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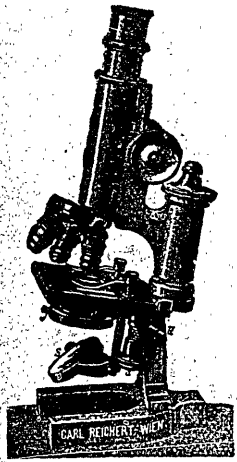

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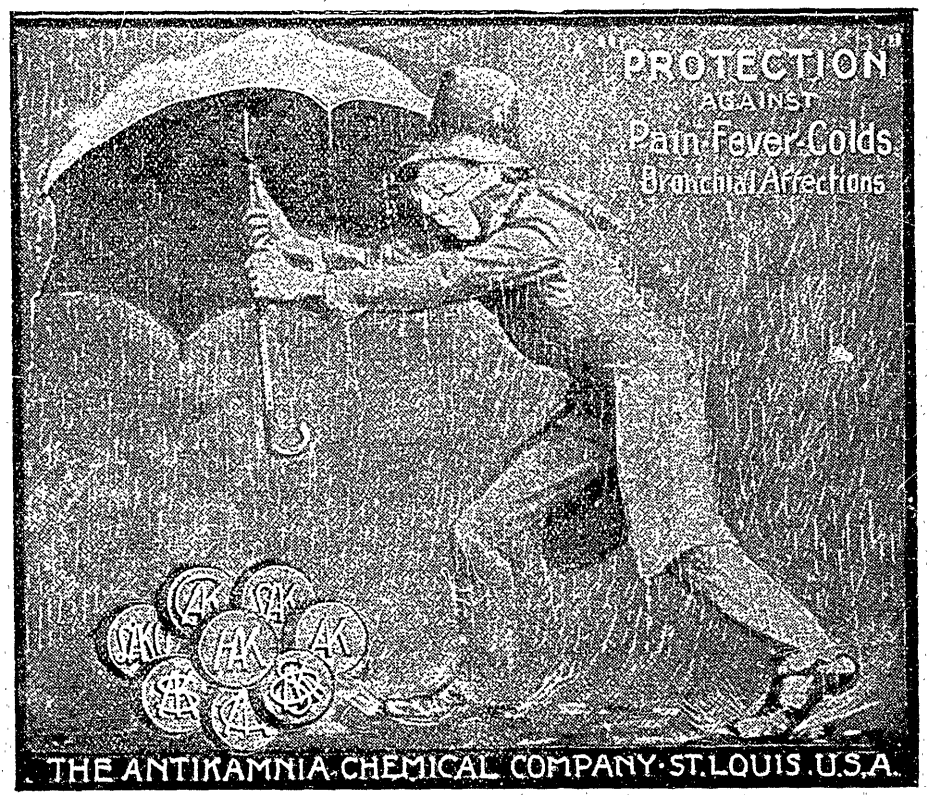

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MARITIME MEDICAL NEWS.

A MONTHLY JOURNAL OF MEDICINE AND SURGERY.

VOL. XV. HALIFAX, N. S., NOVEMBER, 1903. No. 11

THE BURIED ANIMAL SUTURE: ITS VALUE IN ASEPTIC SURGERY.*

By HENRY O. MARCY, A. M., M. D., LL.D., Boston.

I am glad to avail myself of this opportunity to write a chapter of surgical history which, to the young graduate, may seem ancient.

In 1869 it was my singular good fortune to have become, accidentally, and in a special way, the first American pupil of the now world-wide famous Lord Lister. I thought I knew surgery at least exceptionally well for a man of my age. As a graduate at Harvard, I had been the student of Warren and Bigelow. From a subordinate medical position in the army, I left the United States service as a Medical Director at the close of the war between the States. I had been a post-graduate pupil and assistant in Harvard until I entered the University in Berlin, in 1869. There I profited much from the teachings of Langenbeck, Martin and Virchow. After a brief period of study in London, in 1870, I had arranged to become the pupil of Sir James Simpson in Edinburgh. Death, sudden and unexpected, had seized upon him in the midst of his active career. Syme soon followed, leaving as his representative in the surgical clinic, his son-in-law, Mr. Joseph Lister, formerly of Glasgow.

I was advised by several surgeons of local repute to have nothing to do with this man, since his opinions were so utterly different from the accepted demonstrations of science, that they must be misleading and harmful. The first morning at his clinic dispelled from my mind all doubt and misgiving; he certainly was doing work utterly unlike any which I had hitherto seen, and I was equally sure that it was contrary to the accepted belief, called surgical science. Several resections of the elbow-joint were undergoing the processes of primary union without suppuration, or even pain. I found that I had, in a measure, to learn my surgery over again, and that, if Mr. Lister was

*Read before meeting of Medical Society of Nova Scotia, Antigonish, July 1st, 1903.

correct in his teachings, operative surgery must be rewritten. It is not my purpose to recite to you of Mr. Lister's work, fortunately now well known to all surgeons, except so far as pertains to the ligature and suture. To him belongs the immortal honor of demonstrating, in a pioneer way, the vital causes of bacterial infection, or the then so-called wound inflammations. These studies were inspired by the teachings of Pasteur upon the processes of fermentation, which, hitherto, had been considered, under the leadership of the great Prof. Liebig, *chemic* rather than *vital*. Convinced that a something from without of individual vital existence had been introduced and developed within the tissues, the conclusion was evident that that vital something must be excluded at the time of operation, or afterwards destroyed in, or removed from, the wound. This, to his clear and convincing judgment, made simple and easy, results which had hitherto been considered exceptional, if not accidental; to wit, the primary union of all non-infected wounds. As a corollary, it was evident that the arteries might be ligated in continuity with little or no danger from secondary hemorrhage. In order to demonstrate this important fact, it became necessary for him to pursue his investigations in comparative surgery upon the Continent, the laws of Great Britain prohibiting vital studies upon the lower animals. However, singularly enough, up to this time, it had not occurred to Mr. Lister that which now seems an equal obvious deduction, the burial of sutures, introduced for the purpose of closure of wounds. Naturally, it became evident to Mr. Lister that silk did not furnish the proper material for the ligation of arteries, when the ligature was to be cut short and left buried within the tissues, since this material was non-absorbable, and was likely to remain as a foreign body, and become a possible cause of future suffering. It was an obvious inference that a proper ligature must, for a considerable period, retain a firm grasp upon the enclosed vessel, and yet, in the end, soften and disappear. This material seemed to him ready at hand in the violin string of commerce, provided it could be properly disinfected. He had already pursued a series of investigations with a variety of material for the purpose of destroying fermentation, and had found that solutions of phenol, carbolic acid, were very effective. Inferentially, it seemed probable that carbolic acid solutions would serve this purpose, and, after a variety of investigations, the result was demonstrated, that cat-gut, immersed for a considerable time in a 10 per cent. solution of carbolic acid crystals in linseed oil, gave, as a resultant product, a strong supple ligature material which was trustworthy. With this, in 1869 and 1870, Mr. Lister was ligating arteries. He was also using it for the through-and-through suturing of wounds, as a substitute for silk, and often called our attention to the fact that the absorption of the cat-gut went on much more rapidly at the contact point with the deeper layer of skin. These sutures were always interrupted, and at

varying periods after the operation, were cut and removed. At this period, his wound dressing consisted of a narrow strip of oil silk, taken from a solution of carbolic acid and placed immediately over the edge of the wound, which he called a *protective*. All wounds of any considerable size were drained with comparatively small tubes of rubber, and the external dressing consisted of his so-called lac plaster, a composition of gums containg 10 per cent. admixture of carbolic acid, which was spreal upon cotton cloth, making a rather stiff plaster. The primal purpose of this was the destruction of any germs which might gain access to the wound. This material was non-absorbent, and the secretion more or less abundant, until the removal of the drainage tubes about the third day, was absorbed by a large extraneous dressing held in place by the usual method of bandaging.

As all know, the teaching of Mr. Lister met with more, rather than less, favorable reception, although far from being, even in a limited way, adopted. The entire profession has long since been willing to accord him every possible honor, and it belongs to no other surgeon in the history of the entire profession to have lived to receive such universal acknowledgement of merit. The summer spent in his service revolutionized my professional life. In a certain sense, however, this teaching was not altogether new, although there is every reason to believe that with Lord Lister it was entirely original.

Investigations upon the origin of means adapted to a given end clearly teach that active minds had already subjected its chief factors to careful analytical study, although certain phases of the problem are ever presenting themselves under new aspects. Dominated by such thought, Solomon taught that "there is no new thing under the sun," and it is quite probable that the animal ligature was known and used by the Egyptian surgeons, at a period antidating this wise Jewish philosopher. The connective tissue of animals was early utilized for a variety of purposes, when it was necessary to secure great strength and high tension. The Homeric poems afford familiar illustrations. In the Odyssey, the strings of the old Greek harp are described as made from the twisted intestine of the sheep. The ancient Egyptian harp is said to have been strung in a similar manner. The celebrated Arabian writer Rhazes, who practised in Bugdad, A. D., 900, described the stitching of wounds of the abdomen with the strings of the harp; and Albucasis also mentioned the stitching together of wounds of the bowel with a fine thread from the twisted intestine of an animal.

The careful student of the early history of surgery finds abundant evidence that the ligature was used as a hemostatic agent at a very early date. Celsus, at the end of the first century, described the ligature as of ancient origin, and stated that it was used by the Alexandrian school of medicine, with the teachings of which he seems

to have been familiar. He advised placing two ligatures upon the vessel, and dividing it between the points of tying. Galen recommended its use, and Vesalius, in the sixteenth century mentioned the ligature as a relic of the past, greatly underestimated in value because of the lack of anatomical knowledge. Its first application in amputation, on account of gun-shot wounds, was doubtless by Ambrose Pare. At this time such wounds were cauterized with boiling oil, in the belief that the gunpowder in some way poisoned the wound.

Special studies, however, for demonstrating the value of the material used for ligatures do not appear to have been made in the early history of surgery. Indeed, there is little doubt that, whatever the material used, it was always considered as a foreign body to be ultimately eliminated from the wound, and the material selected for its strength without special reference to the irritation which might be induced thereby, was naturally the thread, silk or hemp, which was in ordinary domestic use.

To our distinguished countryman, Prof. Physick, of the University of Pennsylvania, is undoubtedly due the honor of having first introduced into surgical practice, in modern times, what is known as the animal ligature. His ligatures were made of chamois-leather, and he and Dr. Dorsey usually rolled their ligatures on a marble slab to make them round and hard. The advantages claimed for the ligature by Dr. Physick were that, being composed of animal tissue, they would serve long enough to obliterate the artery, and be speedily removed by the absorbents, thus avoiding the difficulty, arising from a foreign body, however minute. These ligatures were used in this country to a great extent, and Sir Astley Cooper demonstrated their superiority in his own operations. I quote as follows: "Dr. Hartshorn used strips of parchment for his ligatures. My friend, Dr. H. G. Jamieson, Professor of Surgery in Washington Medical College, Baltimore, has for a series of years been employing the animal ligature in an extensive surgical practice. He has used it in many amputations of the limbs, and of the mammæ; he has tied the carotid, the iliac, the femoral, the radial, the posterior tibial, the spermatic and other arteries, with the buckskin ligature, and in no instance had secondary hemorrhage; and he states that he has never seen anything of his ligatures, and, of course, his wounds have generally healed by first intention. Dr. Jamieson gives Dr. Physick the honor of having first introduced the animal ligature, but he contends that the practice of rubbing or drawing, to harden the leather, is highly reprehensible. He advises to tie the artery with a buckskin ligature very soft and little broader than the thickness of the skin, taking care not to tie it too tightly. He states, as the result of his observations and experiments upon sheep, dogs and other animals, that a capsule will surround the ligature if the capillary vessels be not much disturbed,

or the vessel will be surrounded by an abundance of lymph and the ligature dissolved."*

The method of Aetius and Celsus, revived by Abernethy, of applying two ligatures and dividing the arteries between them, Dr. Jamieson condemned as unnecessary. Since by a single flat buckskin ligature the artery may be obliterated without destroying its continuity. Hence he opposed all indissoluble ligatures of whatever material; he declared it not only to be unnecessary, but highly hazardous, to cut the inner coats of the vessel, as recommended by Jones and others and agrees with Scarper as regards flat ligatures, but, by the use of the buckskin, he has no need, like him, to remove his ligature on the fourth day, For a very able and interesting account of his views, which are even now of high practical importance, I refer to the thirty-seventh number of the *Medical Recorder*, published at Philadelphia, in 1827, and from which I quote the following extracts:—

"We believe that the animal ligature will secure the patient from all these dangers except one, to wit, the awkwardness of the surgeon; and even in this respect the animal ligature is preferable, not requiring the precision of management essential to the cutting ligature. If the ligature is cut from the leather with care, it will always admit of being tied sufficiently tight, but can never be made to cut the coats, provided it is made of soft buckskin, and not hardened by drying it. It is less likely to slip when somewhat insecurely applied, because, being elastic and soft, it is spread over a small space of the vessel, and almost immediately adheres by its glutinous properties." It lies more securely; while the cutting ligature, resting on a mere line, and having neither adhesive properties nor the advantage of a small vacuum between the vessel and the ligature, as is the case with the flattish adhesive ligature, is more likely to slip off. Besides, as we cut off the ends close, there is a risk of pulling them away by an accidental jerk of the hand. In support of these assertions, we have to offer the experience of several years' practice, during which we have used no other than the buckskin ligature, and no such thing as secondary hemorrhage has ever occurred.

"We are, moreover, decidedly of the opinion that in no case whatever have we had reason to suppose that the healing of a wound, accidental or surgical, was delayed by our ligatures; we never see anything of them after their application. Mr Cooper tied the femoral artery in a female, aged eighty, with a ligature of cat-gut steeped in water, which was cut close, and the wound was healed on the fourth day, and must therefore have healed by first intention. In many cases, we believe the cat-gut would answer as well as the buckskin,

*Cooper's Medical Dictionary, sixth American Edition, Vol II., p. 30, edited by Dr. M. Reese.

but we are confident that a flattish ligature holds best and is most convenient. It may be proper to mention that this case occurred in 1817, three years after Dr. Physick's use of the leather ligature. If we are right in the opinion which we have just expressed, Dr. Physick is entitled to the credit of bringing into use the best ligature as to the material, but here his claim is at an end. Dr. Physick and Sir Astley Cooper have shown the advantage of using a substance which will serve as a ligature till the artery is obliterated, and be speedily afterward in the power of the absorbents, so that they will remove it. We will now proceed to point out our own views, and endeavor to support them by experiment."

