own classification. It is just one possible classification; it is structured to eliminate certain confusing words. Surgical research is one type of clinical research. Surgeons doing research are surgical researchers, surgical investigators or surgical scientists. Clinical research, and therefore surgical research, differs from basic research. Clinical research always has at its root interest in the improvement of patient care. Basic medical research has at its root the study of biologic phenomena. A surgical investigator interested in improving the treatment of shock might be studying stabilization of cell membranes by drugs. A basic scientist interested in the phenomenon of cell membranes might be conducting the same experiment as the surgical investigator. But one is doing surgical investigation, the other basic investigation. The surgeon will, if his work is successful, take his findings from the laboratory bench to the bedside treatment of patients in shock. This is his purpose for looking into the problem in the first place. The basic scientist will turn his knowledge into a better understanding of how the cell functions. Clinicians do not do basic science, nor are they basic scientists because their motivations are different. However, clinical research is very dependent on basic science, which is often the source of new ideas for understanding or attacking clinical problems.

Types of Surgical Research

There are three kinds of clinical or surgical research: clinical epidemiology, technologic research and scientific research.

Clinical epidemiology asks questions about the natural history of disease or about how effective our clinical methods are. Clinical methods include diagnostic and therapeutic techniques and also methods of teaching doctors and patients. We evaluate clinical methods by "clinical trials" in which the new diagnostic or therapeutic methods are tested against standard methods. Clinical trial methods are a form of the scientific method referred to earlier; special training is required to learn this type of critical thinking. Clinical epidemiology also examines the natural history of disease. Recently, it was recognized that many patients who have had gallstone pancreatitis will suffer a second attack within a short time. This attack is often severe, sometimes fatal. This important finding has started to change surgical practice. Most surgeons now agree that early surgical treatment for gallstones after an attack of pancreatitis is advisable. No one surgical practitioner is likely to make such an observation. Such observations are made by asking and answering questions — surgical epidemiology questions.

The second type of surgical research is *technologic research*. This may be thought of as methods and materials development. Much surgical research is of this type. Development and testing of implantable materials and of new operative techniques (e.g., new techniques employing staplers) is technologic research. Surgical researchers are frequently involved in developing special instruments, often working with biomedical engineers. Such instruments may be used to measure flows, test tissue strengths or to measure structural strength or activity of organs or tissues. Surgeons often develop new instruments for use in the operating room. These are just a few examples of technologic investigation. This type of investigation is often done in laboratories; while human subjects are frequently used in technologic research, it is often necessary to use animals. For instance, when an instrument such as a stapler is first used, it is tried out in a model of a human (i.e., an animal model). If you are a bit confused now about the two types of research discussed so far, just remember that technologic research is development of methods and materials. The clinical usefulness of such techniques is tested in that part of clinical epidemiology referred to as clinical trials.

The third kind of research is called *scientific research,* which asks questions about the mechanism of disease or the normal physiology or biochemistry underlying that disease. If you ask "Why does retransfusion after prolonged hypotension due to hemorrhage not result in patient survival?", you are asking a scientific question. To answer that question, you may need to question how cells operate normally and how they respond to certain types of injury. Surgeons have made many important contributions of this type of research and these have resulted in major clinical developments in the treatment of shock, burns, gastrointestinal, cardiovascular and neurologic diseases, just to name a few. Scientific research is powerful because understanding the mechanism of disease often leads to new treatment strategies. This type of research is performed using either humans or animal models. Surgeons also contribute to scientific research that does not seem to relate directly to surgical problems because their surgical training makes them excellent at modelling. A good example of this is Banting's discovery of insulin.

Clinical epidemiology, technologic research and scientific research may ask different types of questions, but they are interdependent. The products of scientific and technologic research must be tested by clinical trials to determine their value. Studying the natural history of disease often leads to questions about mechanisms of disease (i.e., scientific research). Technologic research often is the spring-

board for advances in scientific research. Study of the natural history of disease or scientific research advances may require new technologies. This flow back and forth between different types of research efforts is what investigators mean when they talk of "bedside to bench to bedside" (i.e., from the patient problem to the laboratory bench and then back to the patient for tests of efficacy). The relation between the various types of research is shown in Fig. 1. The different types of research have several features in common: they all use the scientific method, so to do any of them, one has to learn critical thinking; also, clinical research of all three types is related to, based on and stimulates basic research.

Research Studies and Descriptive Studies

Not everything published in the literature is research. Some studies review the research literature and draw a field together. These reviews are often very valuable. Some studies are termed descriptive. Case reports, of interesting, rare individual cases or a series of one class (e.g., all the gastric ulcers seen in one institution over 20 years) are descriptive studies. Description may be one phase of a research study. For instance, it may be necessary to develop a data base and begin to gather data before asking questions. Descriptive studies may be valuable, particularly when rare or unusual cases are described or when a surgical field is developing rapidly. But descriptions of clinical case material alone do not constitute research. Descriptive studies can be, and unfortunately frequently are, repetitious, adding little to what is available in standard texts. A balance between research studies and descriptive studies is required. In my opinion, there is an imbalance in the surgical literature. Do not confuse research and descriptive studies just because they are both published. If it's good research, it will ask and answer a question convincingly. In descriptive studies, the questions often come at the end of the study and can rarely be answered decisively by the study.

