A Case of Haemangioma of the Radius

WITH A DISCUSSION OF THE DIAGNOSIS AND TREATMENT OF BONE TUMOURS

By A. J. Grace, B.A. (Sask.), M.A., B.M., CH. (Oxon.)
F.R.C.S. (Eng.), L.R.C.P. (Lond.)

Department of Surgery, University of Western Ontario Medical School

Bone tumours are sufficiently uncommon that each striking case merits special attention. This fact has been accepted emphatically by the Registry of Bone Sarcoma of the American College of Surgeons, which is attempting to establish a uniform classification of bone tumours, in order to achieve precise diagnosis and scientific, effective treatment in each case.

The case presented below illustrates a number of interesting and important points which must be considered in diagnosis and treatment of bone tumours.

I was fortunate enough to see the patient on his first attendance at the Orthopaedic Clinic of Victoria Hospital on January 20th, 1937, and obtained the following record of his essential history, symptoms and physical signs.

CASE RECORD

History: H. F., aged nine years. During the last eight months a swelling has appeared on the dorsum of the left forearm, associated with increasing weakness and local disability, local tenderness and pain on exertion. Past and personal history were essentially negative, except for an injury to the left forearm, the result of a fall from a sleigh, two years previously. A doctor was consulted because the forearm after the fall was painful and useless. He diagnosed a fracture, but did not have the opportunity for X-ray confirmation. Splints were applied, but were removed by the boy himself after a few days.

It was not found possible to establish the onset of the swelling exactly; no definite swelling was noticed until about a year after the accident. At this time, the tumour appeared about one inch proximal to the wrist, on the dorsum of the left forearm. Progressive enlargement
followed, particularly during the last two months. The extremity became weak and functionally practically useless, while tenderness appeared over the dorsal aspect of the tumour in its most prominent parts.

*Physical Examination:* On inspection, the left forearm was held in moderate pronation, while the hand showed marked radial deviation. Active movements at the wrist joint were of normal range, but were lacking in muscular power. Elbow movements were normal. The dorsal aspect of the forearm showed a diffuse, rounded swelling, occupying its lower one-half and involving the entire width of the forearm. Palpation showed the edges to be sharply defined and slightly uneven; the surface was fairly smooth, but somewhat irregular in contour. The swelling was firm and unyielding in consistency, absolutely fixed, and seemed to be intimately related to the radius. The ulna appeared to be normal throughout, and its posterior border could be defined normally. The lower end of the ulna bore its usual relationship to the radial styloid process, but it was unduly prominent on the dorsal aspect of the wrist. The extensor muscles and tendons moved freely over the mass, and the skin was quite free. The anterior aspect of the forearm showed no unusual features. The regional lymph nodes were not significantly enlarged.

![Fig. 1—Antero-posterior X-Ray plate of Forearm.](image)

The general findings were not abnormal in any way.

*Roentgenological Examination:* (See fig. 1.) Dr. McNeill, Radiologist to Victoria Hospital, reported as follows: "Examination of the left wrist and forearm in two positions shows a large tumour of the giant cell type, involving two-thirds of the shaft of the radius in its lower part, but without involvement of the epiphysis. The cortex is quite thin but the medulla appears almost cystic, with thin layers of bony tissue running through the tumour. The latter measures 10 cm. in length by 4 cm. in breadth."

*Summary:* A boy, aged nine years, develops a tumour within the shaft of the radius, in its lower two-thirds, apparently following an injury. The radiological picture indicates a multicystic type of expanding tumour, over which the periosteum and a thin shell of bone remains intact; the epiphysis is not involved. Growth is comparatively slow but
A CASE OF HAEMANGIOMA OF THE RADIUS

progressive. No evidence of general disease or metastases is found elsewhere in the skeleton or other body tissues.

Differential Diagnosis

In this, as in all surgical cases, effective treatment presupposes precise diagnosis. In this instance, differential diagnosis was difficult, and involved a critical consideration of a number of possibilities.

The various manifestations already detailed pointed clearly toward a neoplastic or cystic process, of intra-osseous origin. It is important to note in passing, as Brailsford emphasizes, that a tuberculous process in bone may mimic the lesions of most other types rather closely, in rare cases, particularly in the radiological findings.

Benign tumours and cysts were first considered. Of this group, the commonest variety, and that which fitted the features here most closely, was a giant cell tumour. This, in fact, was the preoperative diagnosis; hence a rather detailed description of this lesion is in order. "The giant cell tumour is a low-grade neoplastic process, usually single, which affects mainly the long bones, at the epiphysis; it may, however, appear in any bone, producing multicystic excavation, widening of the shaft, never metastases. Cases sometimes are cured spontaneously, but generally, if left without treatment, terminate in death from haemorrhage and infection." (Ladd.) Lest it be assumed that giant cell tumours are in any way common, it is well to recall with Platt that the figures in Great Britain show an average of one case for each large, general hospital, per year. Facts such as these respecting the frequency of incidence of a relatively common bone tumour, will illustrate the need to make public the facts emerging from a study of each case.

The possibility of the condition under discussion being a bone cyst arose. Several varieties of cyst occur in bone. In long bones, apart from the multiple cysts of hyperparathyroidism (generalized osteitis fibrosa cystica) one finds occasionally, so-called "simple bone cysts". These occur most frequently in the upper ends of the humerus and femur, and less commonly in the lower end of the radius and upper end of the tibia. The common site of occurrence is the metaphysical region; the lesion is seen usually in children, and is rare after 20 years of age. Much uncertainty and many theories surround the development of these cysts; trauma is an important factor. Geschickter believes them to represent a healing or healed giant cell tumour and describes pathologically intermediate types. Platt urges that these be regarded as distinct diseases of bone, with different indications as to the urgency of treatment. He tabulates a number of differences. In some cases, apparently, simple bone cysts are the result of degenerative changes in various bone tumours (e.g. giant cell tumours, enchondromas, and myomas). Clinically, the average case of solitary bone cyst presents few or no symptoms until a pathological fracture takes place; there may be a little discomfort or pain. Typically, central expansion of the shaft occurs, and a fusiform or elliptical tumour results, on the diaphyseal side of the
epiphysis. Irregular trabeculae traversing the cavity may be visible in X-ray plates. These features agree with the findings in our case, but a definite decision on this possibility could be obtained only by exploration and later microscopic examination.

A number of other benign bone lesions should be referred to in this differential diagnosis. This could be a typical example of diffuse osteitis fibrosa cystica of a single bone. Enchondromata occur occasionally in the long bones, but are much more frequent in the carpals and metacarpals. Like many tumours of bone, they may be medullary or subperiostial in origin. The central type may be confounded with other small, rarefying, central lesions, but is unlikely to produce a large expanding tumour. Central fibromata and lipomata are recorded, but do not produce the advanced condition we are concerned with here. Myxoma is described as a rare tumour in various bones. In many cases, they are secondary to chondromata; indeed, opinions differ as to whether a pure primary myxoma of bone exists or not. The diagnosis is established only by operation. The main importance concerns prognosis, for myxomata have a striking tendency to recur and metastasize after surgical removal. Some doubt exists as to whether there is a malignant transformation, or whether malignant characteristics were already present but not recognized.

Haemangioma of bone, the condition discovered pathologically in the specimen, is such a rarity that diagnosis is practically never made correctly before operation. The tumour is usually of the cavernous type, and must be distinguished from the very vascular tumours of other types found in bone. They originate in long bones, either near the primary ossification centre, or near the epiphyseal line; the type under discussion commences from vascular elements within the medullary cavity. There is also a group of cases, in which the origin is subperiostial. In gross and microscopic characteristics, this tumour may resemble a cavernous angioma elsewhere in the body, or may stimulate an old bone cyst containing a haematoma. Clinically, the benign haemangioma of bone progresses slowly towards absorption of the shaft. Symptoms rarely appear until erosion has reached the periosteum, when pain may be observed; pathological fracture is likely to occur, and a pulsatile swelling may become apparent. The roentgenological findings are said to only differ from those of giant cell tumour and cysts, in presenting characteristically smaller loculi. In long bones these are described as resembling "soft soap bubbles". The marked sensitivity to irradiation may constitute a therapeutic confirmation of diagnosis in doubtful cases.

A malignant type of angio-sarcoma is described. This may possibly arise from malignant metaplasia in a benign haemangioma. Probably this condition is the same as that described by Ewing as angio-endothelioma, affecting the ends and shafts of long bones.

The possibility of a malignant neoplastic process had to be con-
A CASE OF HAEMANGIOMA OF THE RADIUS

sidered, although this was presumably ruled out by the clinical and roentgenological findings. The localization of the bone lesion, its medullary origin, and the slow advance within a well-preserved shell of bone and periosteum, all argued in favour of a benign process, as did the radiological appearances, and the absence of metastases or evident lesions elsewhere. The limitation to a single bone, and the characteristics found, excluded such conditions as multiple myeloma, and Christian's syndrome; neither give a clinical picture resembling our case in any respect. Similarly, there could be no question of metastatic deposits from a neuroblastoma, or carcinoma; the local features alone excluded these, apart from the age of the patient. Ewing's sarcoma deserved a little more thought, for it may arise in the shaft of long bones, and cause moderate enlargement. However, although the boy's age would favour such a possibility, the degree of expansion is never so great as that of this case. The roentgenogram of Ewing's sarcoma shows a characteristically eroded cortex, with an “onion-skin” appearance superf-

![Fig. 2—The cut surface of the Tumour Mass.](image)

icially, resulting from longitudinal splitting of the periosteum. Such a tumour involves a considerable length of the bone, rather than being limited to one juxta-epiphyseal region. It is characterized essentially by destruction rather than expansion of the cortex from within. There is usually some degree of general reaction.

Osteogenic sarcoma also required consideration. This may originate centrally, or peripherally. It is characterized by a mixture of bone destruction (osteolysis) and production of new bone (osteogensis), especially in the form of spicules radiating from the periosteum. Different types of osteogenic sarcoma are sometimes spoken of, according as one or other of these processes preponderates. Characteristically, this extremely malignant tumour commences in the metaphyseal region of the long bones, in young people. The maximum incidence occurs between the tenth and twentieth years. There may be some general disturbance,
with slight fever, and leucocytosis, as in Ewing's sarcoma, but this is found only in the most rapidly advancing cases. The favourite sites for osteogenic sarcoma are the ends of the femur and tibia contiguous to the knee joint. It is surely significant that no case of this sarcoma occurring in the lower end of the radius is recorded among the seven hundred original cases in the Registry of Bone Sarcoma.

Clearly, the case under discussion presented a clinical and radiological picture suggestive of a benign neoplastic process or cyst. Inasmuch as giant-cell tumour was seriously suspected, it may be well for us to examine somewhat critically the principal features of this condition, laying emphasis on certain aspects which should have raised doubt in our minds as to the correctness of this supposition.

The benign giant cell tumour (also known by a variety of other names, including myeloid sarcoma, giant cell sarcoma, and osteoclastoma) was originally regarded as a true sarcoma. Nelaton (1863) "fully established its benign course, and the wisdom of conservative treatment". Gross (1879) stressed this viewpoint in the States. Nevertheless, for the most part, this lesion was not generally distinguished from bone sarcoma, until Bloodgood published an extensive series of successful cases treated conservatively (1910). The knowledge that some giant cell tumours may exhibit malignant characters, has clouded the issue on this important matter. The comparative rarity of bone tumours, and the infrequency with which any single medical man sees them has further retarded progress. Osteogenic sarcomas, being approximately twice as common as giant cell tumours, and so invariably fatal, have long induced a pessimistic attitude towards bone tumours.

The principal features of the giant cell tumour were synopsized earlier in this paper. It is a tumour occurring primarily after twenty years of age, and usually (perhaps always) commencing in the epiphysis. These points both argued against giant cell tumour in our case, and received insufficient consideration. Offsetting these, we have Geschickter's statement that ninety per cent of all tumours of the lower end of the radius belong in this group. Other favourite sites are the lower end of the femur, and the upper extremity of the tibia. Roentgenologically, these are expanding tumours, showing coarse trabeculation—features shown our case. However, it is to be noted that the outline of the giant cell tumour is generally more globular and less oblong, and it is rarely as perfectly symmetrical; these points, together with the failure to involve the epiphysis, would appear adequate (in retrospect) to have ruled out giant cell tumour.

**TREATMENT**

The treatment selected for our particular case was subperiosteal excision of the tumour; the apparently uninvolved epiphysis was not removed. This procedure was carried through most adroitly by Dr. G. A. Ramsay, on February 2nd, 1937. An inlay type of bone graft was taken from the tibia and enclosed in the periosteal envelope, to replace the
tumour mass. The extremity was put up in a plaster-of-paris cast. A further X-ray plate, taken three weeks later, showed the deposition of new subperiosteal bone to be well under way. Recent examination, with the plaster in place, shows good progress, with satisfactory function in the hand.