It will be observed that in all the essentials, the experiments of Dr. Jamieson, undertaken for a similar purpose, were not unlike those of Sir Joseph Lister, repeated half a century later; and the former at a period when so little was expected of the American people in the way of literary productions, to say nothing of scientific research, that one of England's famous critics asked, "Who reads an American book?"

In the "History of Ovariotomy in the United States," by the late Dr. Peaslie, it is stated that Dr. Nathan Smith, Professor of Surgery in Yale College, in 1821 tied the arteries with leather ligatures (narrow strips cut from a kid glove), which were returned into the peritoneal cavity, and the incision was closed, followed by recovery.

Dr. John Bellinger, of Charlestown, S. C., in 1835, successfully performed ovariotomy, tying two arteries in the pedicle with animal ligatures.

Professor Paul Eve, of Nashville, Tenn., wrote me in 1876, "I have been in the habit of using the sinews of the deer for ligating vessels for forty years. The tendons of the deer, dried and torn in shreds and rolled into ligatures, are what I employ. They are absorbed. I have occasionally used them as sutures."

These fragmentary experiences, drifting down to us through the years, teach that there was more or less blind groping after a something that should serve a better purpose than that which the routine of daily practice, in the use of hemp or silken ligatures, afforded. It was reserved for the present generation to make possible a scientific basis for the better consideration of ligatures and sutures in their application to the living structures. In the light of our present knowledge of surgical pathology, the opposition to the ligature in the days of Ambrose Pare, which we have been wont to attribute to the conservatism of ignorance and stupidity, is invested with a new and vital interest. The amputated limb seared with a hot iron, as a hemostatic, a measure most barbarous and revolting, gave as a result an aseptic wound. Repair was necessarily slow and tedious, but abundant granulation supervened to protect from septic absorption before decomposition ensued.

The constricting ligature, the septic pocketed wound, with little

care as to cleanliness, gave such secondary fatal results that we are led to wonder that the innovation of the ligature in the closing of the great vessels became the established practice. Had it not been for the frightful dangers from secondary hemorrhage, after the use of the cautery slow healing giving imperfect results, it may well be questioned if even the indomitable spirit of Ambrose Pare could have made the innovation survive his own time.

A deeper philosophy sought solution of the problem as to the causation of suppuration in wounds, and if its prevention were not within the possibility of the *rule*, rather than the *exception*, the studies of Pasteur, Tyndall, our own Jeffries Wyman of Cambridge and others, undertaken for the solution of the problem of spontaneous generation, brought fruitage to the human race little dreamed of by these wise philosophers. The genius of Lord Lister seized the application of the thought, and with a patient, investigating spirit and painstaking toil, he worked out the fundamental factors of the *role* of ferments in wounds. It was not until rules could be formulated, based upon the scientific deduction that operative wounds should be free from suppurative processes, hitherto considered almost necessary concomitants that the proper conditions for the study of ligatures and sutures were rendered possible. Of necessity, in intimate association with the question of the treatment of operative wounds, arose *de novo* a most important and interesting chapter, devoted to the best means of controlling arterial hemorrhage. It was clear that the hitherto prevailing method of ligation, having the ends of the ligature long, extending from the wound, by so much at least, prevented primary union, while cutting the ligature short, and closing the wound, were fraught ever with disastrous consequences, since the septic ferments were thereby deeply buried. When aseptically applied, the constricted silken ligature too often proved an irritating foreign body, to be ultimately slowly eliminated.

In retrospect, with present knowledge, what seems simple factors of the problem, proved extremely difficult of solution. The conservatism of opinion, the prejudices of the large number of the surgical authorities of the time, wedded to the present measures, misled by other phases of dominating thought—the so-called vital processes of inflammation, irritation, cell-proliferation, etc., engrossed the subject with many difficulties.

The demonstration that fermentation and suppuration in a wound resulted from the introducing of something from without, was the first real step of progress. To eliminate that something was the next problem for solution. It was clearly shown that the torsion of an artery, to procure rupture and intrafolding of its interior coat, might produce a permanent closure of the vessel, and that the living structures, unpoisoned by germ infection, possessed the power of easy disposition of the aseptic necrotic portion, devitalized by violence.

Histologic study demonstrated that the necrosed part did not undergo the changes which had formerly been supposed necessary for the elimination of dead material, known as suppuration, gangrene, etc., but that the part became invaded by living cells, which, little by little, produce a local change marked by early disappearance of the necrosed tissue. This naturally led up to the thought, could not extraneous animal tissue be prepared in a way that, introduced into the vitalized structures, a similar result would follow?

Repeated experimentation taught that small pieces of dead tissue, preserved in carbolic acid solutions incorporated into the living structures, were disposed of in a manner not unlike the necrosed portion of a twisted artery, and led to the inference that animal tissues, properly preserved, might safely be used for the constriction of vessels. In looking about for a suitable material of animal type to be used as ligature, the cat-gut prepared for musical instruments was again naturally suggested. It proved comparatively easy to render the material non-infective, by immersion for a considerable period in an aqueous carbolic solution, but, being a soft, slippery strand, it lacked the necessary qualities for making a secure knot, and, by its early softening in the tissue, it loosened and thereby failed to secure the end sought. A long immersion in an oily solution of carbolic acid, to which a very little water had been added, produced a very marked change of structure—a kind of tanning process thereby resulted, which gave to the material the quality of less easily softening in the tissues, as well as the better retaining a firm knot, and was ultimately disposed of by the surrounding structures.

Lord Lister's experiments were limited to the ligation of vessels, and there has resulted from his teachings the surgical treatment of the great arterial system with a safety hitherto impossible. He states, "The larger vessels are now tied in continuity, in close relation to their bifurcations, even the greater trunks, with a seeming impunity little less than startling."

Returning from my studies in Edinburgh under Mr. Lister in 1870, liberally supplied with a variety of the antiseptic materials which he then advised to be used in operative treatment, I not only made use of cat-gut for the ligation of vessels, but accident easily furnished me the opportunity for a new application of the ligature in the form of buried sutures. On February 19th, 1871, I closed the structures, necessarily greatly enlarged for the reduction of a strangulated hernia, with deep sutures of cat-gut. This I did in order to retain the abdominal contents, because of a severe asthmatic bronchitis from which the patient was also a sufferer. The resultant permanent cure of the hernia, with a marked proliferation along the line of the buried sutures, led me to inquire if the sutures buried in the part had not been disposed of in a manner similar to that demonstrated by Mr. Lister, resulting about the cat-gut ligatures surrounding the arteries?

I instituted a series of experimental histological studies, upon the lower animals, and demonstrated that, along the track of an aseptically buried suture, cell-proliferation rapidly supervenes, and that new cells invade the softened structure, and, *pari passu* with its absorption, a living band of connective tissue cells replaces the suture. If rapidly absorbed, the proliferated cells are minimized; as the process goes on more slowly, the change becomes more distinctive, until, in young animals, in ten to fifteen days all traces of the suture as a foreign material is lost. The value of such reinforcement of the tissue along the line of the sutures became at once apparent in their application to the cure of hernia, and, little by little, I early extended their use to the closure of wounds of every description, publishing from time to time my results.

In the pursuance of my studies, I early had occasion to examine a great variety of the specimens of cat-gut offered in the market, although from the first I adopted what seemed to me the wise precaution of preparing my own sutures. In cat-gut there are of necessity certain inherent defects. Its method of preparation is not generally known to the profession, who have rarely questioned the product beyond the conditions in which it is offered for sale, as prepared for the musician. The best of these varieties usually comes from Italy, prepared from the intestine of the sheep of the mountainous districts. The small intestine necessarily undergoes maceration, until the strong connective tissue layer, which, as a fibrous sheath, unites the mucous and muscular coats of the intestine, is loosened and can easily be separated, in a manner not unlike that practised in the preparation of the intestine of the pig for the making of sausages. This is split by a cork, armed with sharp blades, drawn through the circular sheath, dividing it into sections to produce the desired size. These ribbons are twisted, dried, and often-times sand-papered, to give evenness of surface, and usually put up in skeins from twelve to fifteen feet in length—the cat-gut of commerce.

The connective-tissue cells of the fibrous coat of the intestine are irregularly disposed, the fine fibres more commonly crossing diagonally to the longitudinal axis of the intestine, a wise distribution of this strengthening portion of the intestine to allow considerable change in its shape. When carefully examined under a low-power lens, the fibres are seen to be irregularly interlaced, not unlike a strip of cloth cut diagonally. The gut, even in the dry state, has a perceptible yield on tension, and every musician knows the care requisite to protect his strings against moisture. Frequent allusion is made in the classics to the care demanded of the bowman in this respect, when it was customary to string the weapon with animal products.

The above condition is readily apparent if a piece of cat-gut is macerated until it can be easily unfolded. Moreover its division is rarely uniform, and, when sand-papered, the removal of the irregular

projections causes oftentimes large abrasions or rents. No matter how prepared for surgical use ultimately the result obtained will depend, in considerable measure, upon the integrity of its structure, since the component cells are little by little separated by the penetration of the new proliferating cells. In the first stage of preparation, the long maceration of the material, remaining for a considerable time a putrefying mass, necessarily damages it, not only by softening the adhesion of the fibres, but infecting them with bacteria; and in the use of cat-gut for all surgical purposes it is important, as the first step in preparation, to destroy any germ infection that may remain. After this has been effected, no method which I have tried gives a result equal to that formulated by Sir Joseph Lister; dissolve one part of chromic acid in 4,000 parts of distilled water, and add to the solution 200 parts of pure carbolic acid or absolute phenol. In other words, I use a 1 to 20 watery solution of carbolic acid, only that the carbolic acid is dissolved, not in pure water, but in an exceedingly dilute solution of chromic acid. But, minute as is the quantity of the chromic acid, it exerts, when in conjunction with carbolic acid, a most powerful effect upon the gut. The first effect of the addition of the carbolic acid to the chromic solution is to change its pale yellow color to a rich golden tint; but, if the liquid is allowed to stand without introduction of the cat-gut, it changes in the course of a few hours to a dingy reddish brown, and a considerable amount of grey precipitate is formed. If, however, cat-gut about equal to the carbolic acid is added, as soon as the ingredients are mixed, the liquid retains its brightness, and the only change observed is a gradual diminution in the depth of the yellow color; the precipitate, which I presume still occurs, taking place in the substance of the cat-gut. As soon, therefore, as the preparing liquid has been made, cat-gut equal in weight to the phenol is introduced into it. If you have too large a proportion of cat-gut, it will not be sufficiently prepared; if you have too small a quantity, it may run the risk of being over-prepared. At the end of forty-eight hours cat-gut steeped in such a solution is sufficiently prepared. It is then taken out of the solution and dried, and, when dry, is placed in 1 to 5 carbolic oil. It is then fit for use.* It improves by age, and is better not to be used until after it has been several months in carbolic oil. The preliminary disinfection of the gut is of the first importance, since the carbolic acid may not penetrate the hardened structure and destroy the bacteria within the strands. I have elsewhere published ** in detail the micrococcal

* In several instances I have known sutures to be ruined by a misunderstanding of the above directions of Mr. Lister, much too large a quantity of chromic acid having been used. It may simplify to remember that the quantity is about four grains of chromic acid to a quart of a saturated solution of carbolic acid.

** "The Surgical Advantages of the Buried Animal Suture," *Journal of the American Medical Association*, July 21st, 1888.

infection, developing only along the line of the buried sutures, of four consecutive surgical cases, giving evidence upon which I deduce the conclusion that it could have been owing only to this inherent defect of the cat-gut, which had been selected from freshly opened preparations, preserved in carbolic oil, and sent to me from London. Owing to these inherent defects in cat-gut, I was led to inquire if there were not animal tissues better suited for surgical uses. The tendinous structures of the body demonstrate the connective-tissue cells parallel and firmly united to each other. Although generally thus disposed, there is considerable variety in the arrangement of the cells, making a parallel separation much more uniform in some tendons than in others. As far as possible, I entered into a detailed investigation of all animal tendons of sufficient size for surgical purposes with varying results. The tendons of the hind leg of the moose or caribou, soaked in a sublimate solution until soft, were the first tested. A considerable portion of the tendon can be subdivided sufficiently fine for sutures, in length from fifteen to eighteen inches.

The late Dr. John H. Gilman, of Lowell, called my attention to tendons from the whale, stating that he had "used them with great satisfaction in the ligation of vessels." Specimens were sent me from Provincetown, four feet in length and of sufficient strength to draw a cart, but the ultimate fibrile were interlacing, while the whole tendon was interspersed with adipose cells. I obtained ligatures also from the whale tendon which were made under the direction of Dr. T. Ishiguro, of Tokio, Surgeon-in-Chief of the Imperial Japanese Army. The mode of preparation is given as follows:—"First, the whole tendon is dissected by the points of needles, and teased out until the fibres look very like those of hemp. Secondly, the longest and finest fibres among them are selected and they are then spun together as ordinary silk thread." There can be no question but that ligatures thus prepared are very serviceable, but the specimens furnished me were not suitable for sutures.

The Sioux Indian women in the North-West taught me, in 1882, their manner of sewing buffalo-skins with the tendinous structures derived from the *fascia lata* of the buffalo, which they preserve for this purpose by drying and smoking. During the summer of 1889, I obtained from Mr. Harry Adams, of the Hudson Bay Company, when in Winnipeg, Manitoba, specimens from the *fascia lata* of the moose, prepared by the Indians as a substitute for that from the buffalo, now extinct, called by them *astis*. They use it in the dry state, stripping it as they sew, occasionally wetting it in the mouth. Imperfect tendon sutures in any quantity can be obtained from this source. My specimens, however, are not more than fifteen inches long, and are in every way inferior to the tendons from the tail of the kangaroo. Some years since a distinguished Russian surgeon sent me specimens from the reindeer, finely divided and slightly twisted. These I prepared and used with good results.

In 1886, Dr. S. G. Simmons, of Charleston, S. C., sent me admirable specimens of tendons from the tail of the fox-squirrel, with the statement that he had often used them for delicate surgical purposes with great satisfaction. This tendon is composed of exquisitely beautiful parallel fibrils, which are hardly larger than fine threads. Their extreme length, however, scarcely exceeds nine inches. The opossum has the tendons of the tail distributed in a manner similar to those of the squirrel. Since the opossum is a member of the marsupial family, it was easy to infer that the kangaroo would furnish larger and longer tendons.