Training the Surgical Scientist

In this section, I shall describe what I consider is the proper training of a surgical scientist. This type of training may not be for you; in fact, probably only a minority of surgical trainees should do the type of training I am about to describe. But, it provides a springboard for other types of surgical training in research. There are several principles that I consider very important and the training is based upon these.

- Do what you want to do! Do what you think you will enjoy. Do what you find exciting. Most good researchers have an intense desire to investigate and love doing it. How will you know if you will like research? Do you have the qualities of inquisitiveness, thoroughness and persistence? Is the unknown a challenge to you or do you shrink from it? Can you sense the excitement of discovery or do you find it difficult to imagine? Such questions may help, but in the end, you must really do research to know whether it's for you. Once you know, do it because you like it and not as an obligation or as part of getting a job; that can be a disaster. You will be unhappy and so will the people who brought you on.

On the other hand, if you do like it, there are great personal rewards and satisfactions in investigation. Your abilities to design and conduct studies will improve with experience and you will see your effectiveness as a surgical investigator increase. You will develop national and international associates, engage in cooperative ventures and you will have your own students. These are great pleasures in addition to the satisfactions of clinical practice.

- Get trained to the level of excellence in surgical patient care. Above and before all else, you must be an excellent clinical surgeon both inside and outside the operating room. You must have the respect of your peers and residents as a clinician. Consider restricting your clinical practice to one area within your specialty and base that restriction upon your research interest. In that way, you will be a clinical authority, as well as a research authority.
- Take as much time in training as you need to get the skills that you require for your work in clinical practice and research. Once you start in practice, it will be difficult to get further training. If you are inadequately trained as a clinician or a scientist, you will probably fail.

A Training-Program Model

The training of the surgical scientist requires parallel training in clinical practice and research. These are like the two legs of a runner; both must be well developed. Each requires a period of core training and then a period of specialization.

In clinical surgery, a period of core training is provided for learning the principles of clinical surgery. This is generally a 2-year period. In surgical research, core training is also required to learn the scientific method, to learn critical thinking. The training in research must be "hands on" like the clinical training, except perhaps in both areas it is really "minds and hands on". In research, this is the period for learning the skeleton of research, how to ask and answer questions, what ways there are to attack a question, to design a study, what are good and bad questions, what are appropriate controls and what constitutes bias. You learn persistence, how to deal with failure

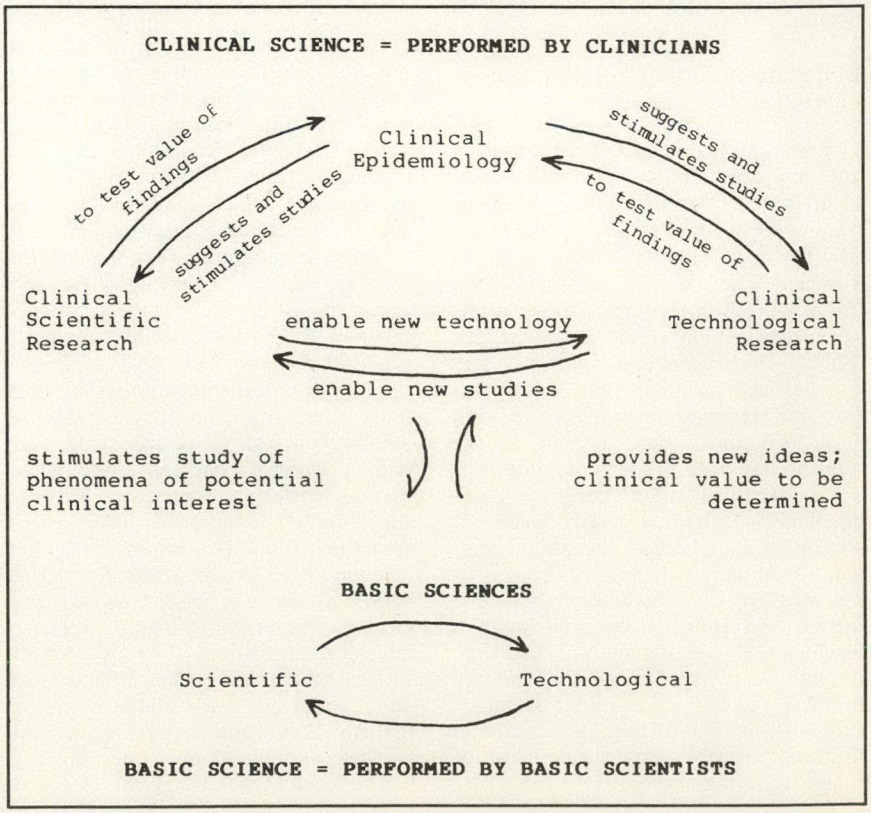

FIG. 1—Interdependence of three types of clinical research and research in basic sciences.

and disappointment, how to be dispassionate, determined and sure, how to take criticism and use it, how to take pride in the work of others and how to know if your work is conclusive. You learn critical thinking and critical thinking can be taught.