The choice of treatment for benign tumours of the skeletal structures may be primarily surgical or radiological. It would appear that surgeons and radiologists each prefer the type of therapy with which they are familiar. It is difficult for even pathologists, who see the failures in any type of therapy, to watch a large enough series of cases to settle the relative merits of each method for a group of cases. The general consensus of opinion today would appear to favour irradiation for malignant tumours which defy radical surgery, and for benign tumours in inaccessible situations, such as the spine, pelvis, etc. Opinions differ concerning regions of moderate difficulty of access, such as the upper end of the femur. There is also divergence of opinion concerning the harmful effects upon the joint structures, muscles and soft parts, of doses of irradiation massive enough to be beneficial where a tumour of bone is concerned. Again, some writers advocate a combination of irradiation with X-rays (before or after operation) or of post-operative

Fig. 3—High power photo-micrograph, H. E. Section. Note endothelial-lined cystic spaces containing blood (A); two giant cells, (B); two trabeculae of new-formed bone, (C); Fibrotic stroma (D).
radium with surgery. This practice is heartily condemned by others as dangerous, by leading to malignant transformation in the case of certain benign tumours. The truth in regard to these matters is not yet clearly before us. Undoubtedly, irradiation is valuable in the treatment of haemangiomata, and in certain cases of other types. Geschickter has outlined a group of cases of giant cell tumour in which this form of therapy may well be given first place; it may be followed by surgery if necessary.

The aims of all forms of treatment for bone tumours is to produce complete eradication, with a minimum of mutilation. The second tenet appears to be particularly satisfied by irradiation, a point appreciated by Herendeen who first advocated irradiation widely in the conservative treatment of bone tumour cases. It is important to realize that, with this procedure, the bones become sclerotic, brittle and avascular. It is estimated that pathological fractures develop in twenty-five per cent of cases of giant cell tumour treated by primary irradiation (B. L. Coley and Higinbotham, 1936). Repair in these cases is poor. Hence, late deformity must be borne in mind. Adequate fixation during this type of treatment should prevent later fractures. The beneficial effects of irradiation appear to be essentially along the lines of destruction of tumour cells, and promotion of progressive calcification in favourable cases. Howbeit, the last is a long drawn out and tedious process.

It is stated that surgical treatment yields results which are more definitely predictable, and these are obtained more rapidly. Frequently, but not always, better function is obtainable by this method. The diagnosis is always firmly established after properly planned surgical measures, while with irradiation, in which it is usually deemed unwise to take biopsies, both diagnosis and prognosis remain in doubt. Certain undesirable complications and sequelae of irradiation can be avoided. Modern surgical measures, properly applied, yield extremely satisfactory results respecting life, limb and function.

Prior to our present understanding of bone tumours, amputation was the standard surgical treatment meted out to all cases of involvement of an extremity. Nowadays this most radical step is reserved entirely for certain malignant cases, and for others in which the disease is so far advanced, from neglect, or from failure of conservative procedures, that no other course of action offers real hope. Occasionally, an artificial lower limb may offer a greater measure of function than the natural one which remains following treatment.

During the present century, radical surgery has been largely replaced by conservative operative endeavours. At first, these met with disfavour, because of the frequency of bad results. The factors responsible for these failures have been practically swept away. Recurrence, or continuation of neoplastic growths has been largely abolished by skilful and well-planned technique. Post-operative infections, persistent sinuses, and fungation of tumour tissue have been forestalled in most recent cases by the adoption of thoroughly up-to-date surgery.
A CASE OF HAEMANGIOMA OF THE RADIUS

Rigid skin preparation is now generally practised. Preliminary biopsy is usually avoided. Exposure is made adequate for the desired manoeuvres. Direct vision is sought, and improved, by the best possible haemostasis, especially by the use of a tourniquet. Primary closure of the wound is customary, while packing, with its attending evil consequences of infections, etc., is avoided.

Thus, for the average benign tumour, in an accessible situation, surgery may be undertaken with hope of a good functional result. In many cases, the simplest procedure is curettage, removing the entire tumour tissue piecemeal. This is to be followed in every case by chemical cauterization, e.g., with phenol followed by alcohol, or with a saturated solution of zinc sulphate. It is to be noted that much disrepute has been brought upon this form of surgery by its careless practice in the hands of those ignorant of the importance of each step. There must be an adequate bone shell, and the joint must be separated by a good layer of intact tissue. It is advisable to obliterate a large cavity in the bone by crushing in the walls, or filling it with bone chips. These procedures demand skill, judgment and technical proficiency. Under such circumstances, a high percentage of successes are obtained, with later freedom from recurrence, especially in the cases of benign bone cysts, giant cell tumours and enchondromas.

In a small group of cases, the treatment of choice is excision. Local excision of the tumour alone, with a minimum of bone at its extremities, working subperiosteally, is rarely possible. This was the procedure
carried out in the case reported. More often, a portion of the bone bearing the tumour is removed. This applies in particular to such bones as the fibula and ulna, which are not truly essential. In general, excision is more applicable to the upper limb than to the lower. Where complete excision is possible without undue disability, it does yield more satisfactory results than any other form of therapy.

Bearing in mind the choice of treatments available, one is able to appreciate the value of excision practiced in our case. Some will, no doubt, affirm that irradiation should have been given a trial first, a view with which I am not in disagreement, provided that the diagnosis is absolutely certain without any form of operation. If biopsy is undertaken in such circumstances, I feel firmly convinced that surgical treatment should be carried through with faithful respect for the now recognized rules set forth above. Of course, treatment does not cease with the last stitch, any more than it should in any other surgical field. The goal is as perfect an arm anatomically and functionally as can be obtained. The boy is under careful supervision at our Orthopaedic clinic.

**Pathological Report**

*Gross Features:* Dr. J. H. Fisher, Chief of Pathology, University of Western Ontario Medical School, reports: “Specimen consists of a section of bone in the form of a cylinder, measuring 9 cm. in length and having a diameter of 3.3 cm. It has been taken from the left radius, and shows evident expansion of the cortex, which has become very thinned out and brittle, so as to form a mere shell. In some small areas, it has been completely eroded through. The periosteum has been stripped off cleanly. On splitting the bone longitudinally, the interior is found to be made up of tumour mass. The cut surface (see fig. 2) presents a somewhat variegated appearance and contains numerous cystic spaces measuring up to about 1.3 cm. in diameter. It is relatively soft in consistency, and is readily cut with a knife; there are some denser greyish-white areas appearing like dense bone. It is evidently very vascular, as considerable blood oozed from the cut surface and many of the cystic spaces appear to contain blood.

*Microscopic Features:* (See figs. 3 and 4.) “The outstanding feature of the sections, which impresses me at first glance, is the presence of numerous rather large irregular cyst-like spaces, containing blood. These spaces appear to be endothelial-lined and surrounding many of them there are scattered giant cells. The latter tend to be smaller than and not typical of the giant cell tumour variety. Furthermore, the stroma in which they occur, lacks the characteristic round-cell structure of giant cell tumour. The main stroma of the tumour is fibroblastic in character, and contains numerous trabeculae of new-formed bone, surrounded by osteoblasts which show relatively little hyperplastic activity. The spicules of bone are benign in character. Some changed blood pigment is found in the stroma of the tumour.

“It is considered that the histological structure, the age of the
patient, and the fact that the epiphysis is not primarily involved, rule out a giant cell tumour. The undersigned considered the tumour to be a polycystic osteitis fibrosa. Sections and a summary of the clinical history have been submitted to Dr. Charles F. Geschickter, of Baltimore, who returns a diagnosis of benign haemangioma of bone. Dr. Geschickter states that some of the tumours similar to this one were formerly included in the group of polycystic osteitis fibrosa, but he considers that they are really angiomatous in nature. These tumours are radio-sensitive."

Pathological Diagnosis: Benign haemangioma of bone.

BIBLIOGRAPHY
Platt—S. G. and Obst., 60: 318; '35.

Modern Education

When he was twenty-five years old, our doctor graduated,
And men of common place ideas pronounced him educated;
But he took three years of travel, to learn the new pathology,
To study skin in old Vienna, and Koch's bacteriology.
Then came a hard post-graduate course, which took him three years longer,
Then, though his health was poor, his intellect was stronger.
His physical condition now approached emaciation,
His fraters ordered two years rest, for his recuperation.
Then polyclinics, it took three years their mysteries to unravel,
And then, to study foreign modes, three more long years for travel.
When he returned, his big moustache with long grey hairs was threaded,
He'd lost his eyesight long before, and now was quite bald-headed.
When he was thirty-nine years old our intellectual giant
Hung out his little shingle, then waited for a client.
The girl he loved in former days had long since wed another,
And had grown a portly matron and an excellent grandmother.
The boy he knew in grammar school seemed ancient as progenitors,
And one was governor of the state and two of them were senators;
But seated in his office, in quiet sequestration,
He waited long for patients, with their tales of inflammation.
One day, when he was forty-five, came in his earliest client,
John tried to be as quiet as the poetry of Bryant;
But the shock, it came so sudden, with such overwhelming power,
That he fell with apoplexy, and died within the hour.

—ANON.
The Life of Sir William Osler

By John G. Stapleton, B.A., '41

The history of medicine is replete with the names of great men, names which are indissolubly associated with important advances in this most essential branch of human knowledge. Particular periods are represented in our minds by such names as Hippocrates, Galen, Vesalius, Harvey, Lister, and many others. Undoubtedly, the period centering around the turn of the present century will be long associated with the name of one who, proceeding from our own locality, became the "best-balanced, best-equipped, most sagacious and most lovable of all modern physicians"—Sir William Osler. His life, the ideal and inspiration of medical students everywhere, was one of such varied accomplishments and eventful passage that it is manifestly impossible, even to outline in a short essay, what his friend and biographer, Harvey Cushing, has with difficulty compressed into two long volumes. Neither is it easy to pick out any one period of his life as being of surpassing interest. From the days when, as a mischievous boy, he was expelled from school in Dundas, to his crowded years as Regius Professor at Oxford, his life is a fascinating story of the reactions of a keen and brilliant mind to the opportunities which life presented to it. It is essentially a story of continuous progress, with apparently no backward steps, as the young clergyman's son, the youngest in a family of nine, proceeded from success to success without losing either his capacity for fun, or his humility.

Sir William Osler's life can best be appreciated when it is viewed as that of a teacher, for thus he regarded himself and he conceived it to be his highest duty to promote the welfare of medical students. Probably his overwhelming interest in his pupils was due in no small measure to the fact that his own life had been profoundly influenced by two men under whom he sat as a pupil, who first lit the spark of ambition in their versatile young protégé. The men were the Rev. W. A. Johnson and Dr. James Bovell. The former first quickened in him an interest in science; the latter led him to choose a career in medicine. Rev. W. A. Johnson was warden of a school at Weston, subsequently Trinity College School (now at Port Hope, Ont.), to which William Osler was admitted in 1866, a lad of seventeen years. Johnson, a versatile Anglican cleric, continually in trouble with his bishop or his people over his ritualistic proclivities, had a conception of education which has been slow in gaining recognition even today. He believed that education did not lie in the number of facts which could be drilled into his boys, but "in the ideas which centrifugally would radiate from them under varied stimuli, not necessarily confined to the classroom." An omnivorous naturalist, everything interested Johnson. He had a flair for observing and recording natural phenomena, and knew how to transmit the flame of his enthusi-

*This essay won the prize of the Hamilton Academy of Medicine in 1936.
asm to others. Little did he realize how the newly-awakened interest in science was to turn his young pupil from the church, for which he had been intended; that what for him was merely a pleasant and interesting avocation was to become Osler’s magnificent obsession. Dr. James Bovell, professor of the Institutes of Medicine in the Upper Canada School of Medicine, and subsequently a member of the faculty of the Toronto Medical School, exerted an influence on Osler which was even greater than that of Johnson, and more enduring. During his two years of medical study at Toronto, Osler lived with Bovell almost as a son, while he threw himself into his studies with the industry and enthusiasm which characterized his relation to his chosen profession to the end. Most of his time seems to have been spent in the dissecting-room, or “looking through a microscope at Bovell’s.” His appreciation of the teaching possibilities of direct microscopic study was characteristic of him in later years, when his determination to have microscopes for his classes at McGill led him to squander his own meagre salary for their purchase. James Bovell came to exercise an extraordinary influence over the boy, and to the end of his life he would, in moments of abstraction or boredom, scribble “James Bovell, M.D., M.R.C.P.” on whatever paper happened to be at hand. Osler, himself a teacher in later years, must have well remembered the benefit of the kindly interest and encouragement of his two early teachers, for he was always more interested in students than in anyone else. On his last visit to America in 1913 he arranged to meet the undergraduates of Yale rather than go to a meeting of faculty members, and no doubt the inspiration of his personal interest heightened the enthusiasm of many on embryo doctor.