Through the kindness of the late Mr. Alonzo H. Newell, of Boston, for many years a prominent merchant in Australia, I secured some most excellent specimens from the wallaby, one of the smaller species of the kangaroo.

At the International Medical Congress, held in London in 1881,* in a paper upon the cure of hernia, I described the use of the tendon suture from the kangaroo and other animals, as especially to be commended. Reference to my recommendation of the kangaroo tendon and its value in surgery was some time later made in an Australian publication. This came to the notice of Dr. Girdlestone, who wrote me that he had used kangaroo tendons for ligatures with great satisfaction, and that he had published his results.**

The tendons should be taken from recently killed animals, quickly sun-dried, and kept dry until ready for further preparation. This prevents primary decomposition, which we have pointed out as unavoidable in the preparation of cat-gut. When soaked until soft, they are easily separated into as find strands as desired with remarkably little waste, and are from fifteen inches to two feet in length. Kangaroos are very numerous in Australia, their skins have a very considerable commercial value, and hundreds of thousands are exported annually; yet it has been with the greatest difficulty that I have succeeded, until quite recently, in securing tendons more than sufficient for my own use, although I sent *carte blanche* orders to various parts of Australia. These are prepared under my personal supervision, and can now be obtained from the various dealers in surgical materials at a cost somewhat in excess of that of cat-gut, to which they are in every way greatly to be preferred.

The larger varieties of the common rat have the tendons of the tail similarly disposed, but are hardly long enough to be of any practical value.

In the *Medical News* for December 5th, 1891, Dr. E. Oliver Belt, of Washington, states that he has made extensive use in ophthalmic operations of a fine fibre derived from the rat's tail. The tail is

* "The Cure of Hernia," Transactions of the International Medical Congress, 1881, Vol., ii., p. 446.

** "Tendon Ligatures," T. M. Girdleston, *Australian Medical Journal*, 1877, Vol. xxii., p. 356.

skinned and soaked in water for several days, when, on slight manipulation, it splits into, perhaps, a hundred fibres, each about eight inches long. They are placed in alcohol and, about once a month for two or three days at a time, they are soaked in a 1 to 5,000 solution of corrosive sublimate. Dr. Belt recommends these fibres in cases where a strong and fine animal suture is required. He says they are much finer than those prepared from the opossum's tail, which he has seen used by Dr. Chisholm, of Baltimore.

Dr. Dudley, of Texas, has written an interesting article upon the use of the tendon of the *lepus*, or mule-eared rabbit, as a material for ligatures and sutures. Dr. Dudley does not state the portion of the animal from which he obtained the tendon, but described them as "an aponeurosis of muscles rolled upon each other, susceptible of being torn into minute threads if so desired." He first had occasion to use the tendon of the *lepus* as a suture, in the fresh state, in 1881, finding he had no silk in his pocket-case. He has continued the use of these tendons with the greatest satisfaction to the time of his report.

The use of the buried animal suture requires the same, and the only precautions that are requisite for the successful application of the ligature. It must be in itself aseptic; it must be aseptically applied in an aseptic wound. When thus applied the range of its use should be extended to all operative wounds. It is difficult to conceive if any possible advantage is to be derived in the treatment of any aseptic wound by leaving it open—the so-called open wound method. Before the *role* of bacterial development in wounds was understood, when it befell from chance rather than from scientific care that primary union supervened, it is easy to understand how many, who dreaded the daily experiences of fermentative material retained in pocketed wounds, not only refused to rely upon drainage with occasional irrigation, but insisted, as far as possible, upon allowing no recess in which purulent material could gather. In order to effect this, the lips of the wound were separated and kept apart by dressings, so that the wound might heal by granulation from its very base. This was manifestly safer for the patient, and the result attained was not unlike that from the repair processes which supervene in the secondary healing of infected wounds; but those who still advocate this method, thereby confessedly acknowledge their lack of confidence in the modern methods of wound treatment, and their inability to protect wounds from infection. In rare instances it has been claimed that the resulting cicatricial union gives an increased strength to the parts involved—an opinion which seems easy to demonstrate is unscientific and contrary to the general concensus of surgical opinion. If it is correct to assume that the theoretic perfection in wound treatment, which it is the ambition of the surgeon to attain, means a reunion of the divided parts, the anatomical relationship to be restored

and maintained, then the buried animal suture holds a higher place in surgery than ever hitherto considered. If the suture itself is replaced by vitalized structures, then its proper application becomes of the highest importance, the value of which the profession, even to the present time, with few exceptions, fails to appreciate. Given, in illustration, the joining of a divided retracted nerve or muscle, and its restoration to subsequent perfect usefulness, the sundered cervical tissues after a hysterectomy where the delicate joining of the peritoneum allows no open wound for hemorrhage or absorption; the reunion of the abdominal wound after laparotomy, where the peritoneum is independently united by a layer of buried sutures, and, where the *linea alba*, or the muscular aponeurosis of the sheath of the recti is carefully joined, since the adoption of which method I have not had a single case of ventral hernia; an again, in the amputation of large tumors of the breast, where the remaining tissues are carefully coaptated, so that retention and pocketing of fluids are impossible, rendering drainage not only superfluous, but harmful. Even in the amputation of the thigh, the periosteum is carefully sutured over the bone, the delicate connective envelope over the vessels and like tissues joined, the skin coaptated by a light parallel buried suture and the entire wound sealed by iodoform collodion, strengthened by a few fibres of cotton. I would not under-estimate the importance of drainage in wounds that are necessarily septic, and in this class of wounds the interrupted silk-worm gut or silver wire suture is to be preferred.

The earlier discussions upon the uses and advantages of the buried animal suture are both interesting and profitable. Dr. Werth, of Kiel, is the first surgeon that I have found, eight years after my first publication, to publish his observations upon buried sutures. He advocated the use of cat-gut as an interrupted buried stitch in the repair of the perineum. These were taken between one and two centimetres apart, the gut tied and cut short upon the knot. In cases where the surfaces to be coaptated were large, a second row of stitches was similarly placed. Great care was exercised in making the application under aseptic precautions, and most satisfactory results were obtained.

My own experience with the buried animal suture commenced with its use in the case of hernia above referred to, 1871. And this, with other cases, where the cure was believed to be referable to the buried suture, was first published in the *Boston Medical and Surgical Journal*, November, 1871. In 1878 I contributed a paper upon the cure of hernia, based upon the resection of the sac, the at present so-called Bassini operation, and closure of the parts with buried sutures, at the meeting of the American Medical Association. A further contribution upon the same subject, emphasizing the value of the tendon suture was published, 1881, in the "Transactions of the International

Medical Congress." These and several other articles giving the results and surgical advantages of the use of the buried animal suture, and its adaptability to special purposes, were printed and widely distributed to the profession in Europe and America.*

If the premises which I have assumed in the early discussion of this article are correct, that a properly prepared aseptic animal suture, aseptically applied, retains its strength sufficiently long to hold at rest the coaptated parts until primary union is effected, and then itself slowly disappears, after having fulfilled its function, to be in a measure replaced by *vitalized connective tissue*, there can be little wanting to attain the theoretical perfection in the suturing of wounds. The first observations which I published, perhaps naturally provoked only criticism and incredulity, and the results were considered rather as accidental. But the evidence already accumulated and presented to the profession by a great variety of observers in different parts of the civilized world is quite sufficient to substantiate this claim.

Silk has justly held a high place in the esteem of the profession, because of its exquisite perfection of preparation, and it has been claimed, if rendered aseptic, that it was equally safe as a buried suture. Mr. Laurence, of London, in the early part of the century just passed, made more interesting and valuable studies upon the ligation of vessels with silk cut short and buried in the wound. His efforts to minimize what he considered the irritating foreign material are very instructive. "The method I have adopted consists in tying the vessels with fine silk ligatures, and cutting off the ends as close to the knot as is consistent with its security. . . . . Of the silk which I commonly employ, a portion sufficient to tie a large artery, when the ends are cut off, weighs between one-fiftieth and one-sixtieth of a grain." Mr. Lister early experimented very carefully with silk steeped in various substances, immersed in melted wax and carbolic acid to render it aseptic. In further proof of its innocuousness, it has been claimed that it is also an animal product, and that the tissues should be capable of assimilating it into their own structures. My late distinguished friend, Dr. Pancoast, of Philadelphia, believed the fault lies in large measure in the introduction of lead during its preparation, and that hence the use of iron-dyed silk is greatly to be preferred. "It is innocuous, does not produce suppuration along the

* "Animal Ligatures," *Annals of Anatomy and Surgery*, July, 1881, p. 232. "Cure of Hernia by the Antiseptic Use of Animal Ligatures," Transactions of the International Medical Congress, 1881. "Animal Ligatures," *New England Medical Monthly*, June, 1883. "The Restoration of the Perineum by a New Method," *Journal of the American Medical Association*, October 27th, 1883, Reprint. "The Surgical Advantages of the Buried Animal Suture," *Journal of the American Medical Association*, July 2nd, 1885, Reprint. "The Perineum: Its Anatomy, Physiology, and Methods of Repair after Injury," Philadelphia, 1889. "A Treatise on Hernia: The Radical Cure by the Use of the Buried Antiseptic Animal Suture," published by George S. Davis, Detroit, Mich., 1889.

track of the thread, and the color adds much to the ease with which it may be distinguished for its removal." These are advantages doubtless, but the necessity of removal emphasizes the fault in material and not in the color, or skill of application, which renders it manifestly unfitted for use as a buried suture.

The general verdict of surgical opinion is that aseptic silk, aseptically applied, may be incorporated into the tissues, but remains encysted, and often after a considerable lapse of time, causes irritation, and is expelled as a foreign body. Many such cases have come under my personal supervision. Somewhat recently, I removed a silk suture three years after its introduction; although buried in the tissues, it was still unchanged. At the meeting of the British Medical Association, in 1890, Mr. Timothy Holmes, of London, one of the most distinguished of surgical authorities, delivered a valuable address upon the surgery of the large arterial trunks, in the discussion of which I had the honor of participating. In the consideration of ligatures, he wrote,* "Silk admirably fulfils four of our conditions: it is of trustworthy composition, easily tied, may be relied on not to untwist, and can be tied with any degree of force, but it is questionable whether it is so far unirritating as to bury itself in the tissue of the artery, and become absorbed or disintegrated, without setting up suppuration, and coming away; that is, dividing the artery. . . . Stout cat-gut ligatures are very handy, and I used them on most of the great arteries, and with uniform success; but they are certainly not of trustworthy composition. Ox aorta appears to me an admirable ligature, and I have used it with perfect ease and success in tying either the external or common iliac artery in 1879. But the kangaroo tendon ligature has seemed to me to unite all the advantages of the ox aorta, and to be also somewhat more manageable and more smooth, so that it has been employed at St. George's in almost all such operations now for some years. Tendon ligatures are of uniform and trustworthy composition, fashioned by the hand of nature, instead of being prepared by a process, involving an uncertain amount of decomposition. One of the most interesting papers bearing on the subject is Mr. Dent's, in the "Medico-Chirurgical Transactions," Vol. lxiv., describing the microscopic examination of a tendon ligature, ten days after its application to the carotid artery, by Mr. Pollock. In passing the ligature it broke while the second knot was being tied, and therefore a stout piece of cat-gut was also tied around the artery, but no trace of the latter was found *post mortem*. The ligature tendon was found still firm, its knot buried in a mass of lymph, the external coat of the artery uninjured, and not ulcerated, the internal coat ruptured in places by the ligature, and with its inner walls lying in contact, the tendon buried in, and closely connected with, the arterial wall, infiltrated with small, round granular cells, or leucocytes,

* *British Medical Journal*, November, 1890, p. 1110.

and permeated by blood vessels which, Mr. Dent believed, to be of new formation. As far as a single case goes, nothing could be more satisfactory as proving the unirritating character and firm grasp of the tendon ligature." Mr. Holmes quoted* from a paper by Mr. Ballance and Mr. Edmunds, "Here it will suffice to say that the authors do not regard silk as a perfect ligature for aseptic wounds, but recommend the use of a small, round, absorbable ligature, preferring tendon for this purpose, for the following conclusive reasons: 'The structure is continuous throughout, and there are no spaces, as there are in cat-gut, due to twisting in its preparation. It does not split or crack during absorption which takes place from the surface. It is easily aseptic. It is only gradually, and after a long time, acted upon by the living materials which encompass it.' They add that kangaroo tendon is very convenient for practical use, being strong, of ample length, and becomes as supple as silk by soaking for half an hour in tepid sublimate solution; and they believe the tendon ligature to be trustworthy for at least two months."

If absorbable sutures are to be used, how may they best be applied? Coaptation and fixation, at rest, of like structures, with as little force applied as possible, is the object sought. More suture material than is required for these purposes is detrimental. It must be applied with a minimum of devitalization of the tissues. The interrupted suture is faulty in that it holds at only the single point of application; and in order to make complete coaptation in large wounds, undue compression, often to the devitalization of the part constricted, must be used. Each stitch necessitates a knot.

The interrupted suture is the legacy of the Fathers, and was used by them distinctly with the purpose of removal, and in order to relieve the tension of the exudation of fluids, a stitch was cut from time to time as thought desirable. If the wound remains aseptic, primary union will supervene, and the stitches taken through the skin for the purpose of removal have no advantage in being single. Thus taken, they coaptate far less evenly and securely the included tissues. It requires much more time to apply them. If the seamstress or the tailor made our clothes in this manner, we should wonder at their bungling methods. The principle is precisely the same with the surgeon; and, even if he has to serve an apprenticeship to the tailor, he should certainly not be less dexterous, since Nature's most precious structures should be most artistically repaired.