In my opinion, the best core training in research is done in an MSc program, particularly if you will be exposed to other students and their studies during this training. Your study and theirs are models for understanding and getting a grip on science. The course work allows you to learn or brush up on statistics and applications of computers, and the thesis preparation and examination are also valuable mind training.

If possible you should do your core training in the subject area that you will ultimately be interested in. However, core research training is best done early, usually after 1 year of clinical core training and it is often not possible for a student to be sure of an ultimate subject area. In my opinion, this is not of great importance. What is important is that the research is done in surroundings and circumstances in which good core training can be obtained. What do you look for? The laboratory or clinical epidemiology unit should be active, publishing, holding grants; the supervisor should be available, often present. The supervisor should preferably be a member of the graduate school and have turned out graduate students. Talk to his present and past students. What has happened to his former students?

On the clinical side, 2 years are also required for core training, and another 2 years are usually required to get the kind of clinical expertise I have referred to earlier. Some can do all the clinical training in 3 years. But remember, don't skimp here or in the research training. The last year of clinical training should be of a superspecialist type and be closely linked to your special research training.

Special research training usually requires only 1 year, if you have already acquired an MSc. At this time, you will look for a laboratory that is working in the area of your special interest. The very specialized techniques and literature will be learned. This is when you get to know your "field".

I have given a rather specific plan, but the important features are core training in both clinical and investigative surgery and special training in both areas. The timing is less important than the time spent and the quality of the training. In general, at least 4 clinical and 3 research years are required to optimize the chance for success. For some, the correct approach will be to do all the clinical training first and for others, all the research training first. The latter approaches best suit those who know what their ultimate subject area will be and this type of training may be appropriate for a PhD. But for the majority I would favour an introduction to surgery, followed by core research training followed by surgical training to fellowship level and then 2 years of special clinical and research training. I have outlined some of my reasons for this in Table I.

Who should do surgical scientist training? As I said, only a minority of surgical trainees want to get this type of training. Some will know that they want to be surgical scientists before they enter surgery, and structured surgical scientist programs are available for them at some schools. Others will get this kind of training by a less direct route. They will start one of the alternative training programs described below and get "turned on" by their exposure to research. Then they will design the rest of their training appropriately. By the way, some of the people who think they want to become surgical scientists will change their minds along the way also. There's no shame in this and programs should be flexible and understanding when this occurs, provided arrangements were made in good faith initially.

Table I—One Way to Train as a Surgical Scientist

Year	Clinical study	Research study
R1	Introduction to surgery. In addition to core clinical training, this year provides an idea of scope of surgery and knowledge of surgical illness which helps in research. It also adds maturity and responsibility helpful in research.	
R2,3		Studies to MSc level. Core research training. Select subject area if possible but concentrate on learning how to do research and to think critically. Research training here helps clinical training and stimulates a question-asking mode that will identify problems, helping to select area of interest.
R4	Complete core training	
R5	Chief residency — start to concentrate on special area of interest. Get fellowship.	
R6		Special research training. Choose area of specific interest. Write grants if this is final year before starting practice.
R7	Continue special clinical training, R6 and R7 may be reversed.	

Other Research Training Plans

Many prospective surgical residents don't know if they will find research interesting. In many cases, they don't really know what research is. It is appropriate for many surgical residents who are in that position to do 1 year of research training early in their residency. Because they are going to be practitioners, the best type of research training in many cases would be in clinical epidemiology. Unfortunately, right now there are few good positions of this type. But, as I said earlier, research training is mind training, and as long as you get into a good research setting you will develop an understanding of how research is done. You will find out if asking questions and then conclusively answering them turns you on and whether you have the necessary qualities. Don't be afraid to find out if you have these qualities. Remember that critical thinking can be taught and that persistence is a very important attribute in investigation. Imagination grows with practice. Some of what appears to be imagination is experience. Some of what appears to be brilliance is thorough reading and classification and hard study. Don't sell yourself short until you try.

It doesn't really matter whether you determine your qualities and suitability for research by doing clinical epidemiology or working in a laboratory doing technologic or scientific research, as long as the research methods are good. But I suggest that during this year you take one of the clinical epidemiologic courses that are now available in some schools. This will prepare you to participate in clinical epidemiologic studies, although without further training it would be difficult to design and run them.