In 1870, after Bovell had left Toronto and gone to the West Indies, Osler effected a transfer from Toronto to McGill, where he found what was undoubtedly the best medical school in Canada, with clinical facilities only rivalled by the great school at Philadelphia. During his two years at McGill he spent much time in the dissecting-rooms, and submitted a thesis of such merit upon his graduation that he was awarded a special prize for it. There followed a two-year period of study abroad, in London, Berlin and Vienna. With his subsequent return to Canada in 1874, Osler’s career as a teacher, in which we are principally interested, really begins. After a few weeks spent in the vicinity of Dundas and Hamilton, he received from Palmer Howard, his old professor at McGill, news that he was to be offered a lectureship upon the Institutes of Medicine, which he very gladly accepted. It is interesting to notice that this was not the first offer which had been made to him by McGill, for two years previously, while he was still in England, he had been offered a lectureship in Botany, which he had had the good sense to decline. A more eloquent tribute to the high esteem in which he was held by his alma mater could scarcely have been paid, for he was at that time only twenty-three years of age.

Osler’s industry, which he always declared was his only talent, was in truth prodigious. He applied himself so thoroughly to his job as
lecturer that at the end of a semester he was appointed professor. Noted always for his generosity, frequently beyond his means, his zeal to provide equipment for his classes was such that, as he himself confesses, he "suffered at that time from an acute attack of chronic impecuniosity." Forthwith, however, began the reformation in teaching methods, which was characteristic of him in all his subsequent associations. He had been profoundly impressed by his observation of Virchow's methods of clinical instruction in Berlin, and his later emphasis on the use of the microscope in physiology and pathology may be traced to this source. His ambition at all times was to make his courses equal to any in the world, unsatisfied as he was to see America lagging behind Europe in methods of medical instruction. The course in clinical microscopy which he introduced, the first to be offered in the country, was designed to afford the students an opportunity "of becoming practically acquainted with the use of the microscope in physiology and pathology." Meanwhile he had voluntarily undertaken to perform autopsies at the Montreal General Hospital, and later had set to work in the smallpox wards, making great use of the clinical and pathological material which the position afforded. As an outgrowth of this, in 1876, the post of pathologist at the Montreal General Hospital was created "to make proper use of William Osler," and in the autopsy room of that institution he laid the foundation of his brilliant career as a clinician. Having found his true vocation he put every ounce of himself into his work. In fact, "Lazarus was nothing," he once wrote to his sister, "to what I have been for the past three weeks." Indeed, Dr. Osler's courses in Practical Anatomy and Practical Pathological Demonstrations were an outstanding feature of the McGill school and were prominently mentioned in the college prospectus. Besides the remarkable power of concentration on the immediate problem, his outstanding gift, he possessed a true scientific curiosity, and to unravel the mysteries of a fatal malady held a profound fascination for him. The results of his investigations were embodied in his frequent contributions to medical journals.

In the Montreal General Hospital he began the practice of bedside teaching of students, which he always insisted was the only proper method of instruction. It seems strange to us that it should have been necessary to insist upon this indispensable feature of modern medical education. Emphasizing the debt we owe to Osler in this development, Cushing dedicates his monumental biography "to medical students . . . particularly those in America, lest it be forgotten who it was that made it possible for them to work at the bedside in the wards." Meanwhile the web of Osler's life became ever more complicated, connected as he was throughout his life with clubs, societies, and associations which afforded opportunities for professional fellowship and scientific discussion. Never, however, did he suffer his multifarious duties to interfere with his teaching, for, whatever his other interests, the welfare of his pupils invariably came first, and no effort was spared to make his teaching methods the best possible. Continual attempts to improve the
physiology and practical histology course, by the addition of an admirable laboratory manual which he wrote himself, and by continual emphasis on the necessity of thorough familiarity with the microscope and its use, had made it outstanding on the continent. In fact, every faculty which, during a busy lifetime, felt the touch of his hand, was revitalized and invigorated.

McGill lost forever her most distinguished son when, in 1884, Osler, only thirty-five years old and quite well known abroad already, accepted a call to occupy the chair of clinical medicine at Philadelphia, lured by the temptations of a larger center and the prospect of consulting work. McGill's hopes that he might return were never fulfilled, "but he was never forgetful of what he owed to Johnson and Bovell and Howard; to the microscope and the pathological laboratory; to the Montreal General and his Canadian friends."

The transformation in teaching methods which had characterized William Osler's connection with McGill was soon in evidence in his new field. Although the students were apparently disappointed with his informal lectures after the dignified discourses of Pepper, his predecessor, it was a "horse of another colour" when they came into contact with the new professor in the wards. He found bedside instruction conspicuously undeveloped, and proceeded to capitalize upon the opportunities afforded by the two large medical wards in the University Hospital, gathering about him an increasingly enthusiastic group of students. His boundless enthusiasm soon led to the provision of a small clinical laboratory, so that original research by the young clinical men, then almost unknown, could be conducted. He cultivated the company of his pupils to the entire exclusion of any but a consulting practise, much to the consternation of his associates and the good fortune of the undergraduates. His peculiar fitness as a teacher is well illustrated in the following extract from the writings of Dr. W. L. Sharpless, an interne at the Berkeley Hospital at the time: "I have the most distinct recollections of the Sundays, when he came early in the morning and spent the whole day in making necropsies, which we saved for him to do insofar as it was possible to do so... If he found something especially interesting he would send out the runner to get all the boys, and show what a wonderful thing it was, how interesting and instructive it was. Once in the ward there was a big coloured man whom he demonstrated as showing all the classical symptoms of croupous pneumonia. The man came to autopsy later. He had no pneumonia, but a chest full of fluid. Dr. Osler seemed delighted, sent especially for all those in his ward classes, showed them what a mistake he had made, how it might have been avoided, and how careful they should be not to repeat it. In thirty years of practise since that time, whenever I have been called upon to decide between these two conditions, I remembered that case. I am sure that it had the same effect upon the other members of the class that it had upon me, and was certainly the right sort of medical teaching..."
Osler had the wonderful power, given only to a few great teachers, of “inseminating other minds.” He was never known to preach what he did not practice, for both by precept and example he stimulated his students to observe, record and publish. Quite frequently the method of “insemination” was merely a scribbled note on a post-card, his favorite method of communication. His very contagious personal enthusiasm for whatever work he was doing invariably infected his assistants. In this way he fathered much of the important work which was done in the Philadelphia and Baltimore clinics on the subject of malarial fever, in which he was much interested. “His writings more than those of any other of his contemporaries served to stimulate interest in malaria, and to popularize throughout the profession the knowledge necessary for its proper recognition,” i.e., by direct microscopic examination of the patient’s blood. The number of time-consuming positions which he could fill constantly amazed his friends, and he never seemed overwhelmed with his work. It was said that his calendar was like india-rubber, and seemed capable of stretching to include any new activity without loss of time for the others. His ability to do so much he owed to the fact that he organized his time well and concentrated always on the tasks immediately at hand, recognizing with Goethe that “each day will set its proper task.” In an address to students which he called “A Way of Life” he summed up the philosophy of life which he said had been “helpful in my work, useful in my play” in the following quotation from Horace:

Happy the man, and happy he alone,
He who can call today his own,
He who secure within can say:
Tomorrow, do thy worst—for I have lived today.

Meanwhile, thanks to the munificence of a Quaker millionaire, the new Johns Hopkins University had come into being at Baltimore, and a hospital had been built under the same endowment. An abrupt offer had come to Osler to take charge of the Medical Department; “his acceptance of the offer was to become a landmark in the history of medical teaching in the United States.” His teaching opportunities were of course greatly increased, for he had the organization of his own clinic, and was free to blaze a perfectly new road “untrammelled by tradition, vested interests, or medical deadwood.” From the first he planned to make much use of bedside clinical teaching, with chief emphasis on practical instruction to small groups of students. He always insisted on “no teaching without a patient,” at a time when many medical colleges in the United States conferred their degree on men who had spent only a couple of years in study, mostly from textbooks, and knew appallingly little about the everyday duties of their profession. Many, it was said, had never even attended a case of labour. Osler’s pedagogical views are well illustrated by the following extract from one of his addresses: “In what may be called the natural method
THE LIFE OF SIR WILLIAM OSLER

of teaching the student begins with the patient, continues with the patient, and ends his studies with the patient, using books and lectures as tools, as means to an end. The student starts, in fact, as a practitioner, as an observer of disordered machines, with the structure and orderly function of which he is perfectly familiar. Teach him how to observe, give him plenty of facts to observe, and the lessons will come out of the facts themselves. . . . The whole art of medicine is in observation, as the old motto goes, but to educate the eye to see, the ear to hear, and the finger to feel, takes time, and to make a beginning, to start a man on the right path is all that we can do. . . . Give him good methods and a proper point of view, and all other things will be added as his experience grows."

During his Baltimore period Osler wrote his magnum opus, "The Principles and Practise of Medicine," which soon replaced Watson's celebrated "Practise," now out of date. Admirably fitted for the task, Osler covered the whole field single-handed, for he was "most emphatically not a specialist, or a believer in narrow specialization." The book achieved an almost immediate success, and the burden of successive editions lay heavily upon him for the rest of his life. It was said that he had "succeeded in making a scientific treatise literature"; and the book soon became the indispensable vade-mecum of medical students. With a characteristic demonstration of appreciation, Osler dedicated the book to the memory of his early teachers: William Arthur Johnson, James Bovell, and Robert Palmer Howard.

The new medical school at Johns Hopkins afforded opportunities for the exercise of Osler's unusual gifts as an inspirer of youth, which soon came to be appreciated at their real worth. Here, in control of his own clinic, his extraordinary talents had full play. "His success lay far less in his thorough familiarity with his subject than it did in his knowledge of young men and of himself. This enabled him to impart something of what he knew in such fashion as inevitably to spur students to take every advantage of their opportunities, not the least of which was that they might be near him." In clinics he laid great stress upon methods of examination, and the necessity of cultivating powers of observation, imparting his instruction by an informal running comment, aptly illustrated, which served to fix indelibly in his hearer's minds the lessons he strove to bring out. During this Baltimore period he had also come to devote his Saturday evenings to his group of fourth-year clinical clerks. Gathered in Osler's home around a dining-room table, each in turn was invited to discuss his week's work, his patients and his reading. Then with appropriate refreshments at hand Osler would give a discourse on one or two favourite authors, illustrated by early editions of their works. These charmingly informal gatherings led to a degree of intimacy between teacher and student which was as unusual as it was stimulating. He affirmed his belief in such fellowship when he said on one occasion: "When a simple earnest spirit permeates a
college there is no appreciable interval between the teacher and the taught, both are in the same class, the one a little more advanced than the other."

By 1905, at the end of the richest period in his life, the twenty years spent in the United States, William Osler had become, though none the less British, the best-loved doctor in America, "whose textbook had become the portal through which almost every English-speaking student was entering the profession of medicine," and behind whom there already lay what to most men would have been more than a life's work. In common with Montreal and Philadelphia, Baltimore was also destined to lose the man it had come to love so well, for in 1905, Osler accepted the post of Regius Professor of Medicine at Oxford. This position he held with great distinction until his death in 1919, in his seventy-first year; a death untimely in a family noted for longevity, and undoubtedly hastened by the strain of a lifetime of devoted and unceasing service. His interest in teaching did not relax, and in a letter from Baltimore to Sir John Burton Sanderson, regarding the Oxford position, he says: "... While very happy here, and with facilities probably unequalled in English-speaking countries, I am overworked and find it increasingly difficult to serve the public and carry on my teaching. ... I am interested in clinical teaching and am fond of it ... and I should miss sadly the daily contact with the students, unless I could arrange for clinical work in London. ..." The fact is that his escape from Baltimore left him with scarcely any more time than before, for he was constitutionally incapable of merely "vegetating," and was soon drawn into a round of lectures, clinics, clubs, societies, and dinners, which left him very little time for any real rest. His "work for others," to quote a brother Regius professor, "was so incessant and his hospitality so unbounded that one always wondered where and when he had amassed and made use of his learning."