Like structures, as far as possible, should be coaptated: fascia to fascia, muscle to muscle. Fine continuous running sutures, taken rapidly, accomplish this purpose in a manner so as not to leave pockets for the accumulation of fluids. The accumulations, as well as larger tendons applied in many layers, we know, if aseptic, will

*"Ligation of the Larger Arteries in their Continuity: An Experimental Inquiry," Medico-Chirurgical Transactions, Vol. lxix.

usually be cared for by Nature's processes, but it is a part of our art to minimize the burden, instead of making the effort to determine how much she can accomplish in this direction. The over-and-over suture, glovers' stitch, is undoubtedly the one in more common use, but it does not serve the purpose in the coaptation of wounds nearly so well as the parallel stitch, namely, the needle is inserted deeply within the tissues *parallel* to the long axis of the wound, and each succeeding stitch is made by introducing the needle exactly opposite the emergence of the preceding one. In this way, upon tension, coaptation is evenly secured and the suture material crosses the incision at right angles, and by this means the suture is completely buried in healthy, closely-surrounding structures. Sometimes, for example, in the reconstruction of the inguinal canal, the closure of the peritoneum and *linea alba*, there is a decided advantage in using a double line of sutures, just as the shoemaker sews leather, the needle with eye near the point, serving as a shuttle to carry the suture. It must, however, be remembered that much force is inadvisable, since *coaptation*, and not constriction, is the purpose. In sewing, the needle is of importance as well as the suture, and the profession is greatly indebted to Hagedorn for his valuable addition to our armamentarium in this direction. The medium sizes of fully curved needles serve best, since they can usually be used by the fingers without the aid of forceps. The continuous suture requires but a single knot, and undue constriction is less liable, since a compensation occurs, equalizing the force applied to the entire suture. This I consider of the first importance, since, under the earlier teaching, most surgeons still use too much force. Injury and devitalization of the structure is the necessary consequent. The extraordinary strength of tendon is, in a measure, a fault, since its unyielding character admits easily of undue force. The frequent inquiry is made, "for larger tendon, since I must have it very strong." Some time ago, one of Europe's most distinguished surgeons operated in my clinic. He would have only braided silk, and in its application broke all his sutures finer than No. 8. Such force must necessarily necrose all the enclosed structures.

Fatty tissues are of low vitality, and burying sutures in them is, as far as possible, to be avoided, since an aseptic fat necrosis will not seldom supervene. As a rule, they do not require independent suturing, since they are not very vascular, and are in themselves passive, and are in easy juxtaposition, when the other structures are held in coaptation. The skin is evenly sutured by the use of a fine tendon. The needle is introduced parallel to the long axis of the wound, and hence I have called it the *parallel* suture. Each stitch is entered exactly opposite the emergence of the former one. In this way juxtaposition of the edges of the skin is accurate without puckering, and the iodoform collodion seal completes the operation.

ADVANTAGES.

All aseptic wounds closed with buried aseptic tendon sutures will remain aseptic and in well vitalized structures will be followed by primary union. There is no danger of subsequent infection, no expensive and troublesome dressings are required; the subsequent nursing and care are very greatly reduced; the anxious forebodings of the surgeon "lest something go wrong with his wound" is avoided; no sutures are to be removed, relieving greatly the dread and anxiety of the patient; safety is greatly enhanced and the period of convalescence is shortened. When the work has been done with care the resultant cicatrix is scarcely visible, a matter of much importance in some portions of the body. Operations hitherto impossible have been rendered feasible by the use of buried absorbable sutures, for example, the reconstruction of the pelvic structures, the closing of rents in the peritoneum, etc. The reconstruction of the obliquity of the inguinal canal for the cure of hernia in the male has become an almost everyday occurrence, and should be yet much more widely practised. Indeed, it was for this very purpose that I first used the buried animal suture in 1870, and am now in my 500th series of cases with over 90 per cent. of resultant cures. The reformed structures may be greatly strengthened by the rejoining of the sundered tissues by means of lines of buried sutures, as contrasted by a single layer of interrupted sutures, for example, the closure of the abdominal wall in laparotomy. Here, in the closure of the wound by a single line of interrupted sutures, about 10 per cent. of the cases result in hernia at the line of the incision. When closed in layers, the compound structures are rejoined, and, in primary union, hernia should be altogether avoided. In over 1,500 laparotomies of this character, I have had but a single subsequent hernia. Indeed, this is but to be expected, since like structures are joined, and the suture itself is replaced by a living band of connective tissue. To-day the aim of the surgeon is to reconstruct and restore, as far as possible, to the normal pattern, all the healthy tissues remaining for manipulation. To this end a tumor is removed, and the parts completely closed, if possible. Although our mission is necessarily iconoclastic, the service should be rendered with such gentleness of measures that Nature accepts it as her best ally, and a double blessing follows the ministration of the surgeon, not alone in the aversion of the threatened danger, but also in the accomplishment of the same with the minimum of pain and suffering, and the maximum of safety.

With all the emphasis of an earnest conviction, I commend to every aseptic surgeon familiarization with the methods of wound closure by means of buried absorbable sutures, preferably tendon, and not alone predict their early general adoption, but that, in importance, they hold the first place in the technique of modern aseptic wound treatment.

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THE EARLY DAYS OF OVARIOTOMY.*

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The rising generation, which has only seen abdominal surgery in its full development, is apt to forget the trials and struggles of those who first attempted to open the abdomen, and who finally put the operation on a firm basis. Few can realize now the amount of opposition, both within and without the profession, which existed. McDowell, as we shall hear, was threatened with death; and later operators were almost ostracized for attempting this "murderous operation." In the last twenty years, the triumphs of surgery have been so great that now no operation, no matter what its magnitude, is condemned untried, and the result is awaited with patient and indulgent expectation. But only forty years ago this was not so, and at the time that abdominal surgery had its beginning the feeling of opposition to "butchering," as they called it, was most emphatic and unreasoning.

Abdominal surgery had its beginning in America. Many attempts have been made to wrest this triumph from us, but all have failed. The claims of the United States are now generally admitted as being clearly proved, and the name of the first operator rescued from oblivion and duly honored.

The first abdominal section, having for its object the removal of an ovarian tumor, was done by Dr. Ephraim McDowell, on December 13th, 1809, in Danville, Ky. Although practising in what was then the backwoods, McDowell was by no means an uneducated, ignorant, or pretentious adventurer. The operation was done after long consideration, after a full unnerstanding of the difficulties with which he had to contend, and a careful planning of the technique. He had been a student of the great John Bell, in Edinburgh, and while there had heard it suggested that perhaps an ovarian tumor could be successfully removed. He formed the determination at that time that, if the proper case ever presented itself, he would make an effort to operate. After his return to Danville, he was sent for to see a Mrs. Crawford, who resided a long distance away. McDowell found her trouble to be an ovarian tumor, and gave a fatal prognosis unless she was relieved by the knife. To quote Dr. Gross:

"After a most thorough and critical examination, Dr. McDowell informed his patient, a woman of unusual courage and strength of mind, that the only chance for relief was the removal of the diseased

*Read by title at meeting of the Canadian Medical Association, London, Ont., August 26th, 1903.

mass. He explained to her, with great clearness and fidelity, the nature and hazard of the operation. He told her that he had never performed it, but that he was ready, if she were willing, to undertake it, and to risk his reputation on the issue, adding that it was an experiment, but one well worthy of trial."

Mrs. Crawford accepted the opinion of the physician with great coolness, and promptly assured him that she was not only willing, but ready, to submit to his decision, asserting that any hope of relief was preferable to the agony she suffered. She travelled on horseback —the only mode of locomotion in those days—to the home of Dr. McDowell, sixty miles away. So great was the weight of the tumor resting upon the pommel of the saddle, that a large contusion was formed on the skin.

On the day of the operation, McDowell was conscious that an angry and excited mob of men had collected outside of his house, openly threatening to hang him if his experiment of "butchering a woman" did not succeed. There is no doubt that if the woman had died, McDowell would have lost his life at the hands of his infuriated townsmen.

I have often wondered which was the braver—the man or the woman—the woman, to subject herself to an operation which she knew had never been done, an experiment which would cause intense suffering at the time, anesthetics being then unknown, and the result of which must be uncertain; the man, to risk his life for the mere sake of doing good, without hope of reward, except, perhaps, a modest fee, and with certain death confronting him if he failed. It seems to me that the bravery of the man was the greater. He put his life at stake without any necessity impelling him, except his love of humanity and his desire to do good; while the woman had death staring her in the face, and was accepting an opportunity which had never yet been offered to anybody, to escape the terrible, persistent suffering which would certainly come. To quote from Thomas Keith: "She had not much to lose—a few months only, it may be, of ever-increasing suffering—and she might gain much by an operation, having much to gain." Fortunately for the good of mankind, and of womankind in particular, the operation was successful.

The technique of the operation sounds a good deal like an operation done to-day. The incision was made, about nine inches long, a little to the left of the median line. The tumor was then opened, its contents allowed to escape; after which it was removed from the abdomen, the pedicle tied by strong silk ligature, and the tumor cut off. After this the patient was turned upon her side to allow all the blood and fluid to escape. This having been accomplished, she was turned on her back, the intestines replaced, and the wound closed by an interrupted suture, the ligature hanging out of the lower end of the incision. Dressings were applied, and the patient put to bed.

Five days later, McDowell, on visiting her, found her making her bed. In twenty-five days she returned home in good health, and lived for thirty-two years after, she having been forty-seven at the time of the operation.

McDowell afterwards operated on twelve cases, eight of the thirteen being successful—a record which was not beaten until the advent of antiseptic surgery.

McDowell is described as a tall, strikingly handsome man, with an erect and commanding figure, and lustrous black eyes, which seemed to penetrate the very thoughts of those who looked into them. His refinement and intellectual powers were of the highest type. Many stories are told illustrative of his abilities of mind; his unflinching adherence to duty in the face of adversity and difficulties seems to have been one of his strongest points. Stories are told of his adventurous rides through the woods, of fording rushing torrents filled with ice and driftwood, and other anecdotes which illustrate the nobility and force of the man's character. He might well have stood for the original of MacLure, Ian MacLaren's justly famous hero.

McDowell was a man of strong religious convictions, and we have left to us a very forcible petition offered by him to Almighty God, a few hours before the appointed time to make the first ovariotomy. Who will say that it was not in answer to this prayer that his hand was guided to bring to a successful termination his momentous and trying experiment, fraught with interest, not only to the operator, but to humanity? It was certainly a trying hour to him, and we can well understand that he should have asked for strength and guidance where he thought he could best obtain them. His biographer says: "His abiding faith in the efficacy of prayer was beautiful, and no doubt his remarkable success in the field of surgery can be largely attributed to his strong convictions and unwavering faith in the Great Jehovah."

After McDowell no operations of this kind were done until 1821, when Dr. Nathan Smith, Professor of Surgery in Yale College, performed a successful ovariotomy. He was just as much entitled to the honors of a discoverer as was McDowell, for he had never heard of the Kentucky surgeon or of his operation. His methods were different, but the result was just as good.

The third successful ovariotomist was Dr. Alban C. Smith, of Danville, who had been a partner of McDowell's. He operated in 1823. A few scattering operations were done after that, but it was not until 1843-44 that a new impulse was given by the success of Dr. John L. Atlee, which was still further aided by his brother, Dr. Washington L. Atlee, of Pennsylvania. After this, cases became more common, and, taking the country at large, several were reported every year, until in 1855 there were twenty-one cases, with six successes and fifteen deaths. This heavy mortality seems to have had

the effect of diminishing the number, as they fell off rapidly, until in the years 1860-63 there were only three in each year. In 1870, Dr. Atlee reported his 200th case, while Kimball had 121, and Dunlap, Peaslee, J. P. White, McRuer, Thomas, Bradford, Emmet and Sims had had from 60 to 12 cases each.

In England the operators who first made reputations were Tyler Smith, Baker Brown, Charles Clay, Thomas Bryant, Thomas Keith and Spencer Wells. To the latter we must unquestionably give the credit of having done an immense deal to influence the profession, and to overcome the opposition which, up to 1860, had existed in England more than anywhere else. Many prominent men opposed the operation, very broadly denouncing those who attempted it as murderers, as guilty of malpractice, and using all their influence to keep the operation down. After Sir Spencer Wells' paper in 1860, opposition was silenced, and from that date it may be said that ovariotomy was adopted as a legitimate resource in England.

My own experience of ovariotomy began in 1870, when I entered the Strangers' Hospital, in New York City, as interne. Dr. T. G. Thomas was appointed gynecologist to this hospital, which had just been established; and filled with the ardor of enthusiasm, he soon collected a considerable number of cases for operation. During the year that I served as senior assistant and house surgeon, I had under my care twelve operation cases, nine of which recovered. As can be readily imagined, an ovariotomy in those days was a great event. I have seen in the operating room at the hospital, witnessing and advising, and perhaps assisting Dr. Thomas, Sims, Peaslee, Emmet, Noeggerath, Sands, Willard Parker, and others of the great lights of surgery in New York at that time. As we had no trained nurses, Dr. E. L. Trudeau, who was my senior by six months, and myself had to take the entire charge of the cases. The nurse would call us frequently during the night, and we would pass the catheter, give hypodermics of morphine, and do all the nursing which is now so much better done by our skilled and trained assistants.

Dr. Thomas' theory in those days was that a great deal of the danger was due to the shock to the nervous system, which led to inflammation; and in order to quiet the nervous system, the patient was put under the influence of opium for a few days in advance of the operation. We can see here the influence of Alonzo-Clark treatment of peritonitis; if large doses of opium would cure peritonitis, smaller doses would prevent. And so, in order to head off the disease, of which everybody stood in holy terror, the opium was given before the operation was commenced.

Dr. Peaslee was the first to perform drainage, which he did as early as 1855. He passed a catheter through the vaginal wall into Douglas' cul-de-sac at the time of an operation, and left it there, corking the end. Septic symptoms supervening, he removed the cork, and

allowed the fluid to come away, and followed it by copious injections into the peritoneal cavity of salt solution, and later by a weak solution of chlorinated soda. He published a paper on the subject in 1870. Thomas immediately took up the idea, following Peaslee's plan of putting a linen tent into the lower angle of the wound. Soon after this the idea of a drainage tube came from Koeberle, of Germany. Thomas immediately began its use.

I remember very well the first drainage tube (1871), which was an old-fashioned, hard-rubber vaginal syringe, an inch in diameter, with four holes at the round end. This was introduced on the second day, the tent of cloth which had been placed in the lower angle of the wound the day of the operation being removed.

Dr. Thomas also followed Peaslee by washing out the abdomen in a septic case, after the operation, using a solution of hyposulphite of soda. As early as 1871 he washed out the abdomen before closing the wound. Antiseptic ideas were then just beginning to dawn. Carbolic acid had just been discovered, and Lister was making his first experiments in what we now call "Listerism," experiments which were destined to revolutionize surgical methods, and to make the name of Sir Joseph Lister one of the greatest in the record of the benefactors of the race.

Although, as already mentioned, drainage was used before Sims began to do abdominal work, it was his paper, published in 1872, which really popularized drainage in abdominal cases.