Surgeons who have a major interest in teaching should also be familiar with research methodology. As I said earlier, research methods are used to test the effectiveness of our teaching methods as well as our diagnostic and treatment methods, and research methodology is used to determine whether new teaching techniques are efficacious. One really cannot be a teaching specialist without some understanding of these methods.

Some specialties or surgical training courses require at least 1 research year. Their reasoning is based on two premises. First, some investigators would be lost

and a wrong career path chosen if they were not exposed to investigation. Second, the mind training is thought to be essential for the specialist so that he may evaluate the literature and incorporate changes in his specialty during his career. There is merit in these arguments particularly if qualified supervisors are available. While there are some obvious negatives to this approach, every surgical resident should understand the role of surgical research in surgery whether or not some research training is done. The surgical resident must have some idea of how to evaluate changes in his specialty. Unproven ideas should be rejected but adequately proven ones incorporated in practice. Furthermore, as a surgical resident, you should have sufficient understanding of the value of clinical trials to convince you to participate in them as a practising surgeon. Otherwise your specialty will stagnate. Right now these fundamental skills are not adequately taught, and this is an area in which many programs can improve.

In summary, you may be in one of three positions with respect to research training. First, you may be fairly sure that you wish to pursue a career as a surgeon scientist. If so, the first type of training that I have described is what you should be seeking. Second, you may not know whether you like investigation or you may feel that you cannot get an idea of what research is like without doing some. You may want to learn about research methodology and critical thinking to help your approach to patients or to the literature. If you fall into any of these groups, then 1 year of research, perhaps with an emphasis on clinical epidemiology, is indicated. Finally, you may be quite sure that research is an aspect of surgery that does not interest you. No formal training is then necessary, but some appreciation of the role of research and how to evaluate new methods will help you later. Whatever you finally choose to do in surgery, remember that there are no better or worse areas. The merit of your work will be judged on how well you do it and not on its subject. Those who feel that they are somehow superior because they do research or because they are involved exclusively in patient care frequently fail to impress their peers.

S. KYZER, MD; I. BAYER, MD; CH. CHAIMOFF, MD

Spontaneous Rupture of the Common Bile Duct

Spontaneous rupture of the common bile duct in adults is very rare. The authors report only the 14th case in the Western literature. A 25-year-old woman had signs of peritonitis suggestive of a perforated appendix, but at operation the appendix appeared normal and a large amount of bile was found in the peritoneal cavity. A 2-mm tear was found on the anterior wall of the common bile duct. The patient recovered without complications after T-tube drainage and cholecystectomy. In this patient none of the factors thought to cause spontaneous rupture of the common bile duct were present, so the authors conclude that the case may be classified as idiopathic spontaneous rupture of the common bile duct.

Chez l'adulte, la rupture spontanée du cholédoque est très rare. Les auteurs décrivent ce qui constitue le 14e cas signalé seulement dans la presse médicale occidentale. Une femme de 25 ans a présenté les signes d'une péritonite suggérant la possibilité d'une perforation de l'appendice. À l'opération, l'appendice paraissait toutefois normal et une grande quantité de bile fut retrouvée dans la cavité péritonéale. Une déchirure de 2 mm a été retrouvée dans la paroi antérieure du cholédoque. La guérison a suivi une cholécystectomie et un drainage à l'aide d'un tube en T. On n'a retrouvé chez cette patiente aucun des facteurs que l'on croit capable de causer une rupture spontanée du cholédoque. Les auteurs concluent donc que ce cas peut être classifié comme étant une rupture spontanée idiopathique du cholédoque.

Compared with spontaneous rupture of the common bile duct in infants,[1] this condition in adults is exceedingly rare. Spira[2] in 1976 summarized 11 cases, including one of his own. Lipinski and colleagues[3] reported another two cases, but no others have been reported in the Western literature. In this paper we report one more case.

Case Report

A 25-year-old, otherwise healthy, unmarried woman of Arabic origin was admitted to the emergency room because of severe abdominal pains that had begun 48 hours earlier. The pain was diffuse but of highest intensity in the right lower quadrant. She could not remember suffering any blunt abdominal trauma. Her temperature was 38°C and her pulse rate was 96 beats/min. On physical examination of the abdomen, there was generalized tenderness with signs of peritonitis, maximally located in the right lower quadrant. The liver and spleen were not palpable and no abdominal masses were found.

Her hemoglobin level was 130 g/L, leukocyte count 21.3 $\times$ 10^9/L, serum urea nitrogen level 14.3 mmol/L urea, creatinine 62 μmol/L, bilirubin 18.8 μmol/L, diastase 153 U/L, alkaline phosphatase 140 U/L and γ-glutamyl transferase 74 U/L.

A plain film revealed no signs of intra-abdominal free air or intestinal obstruction.