Singularly unspoiled by the honours of a lifetime, he was made a baronet in 1911 at King George V's coronation, "much to the embarrassment of my native simplicity," as he confessed privately. None of the innumerable honours which were heaped upon him dampened his enthusiasm for the society of students, and his home became known as the "Open Arms," due to the number of guests which it habitually housed. Especially welcome were the American Rhodes scholars, who found in "the Regius" a confidante and friend, whose charming humility and unfailing good humour were a perfect remedy for discouragement and nostalgia.

Sir William Osler's life may well be the inspiration and ideal of Canadian medical students, the epitome of the ambitions which every student cherishes. It is inevitable that such a thrilling tale as that of his amazing life has suffered much because of compression, in this brief description of the course of his career as a teacher. With almost equal justification it would be possible to write of him as a lecturer and an
essayist, as a scientific research worker, as a consultant, as a campaigner for public health, as a bibliophile, as the activator of literally dozens of literary and scientific societies, and as an ardent protagonist for the advancement and welfare of the medical profession as a whole. Endowed with great talents, he gave of them unstintingly; but he gave more also. For his reputation rested to an equal degree upon the inspiring and stimulating character of his personality. It is doubtful whether medical history records a man who had a greater influence on the students who came under his teaching. He inspired them with a remarkable devotion and a loyal affection. He was their example. His life embodied his precepts and his students cherished his words. "Cultivate peace of mind, serenity, the philosophy of Marcus Aurelius. Think not too much of tomorrow, but of the work of today, the work which lies immediately before you." Truly of such a man we may say:

His life was gentle; and the elements
So mixed in him that Nature might stand up
And say to all the world: This was a man.

BIBLIOGRAPHY

SHOULD COD LIVER OIL BE FLAVORED?
It is a well-known fact that young infants shy at aromatics. Older patients often tire of flavored medications to the point where the flavoring itself becomes repellant. This is particularly true if the flavoring is of a volatile nature or "repeats" hours after being ingested. Physicians have frequently used the terms "fresh," "natural," "sweet," and "nutlike" in commenting upon the fine flavor of Mead's Cod Liver Oil. They find that most patients prefer an unflavored oil when it is as pure as Mead's.

Physicians who look with disfavor upon self-medication by laymen are interested to know that Mead's is one Cod Liver Oil that is not advertised to the public and that carries no dosage directions on carton, bottle or circular. Mead Johnson & Co. of Canada Ltd., Belleville, Ont., will be glad to send samples and literature to physicians only.
The Treatment of Schizophrenia

By G. H. Stevenson, M.D.,
Superintendent, Ontario Hospital, London, Ontario

Schizophrenia, perhaps more commonly known as Dementia Praecox, presents the most important challenge in psychiatry. It is the commonest form of mental illness, accounting for 30% of admissions to mental hospitals. Its resistance to treatment without materially reducing the life expectancy, means that there is a gradual accumulation of these unrecovered cases in mental hospitals, so that the percentage of schizophrenic cases of the total census is considerably higher than the admission rate. At an estimated cost of $1.00 per day, these unrecovered cases are costing the relatives or the taxpayers generally in this one province the sum of $5,000 daily. The distress to their families, caused by this illness in relatives, cannot be estimated in dollars and cents. The fact, too, that this disease usually strikes in youth or early adulthood adds to the general poignancy. And the additional fact that although research in all directions has been continuous, patient, and thorough, nevertheless it is still poorly understood and complete recovery is rare, recovery with defect being the best result usually hoped for or secured.

A few years ago the Association for Research in Nervous and Mental Diseases spent an entire session discussing it from all angles and issued a special volume dealing with it; within the last year the National Committee for Mental Hygiene has co-ordinated research into this disease under the direction of Dr. Nolan Lewis with funds supplied by the Scottish Rite Masons of the U. S. A. This organization has also published a book summarizing their work which is now in progress. But still thousands of cases occur annually, most of which cannot as yet be treated successfully. Cancer, despite all our knowledge, causes 3,500 deaths annually in this province; so schizophrenia, which has been extensively studied, causes mental death to 1,000 young people annually.

Rational treatment for any disease should, of course, be based on accurate knowledge of the etiological factors and the pathological lesions produced. The absence of such knowledge in this disease has added greatly to the difficulty. Autopsies and microscopes have revealed nothing in the brains of schizophrenic victims that is not also found in the brains of so-called normal controls. It is known that schizophrenia tends to develop in persons with a family predisposition, with certain types of body-build and personality, and that there may be some variation in blood chemistry and blood constituents, basal metabolism, etc., but the actual reasons for the development of this condition are not entirely agreed on. Once the condition has developed, its control presents equally puzzling difficulties.
The difficulties have been added to by the strong differences of opinion among psychiatrists as to probable etiology. The organicists have maintained that there are (or should be) demonstrable lesions and moreover claim that such a dramatic disintegration of personality could only be caused by a toxic or infective virus, or by some obscure metabolic poison. They point to the discoveries of actual organic factors in general paresis, and look for a similar discovery in schizophrenia. Opposed to the organicist we have the psychogenist, who points to the absence of revealed pathology, and, moreover, stresses the recognized importance of psychogenic factors and disturbed emotions in such conditions as hysteria. He wants to look for the complete understanding and future control of the disease in the psychogenic, without particular reference to toxic or organic factors. And as in other situations, where there is an absence of scientific proof, opinions are held all the more vigorously and opposing views call forth much bitterness.

As in most conditions of obscure pathology, many new treatments on an empirical basis are tried out one after the other. These treatments are offered usually on the assumption of some theoretical consideration which makes the proffered treatment of great potential value (if the theory turns out to be valid). Unfortunately, the theory is usually wrong and after a few glowing reports, followed by other less favorable findings by persons who are checking the work of the first, the treatment dies a more or less natural death, to be followed shortly by another glowing preliminary report on another new treatment. Within the last few years, we have had the much advertised manganese treatment, which was supposed to improve the synaptic contacts. We have had the aseptic meningitis treatment to improve the circulation in the brain and its covering. We have had the sleep treatment, induced by amytal or chloral and paraldehyde, and now being marketed under the trade name "Cloettal", which was supposed to quiet all mentally abnormal activity; on awakening, the individual would be able to start afresh under medical guidance so as to keep him from again developing the same symptoms. Very encouraging reports were published on all of these, but very little is heard of them now. It is true, there were some favorable results. There are favorable results from almost any form of treatment, but these results are probably due in large part to the routine care the patients received, to the natural tendency of the condition to remissions, and to the "vis medicatrix naturae". I am not disparaging treatment, but I am disparaging the too common tendency to forget total treatment in the search for some magical cure-all.

The present therapeutic vogue in schizophrenia is what is known as the hypoglycemic shock treatment induced by insulin. This treatment had its origin in the clinic of Prof. Pötzl at the University of Vienna, and has been investigated chiefly by Karl Dussik and Manfred Sakel. Although investigations have been going on since 1933, they have been brought to the United States only within the past year. At the present
time the method is being used in several centres in the United States and at the Ontario Hospital at New Toronto; reports are not yet available from these centres. The European centres, as might be expected, have published very encouraging reports, with a remission rate of 86.2% in Pötzel's clinic. As I have suggested, new treatments always begin their career in this way, so these figures should perhaps be accepted with considerable skepticism.

The technique of administering the treatment requires a specially trained staff and is not without considerable risk; however, the malignant nature of the disease quite justifies it. Sakel divides the treatment into four phases:

**Phase 1.** Insulin, 15 to 30 units, is given one to three times daily on an empty stomach, and carbohydrates are withheld for four hours. According to the reaction obtained, the dose is increased to 5 to 10 units every second or third day, until hypoglycemia and coma are produced.

**Phase 2.** A daily early morning dose of insulin is given, in sufficient amount to produce a serious shock. This may be anywhere from 20 to 260 units. The effect is noticed in from \( \frac{3}{4} \) to 5 hours. Carbohydrates are given several hours later, but if the symptoms become critical, it may be necessary to give them earlier, or as an emergency measure. If a convolution occurs, treatment is interrupted. Shocks are continued daily, until an ameliorating effect is observed. As many as 60 or 70 shocks may be given. Sakel speaks of "wet shocks", characterized by sweating and deep coma, and of "dry shocks" or convulsions. He considers that Phase 1 pacifies the patient and has a good general effect, while Phase 2 represents the actual attack on the disease.

**Phase 3.** Insulin is omitted for one day a week, then for two days a week, thus being gradually decreased. This phase is for recuperation and observation.

**Phase 4.** The amount of insulin in the less frequent dosage is reduced and carbohydrate is given earlier. This phase, Sakel states, is for stabilizing the effect and promoting the convalescence and composure of the patient.

There have been a few fatal cases and some of the less serious complications noted are as follows: bradycardia, tachycardia, pancreatic damage, alterations in sugar metabolism, after-shock, urticaria, laryngeal spasm, low temperature, aspiration of saliva and other material, and mental sluggishness.

These complications are of minor importance if good results follow in many cases as Sakel claims they do. He further modestly states, "I do not know whether this is the final therapy for schizophrenia, but it is an approach."

He feels that its effectiveness is by no means due entirely to shock,
although it is well known that shock often causes a favorable effect. He believes that schizophrenic subjects have an undue nervous irrita-
tion from an adrenalin-like substance and that insulin is its normal
antagonist. Insulin muffles excessive stimuli and keeps the cells rela-
tively quiescent. Wortis, an American investigator, thinks that meta-
bolism is improved in the nervous system.

You have probably detected a note of skepticism in this presenta-
tion. While by no means a therapeutic nihilist, the writer has seen too
many treatments come and go, to have any confidence in this one. It
resembles too much the periodic cancer cures that arise from time to
time, and that arouse so much false hope, even as this has done.

The defect of most of these treatments is that only one aspect of
the problem is considered and most people have the common tendency
to depend too much on drugs and to expect a radical solution to some
of these difficult problems.

I take the view that schizophrenia represents a regressive per-
sonality phenomenon with mental dissociation, and that it is largely
due to a frail mental constitution, acted on adversely by physical, emo-
tional, and environmental influences and stresses, both internal and
external. And inasmuch as we are all trying to mould ourselves or our
environment so that we may gain greater satisfaction from life, so in
schizophrenia, the individual, unable to gain a comfortable adjustment
in this life, is forced into or escapes into a world of unreality, fantasy,
hallucination, delusion, all of which are characteristic of schizophrenia.
To bring him back to reality and to keep him there, surely requires
more than a series of hypoglycemic shocks. In the same way one would
not expect hypoglycemic shocks to change a gardener into a machinist,
a Conservative into a Liberal (or vice versa), a communist into a
fascist, a Baptist into an atheist. It is well known, of course, that a
shock may change a drinker into an abstainer, a reckless driver into a
cautious driver. It is also known that certain chemicals or toxins, such
as alcohol or morphine, may change a coward into a hero, a gloomy man
into a cheerful one, a peaceful man into a fighter. When such results
occur, they are usually temporary or due in part to a much more complex
set of circumstances. While insulin shock may have both qualities in
some degree, it is hardly likely to have them in such measure as to
produce permanent results to any particular extent.

A less spectacular, but more conservative and perhaps more effi-
cient technique might be a program something as follows: thorough
physical examination, removal of physical irritants, focal infections,
 improvement of general health, relief from physical stresses, relief from
mental stresses, solution of mental conflicts, improvement of enjoyment
of life by better economic, social and personal adjustments, stimulation
of desire for reality rather than for unreality, by occupational and
recreational therapy and by the direct application of the personality
and psychotherapeutic force of the physician and nurse.
Of course, the real cure of schizophrenia is its prevention. As plague, smallpox, typhoid fever and diphtheria have been practically eliminated by prophylactic inoculation, so it is our hope that schizophrenia may ultimately be eliminated by the improvement in those conditions which at present make for insecurity, the elimination of stresses too heavy for the frail to be burdened with, by the ability and knowledge to keep our bodies in good condition, and the learning and putting into practice of those laws of mental health which will enable us to develop normally and to make satisfactory and harmonious adjustments in a world of less stressful and less soul-scarring reality.

REFERENCES
Wilson, Margaret—Report Board of Control of England and Wales, 1936.