Dr. Thomas, up to 1870, had had twenty-seven ovariotomies, and was only excelled by one other operator in New York, namely, Dr. Peaslee, who had had twenty-eight. Sims, who never made a great name as an abdominal surgeon, had had only twelve. It must be remembered that at this time all other forms of abdominal surgery were unknown and almost undreamed-of. I remember very well when Pean's book came out, about 1871, detailing the histories of a large number of fibroids that had been successfully removed, that Dr. Thomas expressed very grave doubt as to the truthfulness of the histories.

In those days the after-treatment of the cases was made very much more difficult, and the convalescence very much slower, by the method of treating the pedicle. While McDowell had used the ligature, dropping the pedicle, and had done so successfully, others seemed to be afraid of following his example. The great doubt was as to what would become of the piece outside of the ligature. This, it was feared, would die, and poison the patient. Many of the deaths in the early cases were attributed to this cause. To overcome this difficulty, various plans were suggested. Baker-Brown used the cautery, and, as Mr. Tait pointed out, had he lived, no doubt abdominal surgery would have been advanced many years; for, although we cannot help acknowledging an immense debt as due to Sir Spencer Wells, still we

cannot deny that he he kept back ovariotomy and abdominal surgery by his energetic advocacy and use of the clamp. His plan was to clamp the pedicle, leaving it on the outside, the abdomen being closed tightly around it, the clamp preventing it from falling in.

Dr. Thomas was a bold and brilliant operator, a great diagnostician, and full of invention and resources. His record after these early years is well known, though he came a little too late to reap the full advantages of modern abdominal surgery. To my association with Dr. Thomas in those early days I must attribute my interest in this branch of medicine, and, to a great extent, my success. To no man, living or dead, do I owe more than to him. In fact, had it not been for Dr. Thomas, I should not have held my present positions, as it was by his influence that I became Dr. White's successor and a resident of Buffalo. Dr. Sims, although I knew him well and have seen him do some plastic work, I never had the pleasure of seeing open an abdomen. Dr. Peaslee I also knew well, but never saw him operate.

In those days the New York Obstetrical Society was the scene of many exceedingly interesting discussions. Abdominal surgery and gynecology were making rapid strides in advance. Sims, Peaslee, Thomas and Emmet were the four men who have done more for gynecology than any Americans who have ever lived. They were then making rapid advances, and in the Obstetrical Society the new ideas were proposed and weighed and discussed, to be afterwards tested at the bedside and on the operating table, and the results reported back to the Society. I was secretary for a number of years, and had the great advantage of being obliged to take down these discussions. I am sure that this was of great benefit to me, as it fixed in my mind a great many facts which I probably should not otherwise have learned.

Besides these greater lights, Noeggerath, whose name is well known as the discoverer of latent gonorrhea; Jacobi, still a Nestor in the profession; besides some of the younger men, who have since made name and fame, were active members of the Society.

Buffalo took a prominent part in the early days of abdominal surgery. Drs. James P. White and Julius Miner were both pioneers. Dr. White probably did a hundred ovariotomies during his life, about 60 per cent. of which recovered, as far as I can learn. Dr. Miner never did so many, but he originated a principle which has made his name to be mentioned wherever the history of ovariotomy has been spoken of —he originated the idea of enucleation. This I had seen done by Dr. Thomas, but had never practised until I did my first ovariotomy in Buffalo.

My first case was done in Hartford, Connecticut, in 1879. The patient was a poor negress, and as she lived four miles in the country, in a poor little farmhouse, I had to hire a horse each time I made a visit.

I had to pay the nurse myself, and you can readily imagine I did not make a fortune immediately out of the case. Still its effects on my future were greater than were at first apparent. The event was a great one, and my friend, Dr Munde, came all the way from New York to assist me. He had never operated himself, nor had any one else present even seen an ovariotomy. I found a dermoid cyst so adherent that I could not get it all out. I therefore cut off all I could get loose, and sewed the edges of the remaining portion to the edges of the abdominal wound. Two glass drainage tubes were used, one being put into the sac, and the other into the abdominal cavity. The patient convalesced very slowly, and required many visits. I estimated that the case cost me $50. Still it paid, for it gave me experience, and allowed me to say that I was an operator—great advantages when the call came to go to Buffalo.

To illustrate the fear which the early ovariotomists had of the peritoneum, I remember very distinctly a case which came to me a number of years ago. She had a large fibroid tumor and a tremendous ventral hernia. She told me that she had had an ovarian tumor, which had been removed by Dr. Miner, the first successful operation that he had ever done. She showed me a copy of an account of the operation, published in the *Buffalo Medical Journal* at that time. In this article Dr. Miner attributes his success to the fact that he did not pass his stitches through the peritoneum, but only through the skin and fat. This, while it does not explain the success of the operation, certainly explains the ventral hernia. I removed the fibroid, and sewed up the hernia, and sent the woman away cured.

Thus far I have spoken only of ovariotomy; but it is quite natural that the opening of the abdomen for the removal of ovarian tumors should have led to the same procedure for other purposes. In 1876, Dr. Robert Battey, of Rome, Ga., read a paper before the American Gynecological Society, on "The Extirpation of the Functionally Active Ovaries." He had performed his first operation in August, 1872. In 1879, Mr. Lawson Tait announced that he had done a similar operation, claiming priority over Battey. Prof. Hegar, of Freiburg in Germany, published in 1878 a paper on "The Castration of Women," his first case having antedated Battey's by a month. After the publication of these papers, the indications for opening the abdomen were very quickly widened, and the operation took firm hold upon the profession, being performed by operators all over the world; and at that time we may say that abdominal surgery, other than ovariotomy, had its origin.

I first removed the ovaries, March 11th, 1880, in Hartford, Conn., for a fibroid tumor. The first operation for the removal of the ovaries which was done in Western New York, was performed by the

late Dr. G. C. Clark, of Niagara Falls, 1882. I had the pleasure of assisting him; the operation was perfectly successful.

My first operation in Buffalo for the removal of the ovaries was in November, 1883. On March 4th, 1884, I did my first resection of intestine; likewise the first that was done in Buffalo. In October of the same year, I removed a large fibroid tumor by supra-vaginal hysterectomy with the clamp. The woman is still living.

Although I did many operations for the removal of ovaries and fibroids from that time on, it was not until February, 1888, that I removed the first pus tubes. After this, the indications for operations and the number of cases increased rapidly; but I did not meet with a case of extra-uterine pregnancy until 1890. I operated on four during that year. As I was almost the only operator practising abdominal surgery in Buffalo then, these were doubtless the first operations of their kind which were done there.

We thus see that abdominal surgery is of very recent development, the greatest growth and extension of the operation having taken place within the decade between 1880 and 1890. It may now be said to be nearly perfected, and, except in operations on the gall-bladder and the stomach, we cannot look forward to many more advances.

What has made possible the great success of modern abdominal surgery? Two things will at once come to the mind of each of you —anesthesia and antisepsis. Without these there could have been no development. Although the early operations were done without anesthesia, the operation now undertaken would be impossible under similar conditions.

Nor is antisepsis—or, perhaps more strictly speaking, asepsis—any less important. The mortality rates of the pioneers are often frightful to contemplate; and only where life was directly threatened, as in ovarian cystic disease, were operations warranted. So recently as 1880, the writer collected all the known cases of oophorectomy—150, with a mortality of 20 per cent.; and in 1884, Bigelow collected 359 hysterectomies for fibroids, with 58 per cent. mortality. Now all this is changed, and we open the abdomen, even in comparatively simple diseases, with perfect confidence in the result, as far at least as sepsis goes. So much has been accomplished by Lister, Pasteur, and their co-workers.

But, after all, is it not to the American workers that a very large share of the mead of praise is due? Who have done more than McDowell, Nathan Smith, the Atlees, Kimball, Miner, Sims, Peaslee, Thomas, Robb, Battey, Sands, McBurney and Bull—to say nothing of the men of our own day, who have improved, extended and perected the work of their predecessors? Certainly America has a

right to be proud of the credit of originating and perfecting this important branch of surgical work. Not only did ovariotomy originate here, but hysterectomy for fibroids was first done by Kimball. Peaslee and Sims originated drainage; Battey first removed diseased ovaries; Willard Parker did the first operation for disease around the appendix; while Sands, McBurney, Senn and Wier were the pioneers in appendectomy. Bull did the first operation for bullet-wound of the intestines; and Rogers was the first to advocate the operation for ruptured tubal pregnancy. Kimball's lead in removing fibroids was followed by many, and was so perfected by the work of Stimson, Polk, Baer, Pryor and others, that it is now known as the "American operation." Robb was the first to do the modern operation of cholecystectomy, while the genius of Sims had a most important influence in advancing this particular branch of surgery.

But I need not add to the list. It is recent history and familiar to all students of contemporary literature.

When we look back and see what has been accomplished, it seems almost miraculous—all fear of the peritoneum gone; sepsis nearly banished, and scarcely an organ in the abdomen which has not been successfully attacked and removed. Liver, gall-bladder, spleen, stomach, intestines, kidney, uterus, tubes, ovaries, bladder—all have yielded to the surgeon's knife and their possessors relieved of serious or fatal diseases. It is a proud record. Little did McDowell think, when he took up the knife to make his first abdominal section, to what it would lead, and of the years of agony which would be relieved and the thousands of lives saved. All honor to the men who have done this work. Their names should stand higher in the roll of fame than those of generals and conquerors. They have worked to relieve pain and suffering, and to save life, while the soldiers accomplished their ends only through the infliction of measureless agony and the sacrificing of countless lives.

THE LYMPH CIRCULATION IN MODERN MEDICINE.*

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Owing to the illness of Dr. James Stewart, the Address in Medicine was pressed upon me by your President and the programme committee. In reluctantly accepting the honor, I recognized not only the short interval for preparation, but my inability to give such a popular address as the occasion calls for. In relying on your charity to-day, I accepted the investment of this office, not as an honor, but as a duty.

On account of the time left, I must of necessity select a subject with which I have already been familiar. In announcing it as "The Lymph Circulation in Modern Medicine," one feels that we are treading upon a new continent of thought. It is a subject that is in intimate relation with every branch of medicine and surgery. The unsolved problems of physiology, pathology and therapeutics must find their final solution here. The final contributions in these three realms must be cytological, viz: by painstaking study of the cellular elements. As cells of their own vital activity feed and oxidize themselves from the adjacent lymph stream, it must be basic to every problem in medicine how lymph is kept nutritious, and how it rids itself of its waste products. The tissue juice or lymph is not only the food of cells, but their sewerage system as well.

Two hundred and fifty years ago Rudbeck discovered the general lymphatics, and gave the first conception of the irrigation theory of tissue nutrition. Hunter believed in the theory of tissue suction; Johannes Muller ascribed lymph to the vital activities of the living cells of the body (Elements of Physiology, Baly's trans., Vol. 1, p. 248).

In 1850 Ludwig propounded the theory which bears his name, viz: that lymph was renewed by filtration and osmosis. Twelve years ago R. Heidenhain startled the physiological world with experimental evidence, which he claimed was fatal to Ludwig's theory. He experimented with certain substances, which altered in quantity or quality the lymph coming from the thoracic duct; these he called lymphagogues. A great deal of physiological work has been done in the last twelve years in this department, and a considerable number of physiological authorities have fallen away from Ludwig's school, although not fully accepting Heidenhain's theory of endothelial secretion from the capillary wall. The champions of Ludwig have

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been put to their wits' end in squaring the laboratory evidence with filtration, osmosis and diffusion.

Before touching upon the contested theories, let us have a glance at the modern anatomy of the lymphatic system. Budge (Arch. of Anat. and Phys. anat. abthg. 1880 and 1887) thought there were two lymphatic systems. One of these disappeared in development. Ranvier, W. G. MacCallum, Sala and Florence R. Sabine have separately arrived at this conclusion, that the lymphatic system is a modification of the circulatory system, that is grown by budding backward from the subclavian vein, and gradually invades the tissues and organs; that these buds are closed or blind at their terminals, and have no physical connection with tissue spaces. Ranvier looked upon the lymphatic system as a great gland, the blind, protruding capillaries as the secretory parts, while the ducts were the excretory canals. These lymphatic capillaries are lined by endothelial tissue. The termination of the lymphatic system in the lacteal of the intestinal villus is a fair sample of its method of termination in other tissues. There are tissues like cartilage and the cornea which are never invaded by lymphatic capillaries. The lymphatic glands seem to be an after-thought in development, as they are absent until we reach birds and mammals.

These anatomical and embryological studies bring us face to face with this: that we have included as one system the tissue juices and the lymphatic when in reality they are separate. The tissue spaces and their juices are not part of the lymphatic system. The fact that we have been considering two fluid systems as one demands strong confirmatory testimony of an evolutional, pathological and clinical character to be weighed with laboratory evidence in reaching a working hypothesis on this circulation.

The amount of lymph in the human body is difficult of estimation. Waller (Human Physiology, Edition 1893, p. 116) approximately estimated it to equal three or four times that of the blood. This estimate is probably too high, but the quantity of this fluid shows its marvellous importance. Florence R. Sabine, when suggesting the function of the true lymphatic system to be a system of absorbents, gives evidence obtained from a "specimen of twins prematurely born, one of which was normal, while the other was so œdematous that it was simply a round ball." Examination of the œdematous one showed no trace of a thoracic duct, nor lymph glands (American Journal of Anatomy, May 26th, 1902).

The tissue juice circulation I shall call the lymph, and the other the lymphatic. As the lymphatic is one of the forces in the lymph circulation there will be no attempt made here to divorce them. Are we in possession of sufficient data to indicate the method by which lymph passes over from the blood stream to the lymph circulation? Does the balance of testimony point to lymph as a secretion, a filtra-

tion, or a product extracted or sucked out by the vital activity of the tissues themselves?

If the field of inquiry be extended to embrace facts from evolutional, embryological, physiological, pathological and clinical sources, the answer to the first question can reasonably be affirmed. The second question points to lymph as an independent circulation, and its forces are the vital activity of the tissues. It would follow that the lymph itself was an extraction product from the blood stream. The extraction process may have some of the characters of secretion and filtration. It is not to be denied that the physical laws of the liquid act in the body, but their scope in the lymph circulation is overshadowed by the selective action arising out of the vital activities of the tissues. The thing that most concerns us is that lymph circulation is an independent one.

Lymph will flow from the thoracic duct in some cases as long as four hours after the death of the animal. Ludwig long ago discovered that ligation of this duct was soon followed by rupture of it behind the point of ligature.