Because the suggestive diagnosis was perforated appendix, the peritoneal cavity was opened through a McBurney incision. A huge amount of bile was present but the appendix was intact. A perforated duodenal ulcer was suspected so the appendix was untouched, the McBurney incision sutured and the peritoneal cavity reopened through an upper midline incision. The lesser and greater sacs were filled with bile and the duodenum was found intact. A perforation (diameter 2 mm) of the anterior wall of the common bile duct was detected, covered by fibrin. The perforation was located 3 cm distal to the bifurcation of the right and left hepatic ducts (Fig. 1). The common bile duct was of normal size and no stones were evident there or in the gallbladder. There were no signs of obstruction in the papilla of Vater. A T tube was inserted into the common bile duct through the perforation and a cholecystectomy was performed. A T-tube cholangiogram demonstrated narrow hepatic ducts and common bile duct without filling defects and with free passage to the duodenum. The peritoneal cavity was washed with normal saline, a drain placed down to the common bile duct and the abdomen closed.

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The postoperative course was smooth. The T tube was closed without complication on postoperative day 5. A T-tube cholangiogram performed 14 days later was normal (Fig. 2).

Discussion

Although spontaneous rupture of the common bile duct was first described in 1882 by Freeland,[4] only 13 cases have so far been described in the Western literature. According to Shepherd,[5] rupture of the bile duct is classified as follows: (a) traumatic rupture of the duct due to penetrating or nonpenetrating injury, (b) pathologic rupture following cholecystectomy or duct surgery and perforative calculous cholangitis, and (c) spontaneous or unexplained rupture of the duct. Our case belongs to the last category.

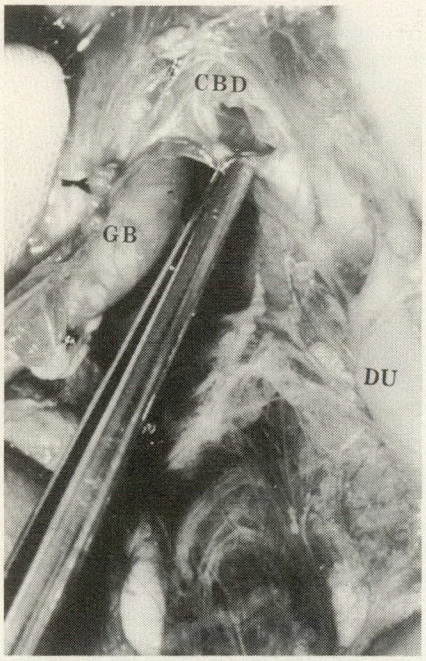

FIG. 1—Perforation is seen in middle of common bile duct (CBD). Perforation was initially 2 mm in diameter, but due to dissection it became wider and here is about 4 mm. GB = gallbladder, D = duodenum.

As described by Spira,[2] most cases reported in the literature were associated with cholelithiasis, although its role in this condition is uncertain. Probably a combination of factors contribute to the development of spontaneous rupture of the common bile duct, such as erosion of a common-bile-duct stone,[6-8] choledochal cyst or diverticulum,[9-11] increased intraductal pressure secondary to obstruction at the sphincter of Oddi,[1] intramural infection,[12,13] and necrosis of the wall of the common bile duct secondary to thrombosis of the intramural vessels.[14]

In our case no calculi were found in the gallbladder or in the common bile duct and none of the factors described could be demonstrated. Due to the narrow duct, no biopsy was performed from the edge of the perforation because such a maneuver may contribute to the future development of common-bile-duct stenosis. Macroscopically, neither acute nor chronic inflammation of the common bile duct was evident.

For us the explanation of common-bile-duct rupture in our case is an enigma and in our opinion the case may be classified as idiopathic spontaneous rupture of the common bile duct.