TO A YOUNG PHYSICIAN
The paths of pain are thine; go forth
With healing and with hope;
The suffering of a sin-sick earth
Shall give thee ample scope.
Smite down the dragons fell and strong,
Whose breath is fever fire;
No knight of table or of song
Encountered foes more dire.
The holiest task by heaven decreed,
An errand all divine,
The burden of our mortal need,
To render less is thine.
No crusade thine for cross or grave,
But for the living man;
Go forth to succor and to save
All that thy skilled hands can.
Before the unveiled mysteries
Of life and death go stand,
With guarded lips and reverent eyes
And pure of heart and hand.
So shalt thou be with power endued
For Him who went about
The Syrian hill paths, doing good
And casting evils out.
The Holy Helper liveth yet,
Thy friend and guide to be;
The Healer by Gennesaret
Shall walk the rounds with thee!
—JOHN GREENLEAF WHITTIER.
The Specialties in Medicine

Obstetrics and Gynecology

By

W. Pelton Tew, M.B., F.R.C.S. (Edin.), M.C.O.G.,
Professor of Obstetrics and Gynecology,
University of Western Ontario Medical School.

At the outset, I wish to make myself quite clear, that this article, written by request, on the above-mentioned subject, is by no means an appeal for students to enter the specialities, but is simply an effort to assist those contemplating such to enter through the proper portals. I am heartily in accord with the impression of my colleagues that the general practitioner always has been, still is, and, as far as one can see, will remain the backbone or foundation of the Medical Profession. I say this in all sincerity, because we, as specialists, often realize how narrow we feel when we meet a good general practitioner in consultation. We may help him over a certain specific difficulty with his case, but when it comes to sizing up the patient from all angles we seem mere infants in comparison. I have many times marvelled at the general man's ability to keep in such close touch with the advances in the whole field of medicine. It seems more than likely, therefore, that the average sick person will continue to be cared for by the general practitioner. The special work will be referred to the specialists. It seems evident that, according to the supply and demand, there is much more scope for the good general practitioner than there is for the specialist.

To specialize or not to specialize is one of the common crossroads which we encounter at one time or another during our professional life. We may give it passing thought even before we enter the field of Medicine. We commonly ponder over the problem during our undergraduate days. Some make their decision reasonably early in their undergraduate life and find themselves changing their minds several times before graduation. Many students find themselves toiling away in a branch of Medicine quite different from what they had planned for themselves in the past. The variety of circumstances accompanying our pathway in life, serving to direct our destinies this way or that, are numerous indeed. Some of these influential circumstances might be mentioned; the particular inclination of the individual toward practical or investigative science; the depth of impression which some of his outstanding teachers have made upon him; the influence of his post-graduate teachers; the influence of his family or close friends; the amount of time and money at his disposal for post-graduate study; the degree of success which some of his professional acquaintances have attained; and lastly, but not least by any means, the student's capacity for industry and his ambition to succeed.
Having decided to specialize, and Obstetrics and Gynecology being the choice, I will endeavour to outline a method of procedure. There are several ways of becoming a so-called specialist in this field. One way is to go to a clinic, such as that in Vienna or Budapest, and pay one of the mercenary medics there to permit you to do a certain number of operations under his guidance. Then you return to this country as a "specialist." This is about the worst possible way to specialize. Secondly, you may proceed as follows: Obtain an appointment in an approved hospital, under the supervision of well-chosen teachers. I would remind you that it is the men under whom you work that should influence you in your choice, rather than the number of patients, or the size of the hospital. Having made the proper start, you will find your program well organized for you. The ideal course will give you a general training at the outset, much as is provided by a good rotating hospital service. You should then receive a part of, or a whole year in laboratory work associated with Obstetrics and Gynecology. You will then proceed as junior interne in your chosen field and gradually work up to the residency in this department. Such a post-graduate course should aim at producing a finished Obstetrician and Gynecologist.

Plan to obtain one of the recognized post-graduate degrees. Such a degree is tangible evidence of your efforts and is also a stepping-stone to your future hospital or university appointments. The value of these worthwhile qualifications is being more and more appreciated in all parts of the British Empire. These degrees may be so planned that they may quite readily fit in with your post-graduate course. The time seems not far distant when the qualifications of the specialist will be much more clearly defined. At the present there are no rigid regulations concerning this rather important matter. Until that time comes, we will, naturally, have many types of specialists among us. This question is now under consideration and no doubt will be worked out in a satisfactory way, soon.

My remarks so far have been confined to the ways and means of helping you to become a recognized specialist, in so far as academic training is concerned. There is really another side to post-graduate training, which is of more importance to your future welfare than the academic side. I refer to the influence which your post-graduate teachers may have upon your cultural or aesthetic life. If one leaves his post-graduate school without having absorbed some portion of that mystic influence which has improved his character and personality, he has missed an important part of his education. In other words, they teach us how to live. When you have been thus highly educated and trained, you will be expected from the outset to portray the finer qualities of a gentleman. If you take stock of yourself after having finished your course and find you have profited thereby, your work has not been in vain and you will take your place among men.
I

Trichomonas Vaginalis Vaginitis

By W. J. KLINCK, Meds '37

ONE hundred years ago Donné discovered in vaginal secretions a flagellated protozoan organism, now known as Trichomonas vaginalis. During the past years, many gynecologists have considered it a more or less harmless saprophytic organism. However, the trend of opinion, as portrayed by the results of modern workers, is that Trichomonas vaginalis causes a definite vaginitis and, because of the rise in the incidence of the disease, Trichomonas vaginalis vaginitis constitutes an ever-increasing problem for the general practitioner of today.

The purpose of this article is to emphasize the importance of Trichomonas vaginalis in vaginal infections, to present the typical clinical picture and to discuss its treatment. It is important that this condition should not be confused with gonorrhoea. It is much more common than gonorrhoea in private practice and a correct diagnosis saves the patient from the moral reproach and phobia which are secondary to a diagnosis of gonorrhoea.

The genus Trichomonas has three species: vaginalis, hominis and buccalis. Trichomonas hominis is found in the stools of 10% of the population and Trichomonas buccalis in the mouths of at least 50%. These species closely resemble each other, but Powell and others state that Trichomonas vaginalis is a species distinct from those found in the human mouth and intestine.

For examination, the "hanging drop" preparation is favored. The vaginal discharge is diluted with normal saline and high, dry microscopic examination of the fresh, unstained vaginal secretion, under reduced illumination, reveals the motile organism; it is about as large as a pus cell. The flagellae and nucleus can easily be seen. For a complete description of the organism, the reader is referred to Powell's recent article. Miller has suggested the addition of 0.1% safranin as a diluent to the pus. The protoplasm of the leucocytes takes the safranin stain and the Trichomonas vaginalis organism remains unstained and clear against a pink background. The organism has been artificially cultured. Its life history has not been determined as yet.

Ever since the discovery of the organism, the perennial question has been: is Trichomonas vaginalis really pathogenic or is it only a secondary infection? After its discovery, many thought it was just a simple ciliated cell. Investigation, especially during the last twenty years, has produced more evidence that the organism is definitely pathogenic. There are a few workers today who deny its pathogenicity. Hibbert is one of them. He concludes that the vaginitis is due to an associated non-haemolytic streptococcus. Many have observed an association between gonorrhoea and Trichomonas vaginalis vaginitis.
The explanation proffered is that the gonorrhoea infection allows the normal bacterial flora to increase and so weaken the vagina that it becomes a prey for the Trichomonas. The most feasible explanation is that of Collis, who says that the vaginitis is caused by the Trichomonas vaginalis, but that it is necessary for the resistance of the vagina to be decreased, either by local or general means. This view seems to harmonize with many of the conclusions arrived at in the recent literature.

Many unsatisfactory theories have been elaborated as to the source of the infection. Histories indicate there is some relation to coitus. The ages at which the disease occurs, namely 18 to 40, suggests that coitus may be a factor. Paul Vitschke showed that 0.3% of patients with prostatitis have Trichomonas vaginalis in their prostatic secretion. He believes that the Trichomonas is present in a fair percentage of cases of the so-called non-specific urethritis and should be looked for as a routine.

Briefly, other possibilities as to the source of the infection are: a spread to the vagina from the bowel, and a transfer by hand from the mouth. There is a chance the infection may be a water-borne one. Davis indicates that the disease may be developed from contact with contaminated water, as many cases are contracted in the summer during bathing in the warm waters of inland lakes.

**SYMPTOMATOLOGY**

The usual subjective symptom is a leucorrhoea, often copious, watery, foamy or frothy, and white or yellowish white. It begins fairly suddenly, with smarting of the external genitalia and has a very disagreeable, sourish odour. In the majority of cases, there is an increase of symptoms prior to and following the menses. The patient may have a severe backache, with a bearing-down sensation in the pelvis. Half of the cases have a history of urinary difficulties, such as frequency, dysuria and nocturia. Pruritis around the vulva and even involving the thighs, occurs. Dyspareunia is a common complaint. Associated arthritic and rheumatoid pains in the legs and chest are frequently relieved upon treatment. The general reaction of the patient is slight, although the discharge and pruritis usually cause some mental depression.

The vaginal discharge first brings the patient to the physician. Allen says that the diagnosis of this condition is not as accurate as it should be, in general practice. Davis comments that "the rarity with which this condition is diagnosed is due to the fact that study of the fresh vaginal secretions is not usually considered a part of the gynecological examination."

A patient presenting herself for investigation of an abnormal vaginal discharge may be examined as follows: An unlubricated speculum is introduced into the vagina, and smears are made from the
cervical canal. A little of the exudate clinging to the blades of the speculum is mixed with a small quantity of warm normal saline, is transferred directly to a slide, covered with a cover slip and examined microscopically. Following this, any material expressed from the urethra should be smeared for staining. It is important that this material be obtained before digital examination is begun, because lubricants quickly arrest the movements of the flagellates. The patient should not have taken a douche or received any other vaginal medication in the previous 48 hours. Later, the staining of the dried secretion will serve to differentiate the Trichomonas from the common organisms in vaginal infections, such as the gonococcus and yeast. Methylene blue and the gram stain will demonstrate the presence of the gonococcus. If yeast is found in the vagina, a qualitative test for sugar in the urine is indicated. The presence of staphylococci or streptococci may be a clue to the cause of a non-specific vaginitis.

The local lesion in the vagina has been described as the “strawberry vagina.” The vaginal walls have a peculiar pink colour, which upon closer examination is seen to be due to small, slightly elevated, petechial spots scattered over the vaginal mucous membrane, especially that of the vaginal vault.

TREATMENT

Salbery and Brunet found that 80% of their cases were controlled by simple methods and that 20% were subject to recurrent exacerbations. In the latter cases, treatment by powders was most efficacious. They advise, as a preliminary measure, gentle cleansing of the entire vaginal tract with tincture of green soap and water. This is followed by the maintenance of efficient drainage and the use of weak antiseptics.

Measures, directed toward raising the general resistance of the patient, are important. The following have been stressed: rest, both physical and sexual, a high vitamin diet, such a reduction or increase as may be necessary to make the body approach normal weight and a maintenance of the normal constituents of the blood.

Collis speaks highly of Devegan, an arsenic compound combined with boric acid and a carbohydrate vehicle which is dispensed in tablet form. After insertion of the tablets into the vagina, they are broken up, and form a layer of paste which clings to the walls. As a rule, douches are not required, but if there is any debris in the vagina, douches of sodium bicarbonate are best. The treatment is begun with two tablets per day, and this dose is continued until the discharge is well controlled. At this point, the dosage is lowered to one tablet per day, and treatment at this level is maintained for six weeks. Then only one tablet a week is inserted and a careful microscopic examination is made at each visit, to discover the organism.

Another efficient treatment employs silver picrate. This is supplied in suppositories and in a powder form. The initial treatment consists
of the distribution of 5 grams of the powdered silver picrate over the entire vaginal wall by means of an insufflator. The patient then inserts one suppository containing 2 grains of silver picrate each night, until six have been used. She then returns for a second insufflation. Usually, barring re-infection, no further medication is required.

A few women have a marked sensitivity to both arsenic and picric acid. In such cases these treatments should be discontinued at once, and another form of therapy advised.

**SUMMARY**

1. Trichomonas vaginalis vaginitis is one of the important vaginal infections.

2. It should not be confused with gonorrhoea.

3. The male consort should be examined in cases of recurring Trichomonas vaginalis vaginitis.

4. Microscopic inspection of fresh vaginal secretions should be a part of the gynecological examination in vaginitis.

5. The local administration of arsenicals and silver picrate over periods of time should form the basis of treatment.

**BIBLIOGRAPHY**

Allen: Amer. J. Surg., 33; 523-528; September, 1936.


**THE DOCTOR’S LIFE**

To be day and night at the beck and call
Of men who cheat and women who lie;
To know how often the scoundrels live,
   And see with sorrow the dear ones die:
To be laughed to scorn as a man who fails,
   When Nature claims her terrible debt:
To give a mother her first-born’s smile,
   And leave the eyes of the husband wet;
To face and brave the gossip and stuff
   That travels about through a country town;
To be thrown in the way of hysterical girls,
   And live all terrible scandals down;
To study at night, in papers hear
   Of new diseases and human ills;
To work like a slave for weary years,
   And then to be cursed when you send your bills,
Now, just one word! Don’t be too hard
   On those who cannot afford to pay.
For nothing you’ll cure the widow and child;
For nothing you’ll watch till night turns to day.
"The Cholera Beacon"

By ELAM STIMSON, M.D.