Harley's experiments (British Medical Journal, Aug. 20, 1892) on the production of jaundice in dogs, found that when he ligated the hepatic lymph ducts and the biliary duct simultaneously, there was great danger of rupture of one of them. These experiments were conducted to show that bile gained entrance alone by way of the lymphatic circulation, but they also show an unsuspected power behind this primeval circulation.

There is evidently as many circulatory forces as there are tissues, each tissue possessing a method of its own in the selection of lymph. Easily understood examples of this may be seen in the vitreous humor of the eye, cartilage, bone, voluntary and involuntary muscles, epidermis and hair. Their peculiarities will be discussed again at some length.

In addition to the ability of this circulation to continue for hours after cardio-vascular death, and independent of the latter forces, we see it the sole circulation in the vegetable kingdom, and the mighty trees of the forest are the evidence of its power. It is the sole circulation in the lowest forms of animal life and executes oxidation, excretion, secretion, vital movement, reproduction and repair. It is the sole circulation in the early weeks of embryonic life of all individuals, promoting purposeful growth, building the scaffolding and laying down the framework of all our human system.

Without question the lymph circulation existed long before the cardio-vascular, and was in possession of independent forces and functions. Can it be possible that this ancient circulation, which called into being the cardio-vascular system, would lose in the new comer its own identity and independence? Or was the cardio-vascular system secured for greater importation and exportation facilities?

The studies of Dr. A. B. MacCallum on the organic composition of certain sea forms and sea water show that the former's degree of salinity can only be explained on the ground that the cells lining their gastro-vascular channels and the covering cells have a vital selective action. Speaking of the inorganic composition of blood plasma and its strong resemblance to ancient sea water, the author says: 'These can hardly be mere coincidences and they seem to indicate that the proportion in plasma are an ancestral feature derived from a form which had its habitat in the ocean in the earlier geological periods, when ocean water was very much less rich in salts of magnesia than it is now. Just as in the Medusae of to-day, the gastro-vascular fluid is but sea water, so in the ancient oceanic prototypes of the vertebrates and of the invertebrates which are provided with a distinct circulatory system, the fluid in their vascular channels which communicate with the exterior was probably but modified sea water as regards its inorganic constituents, and in the long periods of time during which the forms were exposed to the conditions of such an environment, a physiological relation between the tissues and the salts in their vascular fluids, in the proportions occurring in their environment, became so fixed and established that it was of necessity transmitted to the descendant forms living in different habitats, whether on land or in fresh water." (Jour. Physio. Vol. XXIX., No. 3, page 234.)

By the blood stream, oxygen and nutrition are carried to the tissues, and waste products are carried away. If we knew how oxygen was utilized by the tissues, it would give us "scientific anticipation" of the modus operandi of the other functions of the lymph circulation.

The history of the physiological teaching of oxidation is interesting. The ancient belief that arteries contained air and carried it to the tissues was abandoned after Harvey, and in its place came the teaching that the lungs were two furnaces burning up the waste products carried to them. Then followed the teaching that the blood oxidized the tissues through walls of the systemic capillaries. This was replaced by the teaching that the blood oxidized the perivascular lymph, and the tissues became oxidized by contact. The present day teaching is that cells oxidize themselves by their own inherent vital activity. By their own instinct they seize the oxygen in the lymph and cast back their products of metabolism, viz:—products of secretion and excretion.

Internal secretion and excretion are cast from the lymph stream to the blood stream simultaneously, The giving up of lymph by way of the thoracic duct is a very remote and fractional part of the interchange (Tscherwkow Arch. F. D. Ges. Physiol. 1895, Bd. Ch. 12, S. 391, Lazarus Barlow and Starling, Journal Physio. Vol. 16). The interchange is almost entirely effective between the lymph spaces and the blood capillaries. It has been found that when an animal is being

bled the later portions of blood are more dilute than the first, and this is the case whether the thoracic duct is ligated or not.

Experimentally, we know that from the hind limbs of an animal at rest no lymph flows. By kneading the muscles a free flow can be induced. Passive or active movements of the limbs bring about a free flow. It is known that in the quiescent state lymph coming from the thoracic duct is from the viscera. Glandular or muscular activity takes front rank as increasers of lymph flow.

In harmony with the post mortem flow of lymph, examination of the web of a frog's foot after the heart has been cut away or the vessels clamped, movement in the blood capillaries will continue from five to fifteen minutes thereafter; when all movement has ceased, it will return if some irritant be applied to the web.

It seems that the lymph circulation being more ancient and stable continues after cardio-vascular death. A student whose mental make-up enables him to see the other side of things, said in my quiz class that "blood was simply mixed lymph with peculiar cells floating in it." Whatever we find in the serum we know has been cast there by lymph.

A study of the blood serum is practically a study of general lymph. All the modern studies of serum will apply to the lymph. The causes of vital movement must be analyzed before we gain a clear view of lymph circulation. Evolutionally this principle must be true, that all protoplasm not undergoing vital movement in offensive or non-nutritive media must have been lost in the evolutionary process. This must be the basic explanation of all vital movement. By vital movement is meant not only contraction, but intervening relaxations.

The contraction of voluntary muscle is a powerful expulsion force on lymph within its sheath. Now, before a voluntary muscle contracts, there is a carbohydrate explosion, giving rise to carbonic acid, sarco-lactic acid, etc. This takes place in the latent period before the visible contraction, and changes the reaction of the muscle from an alkaline to an acid reaction. The contraction which follows on this expels large quantities of lymph. Here clearly vital movement was inaugurated by offensive lymph, and the purpose was to expel it.

Now, the great stimulus to involuntary muscle movement is venous blood, viz: lymph obtained from venous blood surcharged with waste products—viz., offensive lymph—is the stimulus. (The meaning of vital movements.—Canadian Practitioner, Oct., 1902.)

It is interesting to note the wide distribution of involuntary muscle. We find it composing largely the walls of hollow viscus. It is fully distributed in the stroma and capsules of glands and organs. And I would venture to say that more than one-half the involuntary muscles of the human body would be found to be in the immense area of the skin. Its slow rhythmic contractions with intervening relaxation suggest a tardily beating heart. The attachment of the arrector pili

muscle to the root sheath of the hair in such a way as to pump nutritive lymph into the hair shaft, and the acting of the ciliary muscle on the canal of Schlemm are two examples of this involuntary muscle acting as lymph pumps without doing so directly. This variety of muscle has a tendency to have associated with it in this action white fibrous and yellow elastic. In the lungs the lymph circulation is almost wholly effected by voluntary muscle, during inspiration producing vacuum in the chest cavity which would favor lymph entrance into lymph spaces and reservoirs. The expiratory effort, effected in natural breathing almost entirely by the elastic recoil, would act as a pump to expel.

I have said enough to show how varied are the ways in which the forces act. Vital movement is best seen in muscular tissues, but is not peculiar to it, as doubtless all tissue is capable of some degree of vital movement. Vital movement does not always take away the form of contraction, thorough relaxation may fill the enclosed spaces with lymph and dilute the offending lymph.

The lymphatic glands, spleen, uterus, intestines, ureter and bladder undergo variation in volume, rhythmically due to their involuntary muscle, and this will continue even when removed from the body. The rhythmic flushings of transparant parts (albino rabbit's ear or bat's wing) and periodic variations in volume of one's arm (when in a plethysmograph) are explained as arising from this smooth muscle tissue. Traube-Herring blood pressure curves seen in states of asphyxia are similarly induced. We have the same rhythmic contraction of the walls of the lymphatic duct, and the intestinal lacteal is emptied by this tissue.

Offensive lymph inaugurate the respiratory and cardiac movements. Note how both will speed in states of asphyxia. A piece of steel embedded in the cornea has long taught us that this nonvascular structure can vascularize itself. This can only be explained on the theory that the tissues effected this by suction. Inflammation under such a view of lymph circulation would be simply excessive selection or extraction of fluid and cells from the blood. In states of asphyxia the lymph coming from the thoracic duct is often bloody, an effect to be expected if the tissues secured their own lymph.

Now, what does one mean by offensive lymph? Lymph may be offensive in being devoid of oxygen and nutrition, or containing metabolical and chemical products; high or low temperature would be offensive (to warm blooded animals), high or low pressure, vibrations and certain electrical variations. It is one's right to question "why" as often as "how". Adaptation of pathological process is an axiom in pathology, but there are countless examples in physiology. The adjustment of the iris to varying degrees of light is one of these. Here we see involuntary muscle adapted to expel offense. Heidenhain gave two divisions of lymphagogues, those increasing the water

and those increasing the solids. I need not burden you here with details except to say certain salts like magnesium sulphate are powerful lymphagogues. This agent acted first as a lymphagogue, and secondly as a purgative. It is well that internal excretion should procede external excretion.

The lymph passing over to the blood stream contains defensive fluids, as well as waste products. Hence purging within certain limits may be a form of serum therapeutics (see excretion in the treatment of acute infectious diseases, Philadelphia Medical Journal, Jan. 13, 1900.)

The action of the secretions of the ductless glands have not been brought into this discussion, but they vitally act on the tissues, and consequently on this circulation. The two most powerful agents in the interchange of lymph are the muscular systems. The voluntary expel lymph from their body, and their sheaths, tendons and attachments, and place, as far as the limbs are concerned, this circulation almost wholly under control of the will. The influence of the brain over the movements of the involuntary muscles is less than over the voluntary. The emotions can play upon this circulation almost past belief in some individuals.

To consider the skin as a system of external drains is to consider it not an important organ. The enormous amount of involuntary muscular tissue, the ability to corrugate itself to resemble "goose skin" in states of chill and fever, myodema and dermographia from strong or weak strokes to its surface, and the experimental evidence that stimulation of the pilomotor nerves causes contraction of the skin, especially over the genital region (Langley and Anderson, Journal Physio., Vol. 20, p. 85.) will justify one in speaking of the skin as a great lymph heart. The skin's elasticity alone would make it that. One can scarcely separate the lymph heart action of the skin from some of its several other functions, it being a sensory surface upon which are inagurated impulses of pressure, temperature, pain, etc., which in turn set up reflexes of various kinds that keep the body adapted to environments. If the skin be considered the external body world, it arouses, defends and stimulates the inner mechanism more than can easily be conceived.

In order that I may not be charged with running thoughts till they are out of breath, I may bring forth Head's conclusions (Brain, London, 1893, Vol. 16, p. 129,) that each viscus had a definite segment of skin that would show sympathetic pain when the former was irritated. He assumed that impulses can reflex the other way, viz. that irritation of the skin over these areas would have trophic influences on the corresponding viscus. The so-called "lung reflex" described by Abrams (N. Y. Med. Journal, Jan. 13, 1900), shows that this is true. By irritating the skin over the lung by means of cold, friction, or farradic currents, dilation of the lung ensues, and an increase of the blood in that lung follows.

This is evident by obliteration of apex beat, cardiac and splenic dullness, along with the appearance of hyperresonance on percussion, and a more definite lung outlying under X-rays.

Whether intra-spinal or intra-ganglionic, excitement inside is communicated to the skin outside, and vice versa. Beneath the skin, both superficially and deep, are great laboratories that can be aroused to feverish activity by stimulus applied upon the cutaneous surface.

By contraction of this great lymph heart, interchange of lymph and blood is effected, and the lymph passing over is a mixture of excretion and secretion, waste products and proteids, to defend the whole organism. It appears that the outer world excitement is accompanied by increased activity inside, else we had never been in possession of a heat-regulating mechanism.

You well know the nervous mother who will make a hot-house plant of her child. There comes a day of exposure, and the child has "caught cold"—has bronchitis, pneumonia, nephritis, or gastro-intestinal catarrh. The modus operandi of "catching cold" is this: the lymph stagnates from want of proper skin stimulus (which would be cold). The application of cold to the skin produces a powerful interchange, driving the excretory organs to overwork.

Over-stimulation from clinical evidence we know can end in inflammation.

The child who has daily exposures has his waste products sent into the blood circulation in dosage. The daily exposure is itself a tissue arouser and tonic.

No biological worker now-a-days denies organic evolution, but for the reason that the "how" entirely dominates the "why" it has not been pushed into the explanations of purposeful phenomena.

From the inception there were certain forces that act upon organic growth, and will continue to act for all time.

Shall we ever know the full meaning of "sunlight" giving us light and darkness; air with its varying shades of dissipation of heat from objects; and the medium of vibrations; the changing seasons with their variation of heat and cold; the cold and warm rains cleansing the air, plants and animals, and furnishing fluid for internal use to all? What a cluster of blessings. Try them on the human organism, and everyone plays on its cutaneous surface. Without the sunlight we had no eyesight; without vibration in the air we had no hearing; without the whole group we had not our cutaneous sensations.

In the open air, sunlight, and forced feeding treatment of phthisis, we go back to the primal forces of organic evolution, and we have staggered upon them, not by intelligent grasp, but by accident. Have we conceived the full range of possibility of the skin as an inaugurator of impulses, and movements, and the uses of these in maintaining normal health, and in treating disease? We use in typhoid fever the cold bath and secure rhythmic discharge in dosage of the harmful

toxine and of defensive proteids into the blood circulation. In typhoid fever the height of the temperature is merely the indication, the reduction merely the accident of the treatment. We use massage to remove stagnant lymph in conditions of neurasthenia, melancholia, Glenard's disease and other forms of mal-nutrition.

The relation of the modern treatment of tuberculosis to the lymph system is easily indicated. The forced feeding enables the cells' inherent activity to obtain the material for the formation of the defensive proteids. The sunlight and fresh air stimulates the skin not hourly, but almost continuously to activity, that defensive proteids may constantly flow into the blood stream to enable the long drawn out battle to be won on the side of life. Stagnation of lymph can occur from both warmth and cold. This is overcome in typhoid tubbing by friction.

If one concede so much to the skin as an inauguration of defensive processes, what shall we concede to the great master tissue, the central nervous system in this regard? The influence of mind on the body has not yet attained its full recognition in medicine. The invigorating effect of sane courage in arousing the whole bodily force is a medical axiom from the beginning of time.

"Know then, whatever cheerful and serene
Supports the mind, supports the body too.
Hence the most vital movement mortals feel
Is hope: the balm and life blood of the soul."

The splendid practice of training the sick mind is far too little used. The neurotic should be taught to cease complaining, to minimize his actual objective symptoms and to train his body and mind to gradually increasing periods of alertness as well as periods of absolute repose.