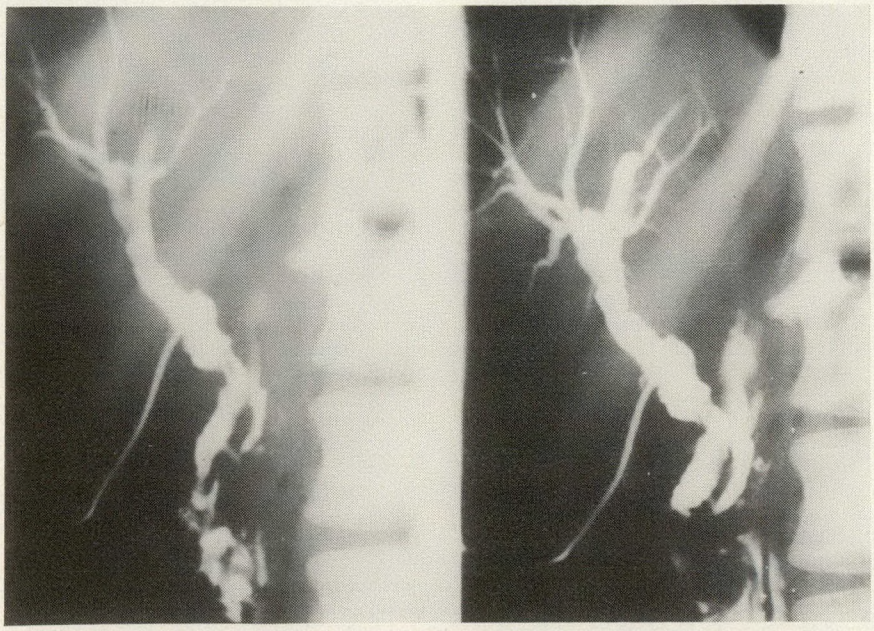

FIG. 2—Postoperative T-tube cholangiograms demonstrating normal choledochus with no sign of leakage. Free passage to duodenum is clearly demonstrated. Slight enlargement of choledochus is due to injection of contrast material.

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NOTICES

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Shock

The 9th annual conference of the Shock Society will be held at the Camelback Inn in Scottsdale, Ariz., June 8–11, 1986. The scientific program chairman will be Dr. Gerald S. Moss of Chicago.

The scientific sessions will consist of a workshop, symposia, papers, poster presentations, special dinner speakers and a keynote address. Topics to be covered include metabolism in shock-like states, oxygen radicals, critical issues in shock research and circulatory shock studies from 1940 to 1950.

For more information contact Dr. Sherwood M. Reichard, Executive Director, Shock Society, Medical College of Georgia, Augusta, GA 30912.

Transurethral Ureteroscopy

A seminar and workshop on transurethral ureteroscopy will be held Apr. 5 and 6, 1986, at the University of California San Diego School of Medicine and at The San Diego Hilton Beach and Tennis Resort. Accreditation will be 13.5 hours of AMA credit. The fee for physicians will be $350 and for interns and residents, $250. Dr. Jeffry L. Huffman will be the course director.

For further information write to the Office of Continuing Medical Education, Rm. M-017, University of California San Diego School of Medicine, La Jolla, CA 92093; or call (619) 452-3940.

BOOK REVIEWS

CONTROVERSIES IN TRAUMA MANAGEMENT. Edited by Robert H. Dailey and Michael Callaham. Clinics in Emergency Medicine. Vol. 6. 257 pp. Illust. Churchill Livingstone, Edinburgh; Academic Press Canada, Don Mills, Ont., 1985. Price not stated. ISBN 0-443-08192-1.

This text, part of an ongoing series of "Clinics in Emergency Medicine", is well worth owning. It addresses 10 issues relating to trauma — all are relevant. The volume's format, presenting two sides of the issue and concluding with an editorial comment, works well. There is no shortage of meaty controversies, as illustrated by such titles as "load and go", "emergency department thoracotomy" and "organized trauma regions and the American College of Surgeons categorization of centers".

The illustrations are adequate only but suffice given the nature of the book. The writing from the 27 contributors is generally of good quality and quite readable.

I would recommend this book to emergency physicians, in particular, and to any doctor involved in the care of seriously injured patients, in general.

ROBERT Y. MCMURTRY, MD, FRCSC

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HORMONE-PRODUCING TUMORS OF THE GASTROINTESTINAL TRACT. Edited by Sidney Cohen and Roger D. Soloway. Contemporary Issues in Gastroenterology. Vol. 5. 164 pp. Illust. Churchill Livingstone, Edinburgh; Academic Press Canada, Don Mills, Ont., 1985, $51.25. ISBN 0-443-08370-3.

This multiauthored book is cohesive and well written. It is well presented, accurate and, but for several spelling mistakes, well edited. The text brings together all that the practising gastroenterologist or general surgeon might want to know about these rare tumours of the gut — and more.

The opening chapter is a readable review of the gastrointestinal regulatory peptides, the APUD system and tumours arising from peptide-producing cells of the intestine. Several excellent photomicrographs and photoelectronmicrographs reflect the pathologic interests of the Hammersmith authors.

There follow individual chapters on the Zollinger–Ellison syndrome (also the subject of many other excellent reviews), glucagonomas (containing 138 references), somatostatinomas (20 reported cases), VIPomas (comprehensive review of watery diarrhea with hypokalemia and achlorhydria), and pancreatic polypeptide and mixed peptide-producing tumours (new frontiers provided by the recognition of more peptides).

The final two chapters review the chemotherapy and surgery applied to these tumours. The last chapter includes a useful approach to carcinoids.