PART II.

The continuance of the thin, light-colored or greyish stools before the occurrence of the watery flux and other more alarming symptoms are liable to great variations in different persons. Sometimes only two or three of these occur before the watery diarrhoea, and is seen followed by collapse, the whole within three or four hours. But generally it continues "off and on" for a day or two, sometimes four or five days, before the watery flux—and in some other cases it has disappeared without the use of medicine, or was cured by very simple means.

During the continuance of this diarrhoea, that precedes the watery, the patient has usually a sense of weakness, and trembling or fluttering at the heart, and sometimes nausea and vomiting; but frequently would call himself well; the most inconvenience he suffers being from the weakness. As in the first form of attack, there is sometimes the indescribable distress, but from our own observation conclude it does not so often occur until near, or at the time the watery diarrhoea commences, or the setting in of collapse.

Of the third form, or Constipated Attack: We have so denominated this from the costive state of the bowels for some time previous to the diarrhoea. This state ought to be particularly regarded—although the Cholera is not often preceded by costiveness, yet when it does occur, it is much more dangerous, and sooner arrives at the stage of collapse. There are many persons in whom previous to their exposure to the epidemic influence, have too torpid and inefficient action in the function of the liver, and such consequently suffer from habitual costiveness. In others the secretion of bile is performed with much irregularity, and costiveness and diarrhoea alternately succeed each other. Such persons, it is thought, are more liable to Cholera—and on account of their previous habit of body would naturally conclude this constipation or relax only a common occurrence. But when the system has been subjected to the epidemic influence of Cholera, this constipated or relaxed state of the bowels are very liable to run into the watery diarrhoea.

If while thus constipated there are occasional slight faintings, or some degree of sickness at the stomach, or faintness or fluttering at the heart, loss of appetite, in short, any of the first grade symptoms, the danger of an attack is greater, and perhaps is in proportion to the number and severity of these symptoms. But even when these are absent a good degree of vigilance is necessary.

In one case that came under our care the patient was severely attacked with the diarrhoea, followed within an hour by vomiting and cramps until which he had no other symptoms but costiveness, except a slight fainting or fluttering when engaged at his work (haying) for
a day or two previous. This patient, however, recovered under the treatment hereafter recommended.

Nothing definite can be said as to the time this costive state will continue—but if it terminates in Cholera, the time between the constipation and the watery diarrhoea and collapse is usually very short. The first profuse evacuations from the bowels are sometimes preceded by the rumbling and commotion, or there is almost always some sensible movement of the bowels—and they are also commonly attended by nausea. The emptying, or first discharges (as in regular attack) are usually attended with some griping and pain. This, however, is often slight and of short duration, and the time between the first of these profuse evacuations from the bowels, to such as are without pain or griping and the stools without fetor, is sometimes not over a few hours. As in other forms of attack, the indescribable distress and general tremor is often experienced as also severe shooting pains in different parts of the body.

Of the fourth form, or Bilious Attack: This is so denominated because the truly Cholera diarrhoea is preceded by a bilious relax. During summer and autumnal heat, a bilious diarrhoea is very common. The stools are generally of a yellow color, or they have a greenish yellow tinge, and sometimes of a dark green—pain and griping usually attend, and sometimes sickness at the stomach—but often when a person is attacked with this bilious diarrhoea that has been exposed to the epidemic influence of Cholera, it is but a fearful prelude to that disease.

It is true the bilious relax frequently subsides of itself, or with the use of very simple means, and the patient subsequently suffers but little except from debility and wandering cholic-like pains—yet in perilous times this bilious state of the bowels may either gradually or suddenly, and to the patient imperceptibly, glide into the watery diarrhoea. We say imperceptibly because as the pain and griping diminish the patient considers his case improving—whereas, if the pain and griping be diminished, and the stool be thin and of a more clear yellow color, imminent danger is betokened—and the truly watery flux will be likely to follow in a short time.

In all the forms of attack, the vomiting does sometimes precede the diarrhoea, or comes on at the same time—and in some few cases, spasms have appeared equally early—such instances, however, are rare, but some sickness at the stomach is most usually present when the diarrhoea begins. Short paroxysms of fever, or what is usually termed “hot flashes,” commonly precede the diarrhoea—though for the most part of the time the surface is colder than natural. The tongue has a soft, moist and smooth appearance, and of a darker hue than natural. This appearance of the tongue we consider a pretty sure indication of a strong predisposition to Cholera.

When children are attacked with Cholera (i.e., third grade), or Cholera developed, the vomiting usually takes place at an earlier period
than in adults—in them it is sometimes the first sign of illness. The first cases in this vicinity (the children already alluded to) commenced with vomiting, and such was the general aspect of the little sufferers that by their parents they were thought to be suffering from some vegetable poison.

It should be noticed that these attacks were shortly after playing (wetting and washing their heads) in a tub of water.

We have now described the different symptoms by which Cholera may be detected before, or at the time the disease has reached the stage to which we have arrived in our description, i.e. the watery diarrhoea.

The reader may rest assured that very few cases of Cholera occur (in this country) but what will fairly class with some of the forms of attack described—and this description should be familiar to the mind of every person who expects to be prepared to detect an incipient attack—but yet there may be some times cases occur in which the symptoms of the different forms of attack appear to blend with each other, forming what might be called a complicated form of attack. These, however, may be readily recognized by any observing person, who will give the above description and the existing symptoms a due degree of attention.

We should mention that some cases have fallen under our observation (and more have come to our knowledge) in which persons addicted to the use of ardent spirits have in that state of debility which always follows preternatural excitement, i.e. which "cooling off," after a debauch (a spree), been suddenly attacked with the Cholera and soon died, without our being able to obtain any evidence of their having had any previous disorder of the bowels.

We come now to consider that stage of the disease as it commonly appears from the setting in or commencement of the watery flux, to the state called collapse—or an entire failure of pulse at the wrist. The first circumstance, and one that might properly have been noticed before, is the change in the countenance. To the friends of the patient and the inexperienced in Cholera, this change might not be noticed. Upon particular observation the countenance will be found to have a more contracted, sharp, or sunken appearance. The eyes are somewhat sunken and the whole physiognomy somehow changed. In it there is often a sort of wildness or timidity more easily recognized (by a frequent observer) than described. This change we have repeatedly noticed, previous to any purging or vomiting whatever. There is also a coldness of the surface of the body, of which the patient is at this time very sensible—but as the disease progresses the sensation of heat is experienced.

As already observed, the vomiting in children frequently precedes the diarrhoea, and sometimes in adults—but most commonly the vomiting occurs from two to eight hours after the setting in of the watery diarrhoea. The contents of the stomach will be first ejected, after which the matter vomited is much like that discharged from the bowels—
cramps now attack, most usually first the toes and fingers, and calves of the legs. The lips and tongue are of a dark or blue color, the latter appearing smooth, soft and moist. There is no evidence of any secretion of bile, urine or tears—there is great thirst, the breath colder than natural, the skin has a dusky appearance, and unnatural doughy feel—the pulse weak and oppressed, sometimes slow, somewhat like that from oppressed brain, but weaker, or rather smothered. The distress or oppression at the pit of the stomach (a symptom almost always present) is considerably increased. If interrogated as to the seat of distress, generally refers to the lower part of chest, and calls it "sense of tightness," or "heavy weight," or "distressed fullness." He often sighs or draws a long breath, and in many cases they complain of "want of air." Sometimes in this stage of the disease there is a sense of fullness or "distress in the head." There is great sensibility of the skin, and, though the surface is covered with a cold, clammy sweat, he suffers a sensation of tormenting heat. There is great anxiety and general restlessness.

If the disease is not arrested, the state of complete collapse will soon ensue. As this stage approaches, all the symptoms become greatly aggravated and still greater uniformity exists in different cases. The pulse grow small, thready and tremulous, and are soon imperceptible. Spasms are more severe, attacking the legs, thighs and body. The fingers and toes are reduced in size, being shrivelled and purple or black. The veins in the arm are only flat and black lines—a cold, clammy sweat covers the whole surface, and to the feel the skin is like a cold, wet hide. The spasms increase and some patients utter the most piercing cries—the thirst is more and more intense, and of a peculiar kind, the patient often supplicates his friends and physician with the most pitiful tones for "cold drink" as the last, greatest and only favor in their power to bestow. The eyes are sunken in their sockets and surrounded by a blue or black circle. The voice fails, is dry, hoarse, or only a whisper, and great restlessness.

After having thus suffered more than horrible martyrdom, the patient has commonly a great alleviation of suffering before death, being less purging, vomiting and spasms, and he often expresses himself better—or he lies in a sort of apoplectic stertor (though not like that from surcharge of blood upon the brain) apparently alike indifferent and unconscious of his fate, and expires with but little additional suffering.

This description of a distressing and closing scene in Cholera applies more particularly to its appearance in the middle-aged and robust. In the aged and infirm a greater degree of firmness and resistance is wanting in the constitution for the disease to exhibit its malignancy. The feeble hold they have upon life is easily shaken off—with the watery flux comes a little retching, and perhaps vomiting, some slight spasms, and distress at the pit of the stomach. The features gradually shrink, and in a few hours dissolution is effected without much violence or pain.
A weak, whispering voice begging "a drink of cold water" is almost the only expression of desire or suffering.

**TREATMENT**

In all our remarks upon this disease and its treatment, it is supposed that the persons in whom these symptoms appear have been, or are at the time of their appearance, subject to the epidemic influence of Cholera.

Under such circumstances it behooves all who regard the safety of themselves and such as are entrusted to their care to watch with the strictest vigilance for the symptoms described previous to the commencement of the watery flux, and upon their appearance resort without delay to the remedies now to be recommended. It certainly would be preferable to do so under the care of a scientific physician—but circumstances often render it impossible. When the disease is once progressing, the delay of an hour, even of half that time, is often extremely hazardous. We therefore (until we treat of the pathology) speak as though every reader was to be his own physician. If the treatment be commenced very early in the disease, much less medicine will be required to effect a cure—20 or 30 grains of Calomel, with half a pint of hot ginger tea, and rendered more diffusible by adding a small quantity of brandy, rum or whisky, and keeping the body warm, will be all that is necessary. But the course of medicine now to be prescribed is appropriate to that stage of disease approaching the watery diarrhoea, or the very commencement of that flux—this may be considered a medium course. As a general rule, the quantity and frequency in the repetition of the doses should be varied as they are intended to meet the disease, prior or subsequent to that stage.

When we recollect that the disease sometimes makes sudden and unexpected advances, we should be decided and efficient in the application of remedies, and if in their administration we err at all, let it rather be on the side of excess, especially of the pure stimulants. For if a greater quantity of these are given than is strictly necessary to counteract the disease, only some additional fever is excited, and perhaps a slight and temporary inflammation of the stomach, states of disease wholly incompatible with Cholera—and no danger need be apprehended from the last so long as a febrile state exists.

With other symptoms of Cholera is the distress or sense of tightness, or fullness at the pit of the stomach. This is a pretty sure indication of the necessity of bleeding. From an adult draw 3 half pints or more, and give 5 grs. of Calomel, with 5 of Capsicum, and repeat this once in half an hour until you have given 3 doses; and between each dose (of the Calomel and Capsicum) give 25 or 30 drops of some of the essential oils, as of peppermint, cloves or origanum. The drink should be hot ginger or allspice tea. During this treatment the patient should keep himself warm in bed—should relax compel him to rise, have on socks, and avoid stepping on cold floor and exposure to the cool air as much as possible. Should these check the relax and vomiting (if the last be
present), a further use of Capsicum and oil of peppermint may not be necessary—but after an interval of three or four hours give 15 grs. of Calomel, with or without Capsicum, as the particular symptoms indicate at the time. If all the Calomel taken is retained (i.e., if not vomited) and the relax checked, and the surface of the body warm, wait patiently twelve or fifteen hours for the operation of the Calomel, giving only weak ginger tea. If this Calomel should not operate, give Elixr. Pro., 2 teaspoonfuls every two hours, until an operation from the bowels be procured.

If this treatment be early adopted it will seldom fail of arresting the disease at once. The thin, light-colored or greyish or watery stools will be followed by bilious, having more odour and color, and the patient will require little else than a short course of tonic and opening medicines. Huxham's Tinct.—Elixr. Pro. or Hiera Picra—varying or alternating their use as the particular condition of the stomach and bowels may require. If there is considerable pain in the bowels, and the Elixr. Pro. fails of allaying it, give 15 or 20 drops of laudanum and repeat, if necessary, to relieve the pain.