Had this been more generally done by the profession there had not arisen in the land a cult who appeal to the mystical to heal disease.

I shall not stay to discuss the relation which exercise, inflammation, hypertophy, atrophy and repair bear to this hypothesis.

You will doubtless see that our attention must be fixed on cells, and the best method of securing their fitness to fight morbid changes. Chemistry and physics give many phenomena a meaning adaptive to our understanding; yet there are innate properties in cells put there by evolutionary factors that must be baffling to all science.

As one understands more of the whole biology of the human body, he turns less to drugs for curative agencies. The body must be considered as a community of cells, and as a united state possessed of a wonderful ability to organize its land and sea forces. All therapy must be measured by its effect on the organization of these forces. In treatment, the great object is to make the human body into the very best fighting machine against the invading enemy—primary or terminal infections. More terrible to a waiting camp than the enemy's

weapons are water and food famine and stagnant sewerage. Malnutrition and stagnant lymph mean to the human body what famine, polluted sewerage, and destroyed ammunition mean to a regular army—capitulation without terms.

In conclusion, I trust your curiosity has been aroused, for my attempt has been merely to lead you to a hill-top in this new continent of thought, and to point out the complex landscape and the open roads. It may be true the valleys are hidden with mist, and the mountains with clouds, and the soil is yet to be enriched by the growth and decomposition of thousands of ideas, but, nevertheless, this is the land that will yield us fruit, the eternal biological verities.

TUBERCULAR ARTHRITIS—WITH SPECIAL REFERENCE TO THE KNEE-JOINT.*

By N E. McKay, M. D., C. M., M. R. C. S., (Eng.) Professor of Surgery, Clinical and Operative Surgery, Halifax Medical College.

Its Treatment.

There are broad general principles which should govern the treatment of all inflammations. For example, the affected part should be given absolute physiological rest, and, if possible, the cause should be removed, and everything which favours the growth of micro-organisms should be got rid of, and fresh infection should be guarded against. If there be any constitutional dyscrasia present attend to it as well.

To treat any disease intelligently, we must understand its pathology, causation and natural tendency. In tubercular arthritis we have to deal with (1) enfeebled tissues, inherited or acquired, and (2) tubercle bacilli. The enfeebled tissues or cells are unable to resist the action of these organisms or do so but very feebly; and the tubercle bacilli and their toxines excite chronic inflammation in the part which results in the formation of tubercular tissue, the characteristic feature of which is its tendency to degeneration and caseation. Chronic inflammation thus induced weakens the already enfeebled tissues still more, and so encourages the spread of the disease locally. Then again, any injury or irritation from whatever cause aggravates the affection and helps to keep up the inflammatory process. The treatment of tubercular arthritis should, therefore, be directed towards removing, as far as possible, the causes and conditions that perpetuate the disease. The treatment resolves itself into general and local.

As tubercular disease occurs in persons with weak constitution, the general treatment should be constructive in its nature. It should be a tissue builder. The weak tissues and cells must be strengthened and toned up and thus put in better condition to defend themselves against the ravages of the tubercle bacilli and their toxines. The system must be built up by good hygiene and an abundance of fresh air, either by the seashore or inland, the locality being determined by the idiosyncrasy of the patient, and a good generous diet. The food should be easil digested. A meat diet is to be preferred to a vegetable one. It is claimed that vegetable food, rich in potash salts, favors the growth of tubercle bacilli (Bidder.)

*Discussion at meeting of Medical Society of Nova Scotia, Antigonish, July 2nd, 1903. (For "Its Pathology," by Dr. J. Stewart, see September number.)

Cod liver oil, iron, quinine, creasote, guaiacol and the bitter tonics are the drugs usually relied upon for building up the system in tubercular arthritis. General treatment in tubercular arthritis does not avail much unless it is supplemented by local means, and if a choice has to be made between the two methods the local should first be tried.

Local treatment may be divided into two classes, viz:—(1) Expectant and (2) Operative. Which plan to adopt in any given case will depend upon (1) the surgeon's views of the curability of tubercular joint disease by the expectant plan, or (2) his idea of the dangers of general infection from local foci, or (3) whether or not the disease has ended in caseation—the formation of an abscess.

By the expectant plan of treatment the tubercle bacilli are not attacked directly but indirectly by rendering the tissues better able to resist their destructive action. These organisms get in their deadly work largely by the chronic inflammation they induce and so paves the way for local extension of the disease. By it the tissues and cells are weakened and rendered less able to defend themselves against the ever aggressive attacks of the tubercle bacilli. Treatment should, therefore, be directed towards removing, it possible, all the local agents that may be concerned in the production of the inflammatory process. First, remove the cause, if possible, but unfortunately this cannot be done in infective diseases under the expectant plan; secondly, give the part absolute physiological rest and elevate the diseased limb. This is done by immobilizing the inflamed joint by some form of fixation splint and the recumbent position. The form of splint will depend upon the extremity and the joint affected. Splint is sufficient where the disease is synovial in origin and limited to that membrane. This is known by the absence of nocturnal spasms and rigidity of muscles, and the presence of hyperplasia of the membrane. When the disease, however, affects the articular surfaces—as is indicated by tonic contraction and rigidity of muscles, pain and nocturnal spasms and flexion of the joint—in these cases the pressure of the two diseased articular surfaces against each other, caused by muscular contraction, aggravates the disease. To overcome this condition, and relieve the pressure and secure absolute rest to the joint, more than the mere application of a fixation splint is required. Here muscular contraction has to be overcome by weight extension. The amount of weight employed has to be regulated by the effect produced. The idea should be, not to draw the two surfaces apart, but to tire the muscles and so relieve the pressure of the two opposing surfaces. When extension does good, pain and spasms will speedily cease. If, however, in 10 or 12 days, pain recurs, but no spasms, it is due probably to overstretching of the ligaments, and the weight should be reduced. In synovial disease *per se* weight extension should not be used except when deformity is present. This

treatment should be continued for 3 or 4 months until good progress is made towards recovery, as indicated by the disappearance of inflammatory symptoms—pain and tenderness, after which he may be allowed to go about on crutches—if limb or knee-joint is affected—with a Thomas's splint. Fixation of the joint may be supplemented by other measures from which benefit has been derived in the treatment of simple chronic inflammation, *e. g.*, the actual cautery, counter-irritation and pressure. Massage in the treatment of tubercular joint disease is positively contra-indicated, although of great value in simple chronic inflammation.

The forms of counter-irritation usually employed, and from which benefit has been derived in tubercular arthritis, are: the actual cautery and Scott's dressing—unguentum hydrarg. comp.

The best results are obtained from the actual cautery in deep seated joints, such as the hip and shoulder, and in spinal caries. It does not do any good in pure synovial disease or in superficial joints like the knee. In fact I have seen it do harm here.

Until 1885 it was the treatment *par excellence* for tubercular arthritis of the knee-joint in our Victoria General Hospital. I have never used it for this joint except once, and I am satisfied that it did more harm than good, for it so aggravated the disease that I was obliged to amputate the limb subsequently to save my patient's life. I would be sorry to have a recourse to this method again.

Pressure is often employed to overcome chronic inflammation. It is of great value in well selected cases of pure tubercular synovial disease. I usually employ it in combination with Scott's dressing. This (Scott's) dressing is applied with strips of lint around the joint, and to secure pressure the part is surrounded with a mass of cotton wool, over which is applied an elastic or cotton bandage, care being taken not to interfere too much with the circulation. The pressure should not cause any pain and it should be used only when recovery is taking place. The dressing need not be changed oftener than once a week if it does not irritate the skin. If it does it is better to depend on pressure alone. Pressure, Scott's dressing and a splint of leather, or of silicate of potash or of plaster of Paris may be used in conjunction with Thomas's splint with advantage. The latter splint alone does not ensure absolute physiological rest to the knee, so that it should be supplemented with one of the fixation splints above mentioned. The object of Thomas's splint is to relieve the joint of pressure by transmitting the weight of the body through the tuber ischii.

In my experience I never found young children to suffer much from confinement in the recumbent position, providing they got abundance of fresh air and a generous diet of easily-digested food. When the case has been so improved as to warrant the employment of a splint, I allow my patient to walk about on crutches, and live in the open air as much as possible. The amount and kind of exercise

permitted depend to some extent on the joint affected. I always remind my patients that they are invalids, and that they must not join in violent games or engage in unduly-vigorous exercise, as the least injury may bring on a relapse.

Some surgeons speak highly of Bier's method, which consists in producing venous congestion of the joint, in hopes thereby to stimulate the growth of fibrous tissue, and so encapsule the tubercular area and prevent the spread of the disease. The circulation should not be entirely stopped, but the congestion should be maintained for from fourteen to eighteen hours out of the twenty-four, and the treatment continued for some time to effect any good. The treatment may be supplemented with advantage with an injection of glycerine emulsion of iodoform, and rest. I have had no experience with Bier's method myself. It is applicable chiefly in knee and elbow disease.

German surgeons speak well of an injection of a ten per cent. glycerine emulsion of iodoform into the joint. Here the tubercle bacilli are attacked directly. For obvious reasons, the use should be limited to pure synovial disease. The efficacy of the injection may be enhanced by first sterilizing the iodoform in carbolic acid and adding to the glycerine hydrarg. perchlor., 1 in 2000. The amount injected will depend on the joint and age of the patient. In children in knee-joint affection from one to four drams is enough, in adults double that amount may be used. The injection should be made directly into the pultaceous, gelatinous, tuberculous synovial membrane, and only a small quantity of it into the joint cavity—two drams. The injection should not be repeated oftener than once a week, and when using it the joint should be immobilized to prevent excessive reaction. It may be used in tubercular synovitis in conjunction with rest and pressure, or Bier's method. I have had not much experience with glycerine injections of iodoform, but from what I have seen of it in the surgical wards of the Victoria General Hospital I am not favorably impressed with its use.

Cure cannot he expected to result from the foregoing measures if caseation (abscess) has occurred before treatment has begun. In these cases the most that can be hoped for by the expectant plan is an improvement in the symptoms. The formation of an abscess calls for operative interference. However, when treatment was begun in the early stage, prior to caseation, and if the symptoms improve under the expectant plan, it had better be continued for a year, or until every appearance of disease in the joint has disappeared. On the other hand, if, in spite of a fair and honest trial of these measures, the case goes from bad to worse, and the symptoms become aggravated, or if suppuration has occurred before the case appears for treatment, the question of operative interference has to be considered.

The object of operative treatment is to remove all the diseased tissues and the tubercle bacilli.

Expectant and operative measures may be combined in some cases of tubercular knee-joint disease, as, for instance, when an abscess is present, but is not communicating with the joint cavity. The abscess may be dissected away—the ideal operation—but when this is impracticable its cavity should be well curetted and swabbed with pure carbolic acid, and irrigated with boracic acid or some other antiseptic solution, and the wound closed. This procedure may have to be repeated two or three times before a cure can be affected.

It is always better to remove tubercular tissue by clean cutting than by scraping, as the latter drives the tubercle bacilli into the tissues and enhances the danger of recurrence. I have found this mode of treating tubercular abscess very satisfactory. It is much easier to keep the wound aseptic by closing it up. This has been my experience.

Then again, if an abscess is located in the head of the bone, trephine it and purify it in like manner. However, great care should be exercised not to open into the joint, and it should be immobilized at the same time.

There are three different kinds of operation performed for advanced tubercular disease of the knee-joint, viz:

(1) Amputation.
(2) Arthrectomy or erasion.
(3) Excision.

Which operation to perform in any given case must depend upon the local and general conditions present, as well as upon the age of the patient.

In weakly subjects, unable to stand the strain of a prolonged operation, and when phthisis is present, amputation should be the operation of choice; similarly in amyloid degeneration of the kidneys and other organs.

Amputation is the least dangerous. In adults with extensive suppuration about the joint, and when multiple septic sinuses are present; and in the young, when bone disease is extensive, and in cases of bad recurrences after excision and erasion, amputate.

When the disease has extended to caseation and the formation of abscesses, and the case is going from bad to worse in spite of expectant treatment, excision or erasion will have to be performed. Erasion or arthrectomy means the removal of all the diseased structures only, while excision means all this and a formal removal of the articular surfaces of the bones forming the joint besides.

The important question for consideration is which one of these operations to perform in any given case. In deciding which to choose, we should consider the following points:

1. The relative dangers of the two operations.
2. The possibility of dissemination of the disease throughout the body.

3. The chances of recurrence of the disease.
4. The subsequent utility of limb as regards—
   (a) Motion.
   (b) Deformity.
   (c) Shortening.

Both operations are severe and prolonged. The danger in each is from shock and hæmorrhage. These are equal in the two operations.

There can be no doubt but that the danger of dissemination of the disease is greater after arthrectomy than after excision. The danger is enhanced if scraping is used instead of clean cutting. Scraping drives the tubercle bacilli into the bones and fibrous tissues.

With reference to the third point, I am convinced that recurrence is less likely to follow excision than erasion. Foci of inflammation are more likely to escape the attention of the operator in the latter than in the former operation. Diseased centres may exist under the margin of apparently healthy cartilages, in the inter-condyloid notch, and about the crucial ligaments, and be overlooked by the operator. Tubercular deposits may be overlooked in excision, but the chances are very much less. The danger of a recurrence is therefore much greater after erasion.

The next point to be considered is the subsequent utility of the limb. The promoters of arthrectomy claimed that they could preserve motion in the knee-joint after this operation. However, after a fair trial they failed to preserve useful motion in the joint and now have abandoned the idea in toto. Then they admit that firmer and better union is secured after excision than after erasion. This brings me to another point, viz.:—deformity. There can be no doubt that the weaker the union obtained the greater the danger of flexion and deformity. The union obtained after erasion being less firm—chiefly fibrous—than after excision, the danger of flexion and deformity of the joint must be proportionately greater.

Now with reference to the last question—the subsequent shortening of the limb. This question, no doubt, is very important especially in children. The future growth of the limb should not be interfered with in either operation if the epiphyseal line is not encroached upon. The mere performance of excision need not necessarily damage the growing cartilage unless the disease has extended up that far. The extent of the disease usually determines the amount of bone to be removed in these cases and not the operation, and whichever one is resorted to all the diseased tissues must be removed, even the epiphyseal cartilage if it should be involved. So that the subsequent shortening of the limb need not be much greater in the one operation than in the other.