Although I was able to read this succinct, yet comprehensive review in less than 3 hours, I wonder who will buy it. The practising physician will find its content too remote from his everyday experience, and the text is well beyond the grasp of undergraduates who may never see a case in a lifetime of non-specialist practice. Probably the researcher will already have access to the information contained in this book. Some clinical teachers and postgraduate students might find this a useful reference book for rounds and presentations, but the information is already available in the form of good reviews in several medical journals. Also, many competing publishing houses produce series of symposia of this type that seem to outstrip their need. None of this should detract from the high quality of the book or the scholarly achievement of its authors and editors. If you need a ready source of information about the rare endocrine tumours of the gastrointestinal tract, this one will do nicely.

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MAXILLOFACIAL INJURIES. 2 vol. set. N.L. Rowe and J.Ll. Williams. 1030 pp. Illust. Churchill Livingstone, Edinburgh; Academic Press Canada, Don Mills, Ont., 1985. $273. ISBN 0-443-01509-0 (2 vol. set).

To review these two volumes was to me not a chore but an exercise of educational enrichment. The text is easy to read and the evolution of the subject matter is extremely well organized and presented. Each chapter aroused my curiosity as to what would be covered sequentially. Complex problems of management are discussed comprehensively and supported by many illustrations and excellent line drawings. These diagrams effectively clarify the text.

For health professionals involved in the management of maxillofacial injuries, these two volumes are indispensable. They present the current state of the art in the management of such problems. Both volumes should be available as a reference in the health professional's library, or in the library of the Health Care Centre.

This set is a major contribution in what is a complex field.

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O'CONNOR'S TEXTBOOK OF ARTHROSCOPIC SURGERY. Edited by Heshmat Shahriaree. 337 pp. Illust. J.B. Lippincott Company, Philadelphia, 1984. $95. (US). ISBN 0-397-52117-0.

This volume is based on a previous textbook by Richard L. O'Connor entitled "Arthroscopy". Many have contributed chapters from their specific fields of expertise. The book is well illustrated, with excellent captions.

The chapter on arthroscopic instrumentation is superficial and could be improved. Gas arthroscopy, not common in North America, is well described and its use in 800 cases is noted. The chapter on the menisci details the anatomy and pathologic changes well.

The history of partial meniscectomy is well outlined and precise and represents the dynamic personality of the late Dr. O'Connor. The chapter on meniscal lesions and their treatment is among the best. It is detailed, with a good discussion of the management of associated pitfalls. I find it unfortunate that conservative management followed by a partial meniscectomy is still accepted as treatment for hypermobile medial meniscus.

The chapter on acute knee arthroscopy by Jan Gillquist is well written, emphasizing the anterior approach. I believe that the chapter on arthroscopy and the management of fractures of the tibial plateau will be confusing to the inexperienced reader.

All aspects of the synovial plica of the knee are well described. James Guhl's chapter on osteochondritis dissecans is of the highest calibre.

The subject of intra-articular adhesions and fibrous ankylosis of the knee is well stated, emphasizing the author's appreciation of the pathological characteristics in the suprapatellar pouch. The chapters on cystic conditions of the knee, extra-articular sources of knee pain and synovial disease can easily be eliminated without any loss to the total text.

This book is recommended to the person interested in arthroscopic surgery. It is complete and well illustrated.

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VASCULAR AND DOPPLER ULTRASOUND. Edited by C. Carl Jaffe. 311 pp. Illust. Churchill Livingstone, Edinburgh; Academic Press Canada, Don Mills, Ont., 1984. $40.50. ISBN 0-443-08295-2.

This book is volume 13 in a 17-part series entitled "Clinics in Diagnostic Ultrasound". It contains eight chapters each by a different contributor.

The first two chapters entitled "Doppler applications and limits of the method" and "Doppler instrumentation for the evaluation of arterial and venous disease" serve as comprehensive introductions to Doppler technology. Topics covered include the principles of physics related to Doppler instruments, nondirectional versus directional systems, continuous-wave versus pulsed Doppler, a discussion of the various electronic methods used to process the Doppler signal and the problem of statistical variability of the signals produced.

Zierler and Strandness review the clinical use of the Doppler velocity meter in the diagnosis and management of peripheral arterial and venous disease.

The role of duplex scanners (combined B-mode imaging and pulsed Doppler analysis) in the evaluation of carotid disease is detailed thoroughly by Driesbach.

Smith and Lawson review applications of Doppler ultrasound in the abdomen. These include intraoperative assessment of renal and intestinal ischemia using sterile probes and transcutaneous evaluation of renal transplants, the renal vasculature, and the portal circulation in portal hypertension. In addition, its use as an adjunct in better defining various structures using real-time sonography is outlined.

Gill reports on the use of a complex experimental combination of B-scanning and pulsed Doppler flowmetry to measure the fetal circulation noninvasively in utero. The technique has been devised to diagnose intrauterine growth retardation and other causes of perinatal morbidity and mortality.

The combination of Doppler ultrasound and 2-D echocardiography to produce exciting hemodynamic-anatomic correlations in the noninvasive diagnosis of cardiac disease is discussed in detail.