If from previous neglect the case shall have made a more dangerous progress before the treatment is commenced, the most efficient and energetic measures should be pursued. Let the patient be constantly rubbed with hot flannel cloths; at the same time draw blood—if it is thick and black and flows with difficulty, only trickling slowly from the arm, the necessity of abstracting it is great. Continue to draw blood (if you can) until it flows a full stream and is of a more florid color. Give 10 grs. Calomel, the same quantity of Capsicum, and follow it immediately with about 40 drops of oil of peppermint. When these have been down about ten minutes, if you failed of getting blood first, try again, and be sure to make a large opening in the vein, even make an orifice in each arm, and by rubbing the arms may ultimately succeed. The fact that long-continued exertions have sometimes unexpectedly been crowned with success should encourage the attendants to persevere. If you succeed in bleeding so as to cause it to flow freely and to become more florid, the danger is greatly diminished, and by following up the advantage thus obtained, with Calomel, Capsicum and other pure stimulants (not narcotic) a recovery may confidently be expected. The friction with hot flannels (under the bed clothes as much as possible) should be continued, particularly to the feet and legs, where the spasms are most severe, and dry heat, by applying hot flannels, bags of hot bran, or bottles of warm water to the body generally.

Continue to give of Calomel and Capsicum 10 grs. of each. The best time for giving this is immediately after vomiting, and repeat every half hour, or oftener, should there be frequent vomiting, until at least 40 grs. of Calomel be retained in the stomach. Should the medicine be repeatedly ejected when given this way, give 20 or 30 grs. of Calomel immediately after vomiting, alone and dry—putting only a teaspoonful or two of ginger tea in the mouth just to enable the patient to swallow the Calomel, and give no drinks for some time after.
Between the doses of Calomel and Capsicum give large doses (40 or 50 drops) of oil of peppermint, and the tincture of Capsicum and Myrrh in teaspoonful doses.

The most pure astringents should also be given in conjunction with the stimulants. Take equal parts of the tincture of Kino, Catechu, and Gum Guaicum, and mix—of this give a tablespoonful in a little ginger tea, and repeat as the case requires, i.e., as the evacuations are more or less profuse. The foregoing treatment will very seldom fail of curing Cholera, whenever it is resorted to while blood can be, and actually is, drawn in a full stream, and until it becomes more florid. But if the patient previous to, or during the course of this treatment, should take emetics or other nauseating medicines, or opium in any form, in sufficient quantities to have any sensible effect, they may counteract the beneficial effects of the remedies here recommended—or at least render a favorable issue more doubtful. But even when blood cannot be drawn, or if emetics or opiates have been injudiciously administered, the foregoing plan perseveringly employed, affords the patient by far the best chance for his life.

There is one other variety of Cholera in which sudden and dangerous congestions occur without being preceded or attended by the common symptoms, as vomiting, spasms, etc. Believing it to be produced by the same cause, we have called it Primary Cardiac Congestive Cholera. Of this variety of the disease we have seen but two cases; for which see Appendix Nos. 1 and 2.

PATHOLOGY

For the purpose of popular instruction we might remain silent in regard to any theory—but courtesy to the medical profession alone would be sufficient reason why we should devote a few pages to an explanation of the theory of a disease for the practice in which we have so confidently laid down rules for the non-professional reader, with whom that practice must necessarily be mostly empirical.

In the intended brief investigation of the pathology of Cholera, it is hoped that all bias or preconceived opinion as regards the nature of the disease will be wholly laid aside, and that he judge the case as it shall actually appear from an investigation of all the facts, and not from any preconception, founded upon a partial view of the numerous circumstances connected with the disease.

These preliminary remarks may seem unnecessary, but our only intention is to prepare the mind of the reader to give the varied phenomena of Cholera a full examination—not of a single and isolated case, but to trace its effects upon many individuals from the most slight and evanescent morbid sensations, to the stage called collapse, and from that to recovery or death.

We believe the remote cause of Cholera to be some atmospheric impurity, and the proximate cause an imperfection in the performance of the chemical function of the lungs. The opinion of the reader may probably coincide with ours in respect to the remote cause. He will
also perceive that the evidence to be adduced in support of our opinion of the proximate cause must, from the nature of the case, be mostly circumstantial.

In these circumstances there are many which, if viewed abstractly, lend but little or no support to our opinion, but when compared with others, striking coincidences, and a sort of concatenation is produced, which upon attentive examination has produced upon our mind a firm conviction of the correctness and validity of the hypothesis here set forth.

In all our intercourse and examinations of persons affected with the first grade symptoms, and from numerous and anxious investigations at the bedside of the sick and dying, we found it impossible to reconcile the varied phenomena, with the idea of their being the product of local irritation. In view of the first grade symptoms, we had such a variety and so discordant sensations as to be wholly irreconcilable with any known laws or usages of sympathy. In the absence of all evidence of local inflammation, or previous or existing arterial excitement, without even the slightest indications of a phlogistic diathesis, through what medium can these morbid impressions, these nervous irritations be produced, but through the medium of the circulating blood.

Before fully entering upon the modus operandi of Cholera we should take a summary view of the three principal excretions by which the blood is continually discharging its impurities, that is, the lungs, the liver and kidneys. The lungs performing the double function of decomposing atmospheric air, and robbing it of its vital properties, the oxygen—and at the same time disengaging from the blood a part of its impure and noxious matter—hydrogen and carbon—but the blood not being fully decarbonized in the lungs, has an adjuvent or supplementary organ in the liver, which extracts another portion of this impurity in the form of bile—to be like the manure of the farmer, converted to a useful and important purpose. And last, the kidneys, like a wasteweer to the system, clear the blood of such superfluous matter as is of no further use.

We ought also fully to consider the mutual influence and reciprocated action that exists between the nervous and vascular systems. Not only of the mechanical action of the blood vessels upon the nerves, but the chymical qualities of the blood itself, must be to a certain degree pure, or the proper energy and influence of the nerves can never be maintained. Neither must we forget that a gland cannot act upon imperfect blood, or if it contain heterogeneous or extraneous matter—even though that gland was receiving its usual degree of nervous energy.

The form called Regular Attack is perhaps the least complicated form of the disease. We therefore select that as a sort of pathological text.

In whatever the atmosphere impurity consists, the effect of it when inhaled is to incapacitate the lungs from fully performing their excretory function. A small portion of the hydrogen and carbon, which in the lesser circulation ought to be disengaged, passes to the left portion
of the heart and is again sent the rounds of the general circulation. But the retained impurity is so small in quantity that no immediate mischief results from it. After a few days (more or less in proportion to the change the blood undergoes in the lungs) the impurities increase and their action upon the nerves in various parts of the body in the capillary circulation produces the varied morbid sensations, the first grade of Cholera.

The liver is the organ upon which devolves the task of clearing the blood of this impurity—but in consequence of its action upon the nerves, their influence is diminished and the secretion ceases. At the same time the whole sympathetic system of nerves suffer from the same cause. Their energy is diminished. The blood now accumulates in the vena portea, and forming an obstruction to the venous circulation of the abdominal visera—dissolves, the serum exuding from the inner surface of the intestines, produces the watery diarrhoea.

In consequence of the imperfection in the chymical part of respiration, animal heat is not fully generated. The temperature, not only of the surface of the body, but of the blood itself is diminished.

This, together with its obstructed course through the liver and the gross impurities it contains, are all circumstances highly favorable to its dissolution. And the absence of valves in the veins of the abdomen and the want of bile in the intestines to excite their inner surface are also as favorable to the regurgitation and effusion of the serum.

When this paralyzed state of the sympathetic nerves occurs, and the liver ceases in its function, the process of digestion also ceases—the contents of the stomach and intestines are only an extraneous substance, which irritating their inner surface (mechanically) increase their peristaltic motion; the discharges previous to the watery diarrhoea are the consequence.

Another most important organ that suffers from the want of nervous influence is the heart. The force of its contractions are diminished, whereby congestions take place not only in the great veins connected with the heart, but in the venous portion of that organ itself; and these congestions further diminish and oppress its action.

The imperfect or smothered excitement which often precedes the disease appears like an effect of the heart to overcome these incipient congestions, and the "hot flashes" a sensation produced by the action of the impure blood upon the nerves in the cutaneous capillaries.

That form of attack which is by a diarrhoea of thin, light-colored or greyish stools, appears to be an effort of nature to supply the diminished or suppressed biliary secretion from the gastro-enteric mucous membrane. In these cases the nervous energy is gradually impaired, and when further diminished this morbid secretion ceases also—and is succeeded by the watery effusion and diarrhoea. This substituted morbid secretion cannot be much unlike that which takes place in Cholera Morbus—though authors speak of this as a vitiated biliary secretion—and though we sometimes meet with a few discharges of vitiated bile
by vomiting and purging at the commencement of Cholera Morbus, yet when the disease is fairly established no evidence can be obtained that any portion of the evacuations are the product of hepatic secretion.

This idea might seem to support an opinion entertained by some, that Cholera is but an aggravated form of Cholera Morbus—yet in the two diseases there are marked discrepancies. The pain and torments of the bowels and fetor of stools indicate not only a different state of the sympathetic nerves, but in the nature of the matter discharged from that which exists in the watery diarrhoea when the evacuations are without pain in the bowels and the stools without the fetid smell. Besides, the watery flux is not the product of a secretion. Of serum as it existed in the veins and on which no subsequent secretory process has been performed—or, in other words, it is haemorrhage.

Previous to 1832 Cholera Morbus, however severe, even when it proved fatal (so far as we know) never merged in the watery diarrhoea. It is conclusive then that Cholera Morbus (as it occurred in this country previous to '32) is essentially different from Cholera, inasmuch as the former is not attended with that paralyzed state of the great sympathetics, nor the dissolved blood nor watery diarrhoea, that so uniformly attend the latter.

In the constipated state of the bowels, which sometimes precedes the Cholera, it would seem that the secretory function of the liver only is diminished, and the blood continues its circulation through the gland. But little or no bile, however, is poured into the duodenum, a sluggish peristaltic motion of the intestines ensues—probably in these cases the blood becomes more highly carbonated, which together with the retained and hardened feces increase the watery flux when it does occur, and is a sufficient reason why such cases are unusually severe.

The bilious diarrhoea that sometimes precedes the watery diarrhoea is a regular effort of nature to free the blood of the impure matter by an increased biliary secretion.

The vomiting and spasms usually occur about the time the secretions become suppressed, or if present previously become greatly aggravated. Whenever the blood becomes unfit to furnish fluids by the secretory glands, it transmits the capillaries with difficulty, and in them is brought in more immediate contact with the extremities of the spinocerebral nerves, which thus irritating produces painful muscular contractions—the cramps. Hence they generally first attack the parts most remote from, and least under the immediate influence of the heart—and thus by rubbing the limb affected, the stagnating blood is forced through the capillaries, and temporary relief obtained. The capillaries are endowed with a great degree of sensibility and contractility—otherwise the blood would cease to be transmitted through tubes so innumerable and minute.

[To Be Concluded]
Perhaps the most discouraging phase of medicine to the student, is that embraced by the term "therapeutics." Yet, to the patient, this is without doubt, the most important consideration. A patient does not consult a doctor because he has a disease; most vital from the patient's viewpoint, is the fact that he has certain symptoms. He is not interested particularly to know that his is a rare syndrome, first described by John Doe, M.D., in 1700, characterized by a peculiar series of symptoms and signs, the treatment for which is "rather unsatisfactory." Yet, how often is the physician, who has by a wealth of theoretical and practical knowledge, made an accurate diagnosis, forced to tell the sufferer (if he is honest), that while the medical profession is quite familiar with his condition, unfortunately, nothing can be done for him.

It must be admitted, indeed, that treatment today is not the pharmaceutical bog of trial and error, hit or miss empiricalism, that made drug "nihilists" of so many medical men in the past; the "shotgun" prescription is no longer a haven for the incompetent or lazy diagnostician. With the arrival of vaccines, antitoxins and serums, we have controlled many of the formerly malignant bacterial diseases. This is excellent progress, but in one way, it has made medical practice more difficult. All the weaklings, formerly weeded out in childhood by diphtheria, scarlet fever, smallpox, etc., live now, only to perish prematurely from the degenerative group of diseases.

People, of course, will always die of something; it is, perhaps, just as well that they do. But too many people die in full possession of the intellectual and emotional faculties which make life desirable, early victims of hypertension, nephritis, and cancer.