The final chapter reviews the use of Doppler techniques in quantitating arterial occlusive disease and detecting venous obstruction. This section is somewhat redundant in that it covers much of the material contained in chapter 3.

Overall this monograph constitutes an excellent basic review of the multiple uses of Doppler ultrasound in medicine. Its strength lies in the chapters on the basic physics of the techniques and in highlighting both the usefulness and the current limitations of this evolving methodology. Although written primarily for radiologists, it should serve well as a basic review of Doppler for students, residents and technicians as well as practitioners newly entering the field.

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SESAP IV Critique

ITEM 130

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D

Reference

130/1. Kaufman JJ: Current Urological Therapy. Philadelphia, WB Saunders Co, 1980, pp 225-226

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ICU RESEARCH FELLOW: — Ewart Angus Intensive Care Unit, The Wellesley Hospital. Available July 1, 1986 for a one year period in an academic Medical-Surgical Unit. Research areas include clinical epidemiology of ICU care, nutrition and respiratory muscle physiology. Reply to: **Dr. I.M. Fraser, Director EAICU, 247 The Jones Bldg., 160 Wellesley St. E., Toronto, ON M4Y 1J3 (416) 926-7747.** –S86-04

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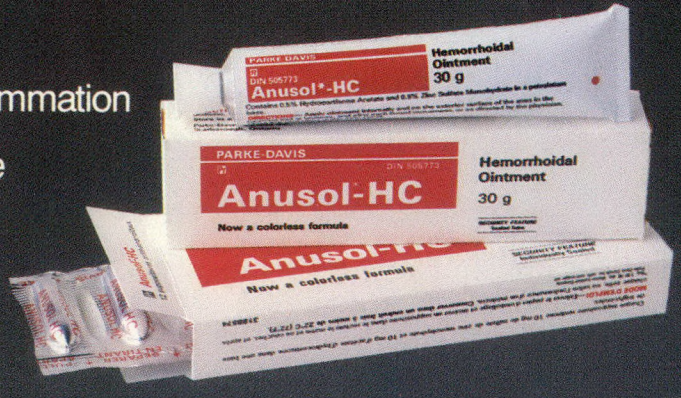

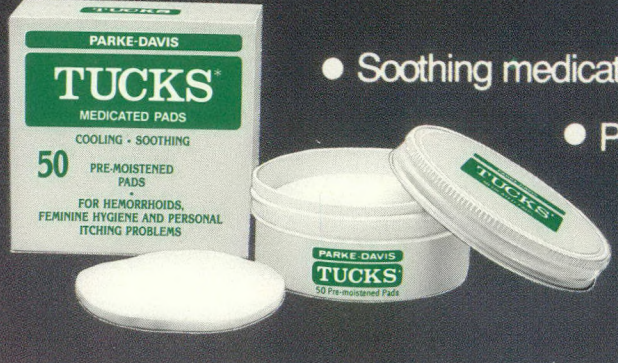

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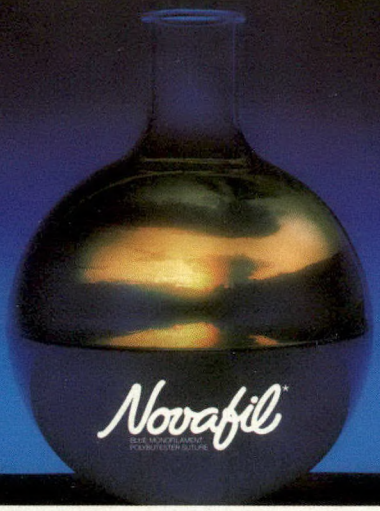

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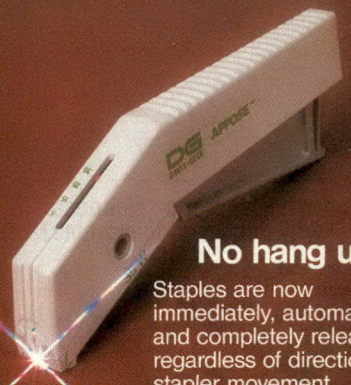

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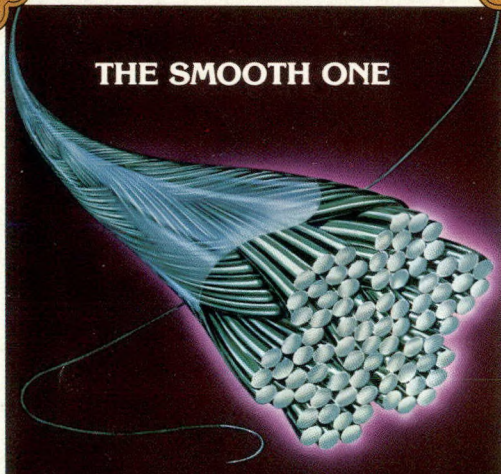

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