The obvious course is, of necessity, more research. The modern laity have a rather exalted idea of the research worker; to them, he is a romantic figure in a white smock, who, far removed from the economic stresses of life, spends his days in a jungle of strange glassware, peering into microscopes. Unfortunately, he is an ordinary person who likes good food and good cars and would like to send his children to college. Until this academic phase of medicine is made more attractive economically, many men who have minds for the task will be forced to mark time in practice.

The world, it seems, has plenty of money for armaments today. Billions are poured into battleships and aircraft that, unfortunately, become obsolete, as we wait for the inevitable next war. Yet in the United States only a half a million dollars was spent on cancer research in 1936 by the government; Canada's expenditure will probably not bear close inspection. Therefore, until the public is prepared to risk its pocketbook to save its life and subsidize research properly, therapeutics will remain the dark chapter of medicine that it is today.
CEREBRAL VASCULAR ACCIDENTS

By C. M. H. Howell

Brit. Med. J.; Feb. 6, 1937; P. 255

These conditions are matters of daily occurrence. Their clinical manifestations are dramatic and are often difficult to diagnose.

Vascular accidents in the skull may be divided into:

1. Those due to injury.
2. Those due to the result of a disease process.

Haemorrhage As the Result of Injury—

As a result of injury, there may be concussion; haemorrhage; contusion or laceration of brain, associated with or without fracture.

Extradural Haemorrhage—

This is usually due to a head injury. There is a short period of concussion followed by recovery (lucid interval) and following this period, which is variable in length, there are symptoms of cerebral compression. These are: headache; vomiting; slowing pulse (full); rising blood pressure followed by paralysis, and finally, death.

Subdural Haemorrhage—

This occurs either in a diffuse or a localized form. The former is associated with a severe injury, which results usually in the laceration of a venous sinus. As a result, compression symptoms appear rapidly. The latter is more common and it is important to recognize the clinical picture produced. In elderly people the condition is produced by a comparatively slight injury and the haemorrhage is often bilateral.

It is important to keep people with recurring headaches after a head injury under close observation for a long period.

The pathology of the condition is remarkable. A membrane is developed around the extravasated blood which becomes vascularized, resulting in slow oozing. This causes a slowly increasing compression of the brain. Therefore, there is a fairly long latent interval and during this time the symptoms are of traumatic neurasthaenia, viz.: headache; irritability; lack of concentration; memory defect. As the compression increases, the patient becomes unconscious; the pupils dilate; breathing is irregular; the pulse changes from full and slow to feeble and rapid, and the blood pressure which was higher falls. Therefore, watch the blood pressure and pulse. Perform lumbar puncture.

Haemorrhage As the Result of Disease—

Mention is made of puerperal disease, and blood dyscrasias. Other lesions described are:

1. Leaking cerebral aneurysm — aneurysm most commonly occurs in the circle of Willis, and its branches, and therefore outside of the brain substance. The types described are—congenital (commonest). Here the muscular coat is developed in a deficient manner at the bifurcation of the artery; arteriosclerosis; Syphilis (rare); mycotic; arteriovenous.

Aneurysm is practically impossible to diagnose clinically without X-ray examination. This reveals the concentric rings of calcium (Albl's rings), following injection of thorotrast into the internal carotid artery.

The symptoms of leaking anerysm are sudden with severe pain; the cerebrospinal fluid is uniformly tinged with blood at first, becoming straw-coloured latter. The urine contains albumen and if the patient is in coma, the condition may be confused with uraemia. Neck rigidity is often present and is due to irritation of the posterior roots.

2. Cardiovascular disease. Embolism; thrombosis; haemorrhage. Embolism is usually associated with valvular disease. Thrombosis occurring on atheromatous plaques is a cause which should not be overlooked. If the artery is completely blocked, thrombosis will result, but if the occlusion is small the clot may retract with resulting disappearance of symptoms.

Thrombosis and haemorrhage in a young adult is usually due to syphilis, if tumour, disseminated sclerosis and embolus can be excluded. It is likely to occur when the blood pressure is low.
Premonitory symptoms are paraesthesia; aphasia, monoplegia. Haemorrhage may result from angiospasm. Therefore the blood pressure will determine whether there was thrombosis or haemorrhage. Haemorrhage occurs during activity and thrombosis during rest. Consciousness is more liable to be lost in haemorrhage. It is good practice to do lumbar puncture in every case of apoplexy. Convulsions indicate cortical irritation and are most frequently due to thrombosis.

The Severity of the Lesion—
This can be recognized from the depth of coma (response to cutaneous irritation); depression of the nervous system (muscular flaccidity) and condition of the respiratory centre.

Prognosis—
If the patient is unconscious for over 24 hours, the outlook is grave. There will never be complete recovery of limbs.

W. E. Crysler, '38

THE PROBLEM OF THE SPASTIC CHILD WITH CLINICAL SUMMARY OF 1,000 CASES
By A. Brockway, M.D.
Orthopaedic Hospital, Los Angeles
J. Amer. Med. Ass.; 106-9; May 9, 1936
This paper is the outgrowth of a year's study of 1,000 cases of cerebral haemorrhages. Probably the chief pathological condition found in the first month of life is injury to the brain from haemorrhage. In less than 50% of this series observed, is there a history of long hard labour or use of forceps; brain haemorrhage has occurred with Caesarian section. In deplegic cases, history of difficult labour is probably less than 30%. Some workers believe that in cases of diplegic paralysis, haemorrhage may not be the cause of the spasticity and mental deficiency but that something must have happened to check the completion of the motor pattern in these children; something interfering with the myelination process. In support of this view, there is the evidence of spasticity and alteration of muscle tone that develops in multiple sclerosis and the fact that 43% of the patients in this series show definite endocrine disturbance.

Early Treatment—
1. Early surgery to relieve haemorrhage is not successful because haemorrhage is often inaccessible and may be diffuse.
2. Frequent repeated spinal punctures until fluid is free from blood has given good results.

Later Treatment—
At Orthopaedic Hospital, a team of medical men from various fields has been formed to give the maximum end-results. Such a team consists of:
1. An Orthopaedic Surgeon who is in charge; who evaluates the surgical and bracing possibilities.
2. The medical consultant—deals with the endocrinological side of the case.
3. The dentist; necessary because of the poor mastication in these cases.
4. The psychologist, whose role is to help put physical therapy on a sounder psychological basis.
5. Neurosurgeon—who has all cases for routine examination and final diagnosis.

Physical Therapy and Occupational Therapy—
These departments teach the spastic child to inhibit those muscles not necessary and to use smoothly only those necessary for any particular act.

Speech Training—
About 15% of patients in this series showed speech defects after the sixth year. Speech training should be started along with mental training.

Surgical and Bracing Aspect—
In this series of cases, 542 surgical operations were performed, in 38% braces of some sort were worn during the treatment, in 28% shoe corrections were given.

Braces—
1. They help to stretch over-active muscles continuously.
2. They minimize the number of joints that are brought into play when walking so that a child learning to walk can focus his attention on fewer moving points.
3. Post-operatively, bracing prevents the original contractures from recurring.

Surgery—
(a) In upper limb:
1. Continuous stretching in plaster splints for flexion contractures of hand and fingers and mild pronation contractures, followed by training.
2. Severe pronation contractures are treated by transplantation of pronator teres so that the contraction of this muscle will cause supination.
3. For underslung thumbs, a complete or partial resection of nerve supply to short flexor muscle of the thumb followed by immobilization in abduction.

(b) In lower limb:
of the thigh and neurectomy of the obturator nerves for over-active adductors and scissors gait.

2. Casts or capsulotomies for flexion contractures depending on severity.

3. Lengthening of the short heel cords plus bracing to improve balance.

4. Stretching and bracing is of more value than resection of nerve supply to gastrocnemius muscles for over-active calf muscles.

5. Stability operations for deformed feet, and uncontrolled motions are of value.

Comment—

Given a child of fair mentality, an intelligence of 80 or more, a great deal can be done for these spastic patients under the regimen outlined. **M. Wong, '37**

---

**THE ORR TREATMENT OF PYOGENIC OSTEOMYELITIS**

*By Jacob Kulowski, M.D.*

*Ann. Surg.;* April, 1936

Although the Orr treatment of osteomyelitis is as much a procedure for cases of acute osteomyelitis as it is for chronic, its value in the treatment of chronic osteomyelitis is probably greater than that of any other method.

The procedure is based on two major premises—adequate drainage and adequate rest. Both of these are equally important and neither one alone is sufficient or can be subordinated to the other. The ideal to be attained in the treatment is the complete eradication of the infectious bony process whenever possible and the author believes that osteomyelitis is a most devastating disease which must be combatted by bold, aggressive, radical, operative measures. He is convinced that the majority of cases are pitifully under-treated. He discusses the Orr treatment under the following headings:

1. **Approach**—

   The most direct incisions are used and the area is opened widely. If old sinuses and scarred areas are present, they must be excised in order to establish a subsequently healthy basis for granulation tissue. In infected compound fractures, counter-incisions must always be made.

2. **Saucerize and Remove All Diseased Bone**

   The bone in chronic osteomyelitis usually presents considerable debris and one or more sequestra. Thorough curet-
MENTAL DISORDER ASSOCIATED WITH CHILD-BEARING

HARRIS, J. S.


The author presents an analysis of forty-five cases of mental disorder associated with child-bearing.

The cases resolve themselves into three groups:

2. The Delirious Group—(Acute Confusional).
3. The Schizophrenic Group.

Thirty-seven of the forty-five cases showed that child-bearing appeared to be in whole or in most part the cause of the breakdown.

Group I.—15 Patients

Twelve depressed cases with high recovery rate, two excited cases, and one varied between depression and excitement.

Duration of illness—Two to thirty-two months.

Average duration—12 months.

Ages—Eighteen to thirty-nine years.

Average—Thirty-two years for recovered cases; thirty-three years for unrecovered cases.

Primiparae and multiparae both present in this group. Multiparae unrecovered.

Other aetiological factors were:

1. Congenital mental defect—2 patients.
2. Physical debility.
3. Unhappiness and infidelity.
4. No other factors—3 patients.

The author discusses in detail each section of cases comprising this group.

Group II.—8 Patients

Six patients recovered in from three to six and one-half months.

Ages—Seventeen to thirty years.

Average—Twenty-five years.

One patient died of pulmonary tuberculosis.

One patient unrecovered; age thirty years.

Those who recovered were primiparae; the unrecovered case was a multipara.

Other aetiological factors:

1. Toxic focus—1 patient.
2. Family mental disorder—1 patient.
3. Cessation of breast feeding—2 patients.
4. Unhappiness and infidelity.
5. Monetary difficulties.

The onset of the mental illness occurred within the first ten days after parturition in six cases; in the remaining one the onset occurred some eight months afterwards, and coincided with the cessation of breast feeding.

Group III.—14 Patients

Seven patients recovered in from five to thirty-five months. Six patients are still ill. One patient is dead.

Ages—Twenty-three to forty years.

Recovered cases (average) 28 years.

Unrecovered cases (average) 30 years.

Primipare—8 patients, 4 recovered.

Multiparae—6 patients, 3 recovered.

Other aetiological factors:

The factors here seem similar to the other two groups. The author then discusses the whole thirty-five cases from the point of view of prognosis.

Time of Onset of the Psychosis—

The author discusses the relation between time of onset and its relation to recovery. Patients who develop mental symptoms within the first week after parturition are likely to recover.

Mode of Onset

Sudden and gradual onsets are described in fifteen and twenty cases respectively. The recovery rate appears to be higher in the cases of sudden onset.

Duration of the Psychosis—

Average duration of the mental symptoms was ten months. The author points out after group discussion that “when dealing with the different forms of psychosis, all the excited and delirious patients who recovered did so in a relatively short time, while rather more than half of the depressive patients who got well took a relatively long time.”

This whole article discusses the cases presented in detail and serves a satisfactory understanding of these mental patients.

—JOHN M. GRAHAM, '37.
Complete Proteins

Vi-Tone provides balanced nourishment in appetizing, highly digestible form. Supplies complete proteins. Widely approved for delicate digestions.

"A Food - Tonic - Beverage"

Vi-Tone Company

HAMILTON - CANADA

CORAMINE "CIBA"

A non-toxic circulatory and respiratory stimulant for oral, hypodermic, intravenous and intracardiac administration.

Improves the pulse and blood pressure, reinforces the contractions of the myocardium.

Very wide margin of safety (1 - 15 c.c.)

AMPOULES LIQUID

CIBA COMPANY LIMITED MONTREAL

When writing advertisers please mention University of Western Ontario Medical Journal.