It is admitted to-day by the promotors of arthrectomy that excision should be the operation of choice in knee-joint disease in persons over sixteen years of age. Under that age, however, many surgeons

prefer arthrectomy, chiefly because they are of opinion that the danger of subsequent shortening of the limb is less, and that this alone should outweigh the disadvantages of the operation. They say excision should never be done in young children. I do not agree with them. The extent of the disease and not the operation must determine the subsequent shortening. In excision the articular surfaces can be formally removed, even in children, without damage to the growing cartilages. I have often done it, and never had any cause to regret it.

I have done excision of the knee thirty-five or forty times, and the results obtained have been on the whole very satisfactory. No serious shortening occurred in any of my cases, and no deformity. In one case, a child seven years old, where the disease was limited to the synovial membrane, I performed arthrectomy, and I have always regretted having done so, as the results were most unsatisfactory.

DISCUSSION.

Dr. Hayes: I am not satisfied as to the primary relation of the tubercle bacillus to tubercular arthritis. I believe that primarily there is something wrong in the trophic centres or in the peripheral trophic nerves. I think in every case there is some established defect to deal with. In the early stage I consider iron to be the remedy *par excellence*. If the iron is not assimilated, bismuth subgallate, 20 grains, with pepsin, 4 grains, before meals, and the iron taken after meals often has a decided effect. The good from climate is probably due to mental exhilaration, particularly moving from place to place. Often good results are obtained even when tubercular foci are not all removed by the production of leucocytosis. In cases of tubercular peritonitis after laparotomy reaction takes place, a new inflammation over peritoneum, and patient often obtains good health. Here there is always a flooding of leucocytes.

Dr. J. W. Reid: I have seen the actual cautery give good results in Potts' disease and in knee cases. Plaster Paris is often good to ensure perfect rest. If an operation is necessary, the age of the patient should decide what operation. In a child, only remove the diseased tissues. Arthrectomy, I believe, is only recommended as necessary in most of these cases.

Dr. Chisholm: Simple incision into the joint is sometimes recommended, particularly as it is an easy operation. In many abdominal cases a cure results from simple incision; why not also get a cure by a simple incision into the joint?

Dr. C. P. Bissett: There is a difference of opinion whether pleurisy is always tubercular or not. Tapping often effects a cure where indication is tuberculous. One patient I tapped three times, and it appears to be cured.

Dr. Marcy: I have listened with much pleasure to the discussion Some years ago I gave a good deal of attention to joint diseases, and reported one hundred and fifty cases treated by hyperdistention with three per cent. of carbolic acid, and then fixation in plaster Paris. This was only a tentative study which led up to measures discussed this morning.

Dr. McKay: I would like to say a word in reply to Dr. Hayes. Tuberculosis begins in the knee-joint after a slight injury which the patient neglects, while after a severe injury the patient rests. When affecting the lung after bronchitis, perhaps following la grippe, lowered nutrition is the result and the bacilli get in. In tubercular peritonitis, no one can explain why operation cures; this was found by mistakes. Dr. Hayes should not say that a new inflammation spreads over all the peritoneum, for if that were so likely the patient would die. I consider arthrectomy not worth mentioning.

SOME COMMON ERRORS IN DIAGNOSIS.*

By G. Gordon Campbell, B. Sc., M. D., Lecturer in Medicine, McGill University, Assistant Physician to the Montreal General Hospital.

During the past decade almost every year has seen, either in the domain of medicine or electricity, some new discovery, which has added to our armamentarium, either a new method of treatment or a more exact means of diagnosis. In the Roentgen rays, for example, we have an agent undreamt of by the teachers and writers of fifteen years ago, a force which is seen to be of more and more value in the field of both diagnosis and treatment, as it becomes better understood Have these new discoveries placed those of us who do not possess the costly apparatus and technical knowledge required to make use of them at a great disadvantage as compared with the more fortunate of our fellows? Will the physician of the future, nay, can the physician of the present even now, to a considerable extent, abandon the older methods of determining the nature of disease, and rely upon the skiascope, the agglutination tests, and the results of bacteriological examination for his information? I think not; and yet one can already see an increasing tendency to undervalue and partly neglect the older methods in cases where the new are applicable. Men appear to think that because in typhoid fever, for instance, we have an exact means of diagnosis in the Widal reaction, dependence should be placed upon it alone.

Of the importance of diagnosis it would seem almost unnecessary to speak, were it not that one continually meets with evidence tending to show that it holds a position of secondary importance in the minds of many of the profession. Take a look at the price-lists of the leading manufacturing pharmacists, and you will find every year an increasing number of preparations intended for the treatment of symptoms. Here we see triturates for diarrhœa, powders for headache, mixtures for fever, and a hundred and one things all aimed at saving the physician the bother of making a diagnosis by enabling him to prescribe for symptoms. Is it not reasonable to conclude that the demand for this class of ready-made prescriptions is on the increase?

Correct diagnosis is essential to proper treatment. The man who is uncertain in diagnosis is half-hearted in treatment. Moreover, if the disease does not at once respond to the remedies exhibited, his

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uncertainty settles into a conviction that he has mistaken the nature of the ailment, and he contents himself with prescribing for the predominating symptoms. We have been accused many times at McGill for neglecting the teaching of treatment and paying too much attention to diagnosis, but, after all, if we can send out our graduates with a careful training in the methods of case-taking and physical diagnosis, a training which will enable them by pursuing the methods taught at college, to reach correct conclusions, the deficiency in treatment, if any, can be easily supplied by themselves. Upon himself alone must a man depend in determining the disease with which he has to cope, and the correctness of his decision regarding the nature of a case will depend in the main upon the skill with which he is able to detect the condition of the various organs of the body by physical examination, and his ability to elicit a clear and connected account of the patient's disease and of his past history. Once the diagnosis is established, the appropriate treatment can be learned from any reliable text-book upon the subject. I believe, and I speak as a clinical teacher, that if every case of disease is thoroughly investigated, from every point of view, after a definite method, inability, from whatever cause, to make use of the more recent discoveries in diagnostic methods, will not prevent one from reaching correct conclusions in ninety nine cases out of one hundred. Do not let me be understood as wishing in any way to underestimate the value of these recent additions to our methods of diagnosis: on the contrary they have provided a solution to many of the problems of medicine. Rather is it my wish to point out that want of method and carelessness are responsible for the vast majority of mistakes in diagnosis. The properly trained, careful physician, no matter where he may reside, whether within reach or not of the specialist's aid, will rarely make those stupid mistakes which so often lead to serious results for his patient and injure his own reputation. Of the importance of thoroughly investigating even the simplest case from every point of view one cannot too strongly insist. Sins of omission rather than sins of commission, as one of our clinical teachers never fails to impress upon his class, are responsible for the great majority of errors in diagnosis. It is this very quality of thoroughness which has characterized the eminent physicians of the past, and when we study the men who are the leaders of our profession at the present time, we see that on this in large measure depends their success.

That mistakes are daily made, which are seen to have been easily avoidable, no one will care to dispute; and it will almost invariably be found that want of care in physical examination, or that unfortunate faculty of taking too much for granted, has led to them. To some few of the more common errors I wish to refer more in detail,

as illustrations of how easily one may reach wrong conclusions by neglecting to make use of every source of information.

Headache and pain in the stomach are two symptoms which are met with perhaps as frequently as any in the daily routine of work; and yet who can afford to pass them by, without running the risk of some day overlooking Bright's disease in the former, and malignant disease or locomotor ataxia in the latter? This fact was impressed upon me very early in my professional career by a patient to whom I was called one evening on account of a severe attack of gastric pain. My patient was an able-bodied policeman who had never been forced to relinquish his duties, although he had had many similar attacks during the previous year. I found him suffering extremely and the only history I could elicit was of similar attacks of severe pain in the stomach, lasting for a few hours at a time, and then passing away and leaving him as well as ever. He had consulted several physicians and in each case had been told he was suffering from acute gastritis, as indeed the treatment indicated. While talking to him I noted that his pupils were much contracted and suspected him of having had recourse to morphine to relieve the pain. I examined his abdomen without obtaining any information of help in forming a diagnosis, and my physical examination, I confess, would have ended here, had not the lamp in the room fortunately gone out and left us in the dark. The darkness, however, proved my light, for it showed that my patient had difficulty in getting about without a light in the room, and the true explanation of the pain flashed upon me. It was locomotor ataxia with gastric crises, as a further examination with this end in view established without difficulty.

Mention of tabes brings to mind another condition which has been a stumbling block to many, myself among the number. Many of you must have met the man and will recognise him easily from my description. In my case he was about thirty-five years of age, and consulted me on account of obstinate constipation, amounting almost to complete obstruction of the bowels. Examination revealed a large, moveable tumor, about the size of a fœtal head, in the hypogastric region. This was evidently the cause of the obstruction, although the patient had not noticed it, and an overfilled bladder was suggested as the most probable explanation. Enquiry, however, showed that he was passing daily a normal quantity of urine, and that there was no obstruction to the urethra, as evidenced by a full sized stream. This, together with the early age of the patient, excluded, in my opinion, over-distension of the bladder, as these facts were incompatible with prostatic enlargement or stricture. As the condition persisted and I could do nothing to relieve it, I finally sent the man into hospital, where he was seen by a surgeon and arrangements

made for an exploratory laparotomy the following day. In the meantime I happened to ask one of my confreres to see him, and on his suggestion passed a catheter, which resulted in the rapid disappearance of the tumor as nearly fifty ounces of urine were withdrawn. Since then I have seen a similar condition on two occasions, and in both an incorrect diagnosis had been made on the same grounds.

In connection with diseases of the respiratory tract, one naturally thinks first of that disease which has been brought into such prominence by the almost world-wide crusade against its ravages. Increased knowledge of the curability of pulmonary tuberculosis, when treated in its earlier stages, has made medical men more watchful for the first manifestations of its appearance, and it is now not so commonly overlooked. There are still, however, many cases of the disease which reach a stage where the chances of cure are very slight before the true nature of the complaint is recognized. In some of these cases, although cough and expectoration are almost entirely absent, physical examination reveals the presence of an area of consolidation with softening.

One puzzling disease of the respiratory tract is primary nasal diphtheria. While secondary infection of the nares in diphtheria is usually to be looked upon as a most serious complication, when the disease occurs there primarily, a remarkable freedom from all symptoms, except inability to breathe through the nose, is noted. In the three cases which I have seen the children were apparently in normal health and running about the house. There was no temperature, loss of appetite or other signs of disease beyond the fact that the nose was blocked and the nostrils excoriated. Indeed I was asked to see one child because I happened to be in the house for another purpose. In all these cases inspection in a good light and without the aid of a speculum showed a dirty-white membrane on the septum and filling the nares, and a single dose of antitoxine caused the membrane to come away *en masse* the following day. Laryngeal diphtheria is also extremely liable to be mistaken for croup, when the respiratory passages above the vocal cords are not involved. In these cases there is no glandular enlargement and, without the aid of a laryngoscope, one can only rely upon the to and fro character of the stridor in the membranous stenosis as compared with the inspiratory stridor of spasmodic croup.

Even in pleurisy and pneumonia one may be led astray. I do not refer here to the difficulty of differentiating between the two diseases, which is admittedly great, if not almost impossible in many cases in children and occasionally so in adults, except by the introduction of an aspirating needle. I refer to those cases in which neither of these diseases is suspected from the symptoms and general condition of the

patient. Some of you may have had the following experience: A child is brought to you with a history of a slight cough and general malaise, lasting perhaps for weeks and hardly attracting attention until a disinclination for play has shown that something was wrong and professional advice was sought. When fully dressed, there is nothing to give any hint of the nature of the illness from which the child is suffering, but, stripped to the skin, inspection alone shows, by the fullness and immobility of one side of the thorax, the astonishing fact that one pleural cavity is full of fluid. These cases are fairly common and may fall within the experience of any one, but the fact that lobar pneumonia may also be latent in so far as the subjective symptoms are concerned, is not generally recognized. Three times within the past five years has an adult suffering from lobar pneumonia walked into my clinic at the out-patient department of the Montreal General Hospital, and, until a careful physical examination had been made, nothing led us to suppose that we had to do with other than an ordinary cold. In one of these cases, which I reported some years ago under the title of "Ambulatory Pneumonia," the patient died within forty-eight hours and the autopsy showed a large area of one lung in the stage of grey hepatization.

But pneumonia is more often diagnosed when it does not exist than overlooked when its presence might be detected. Rapid breathing, often of sudden onset, with frequent cough and blood-stained sputum, associated with an area of dullness at the base of one lung are certainly suggestive symptoms, even if definite bronchial breathing cannot be made out; but their dependence upon loss of compensation in a lesion of the mitral valve is many times unsuspected, simply because of unpardonable neglect in the conduct of the physical examination. Yet this is not an unusual mistake.

Perhaps of all grave conditions which are apt to mislead the physician who prides himself upon his ability to make a snap diagnosis, uræmia is the most common. When we remember that in cirrhosis of the kidney the disease may proceed to the very last stage without awakening any suspicion of its existence and then manifest itself by only one of the many well-known evidences of toxæmia, this is not to be wondered at. I have already referred to the danger of not investigating the condition of the kidneys and vascular system in persistent headache, and we have also coma, convulsions, partial loss of vision, vomiting and shortness of breath as indications of a uræmic state. The last, the so-called renal asthma, has led to many blunders. There are, of course, times in which, even after examination of the urine and cardio-vascular system, one connot say definitely that renal sclerosis exists, but these are fortunately rare.

To the above avoidable errors in diagnosis many instances could be

added, some of them not followed by serious consequences, and others again in which a wrong diagnosis is responsible for permanent injury to the individual. How often, in our examinations for life insurance, we meet with old valvular lesions of endocarditis, fully compensated it is true, the existense of which is quite unexpected by the applicant. Close questioning fails to elicit the history of any illness likely to have been acute rheumatism, and there is no means of fixing the time at which the damage was done. It is not unlikely that when the primary endocarditis did occur, a physician was not consulted, the illness being apparently of so little moment that medical advice was not deemed necessary. It is equally true, however, that the profession does not sufficiently recognize the fact that rheumatic fever in childhood is often free from articular manifestations, and that, in the absence of pronounced arthritis, the illness may have been passed over as a slight febrile attack from some unknown cause, and thus the needed rest and quiet which would at least have limited the extent, if not entirely cure the endocarditis, were not enforced. That endocarditis sometimes does get well without any appreciable damage to the valves, we have abundant evidence, and we cannot hold ourselves free from blame when the failure to recognize it and the consequent adoption of proper measures of treatment are due to our own carelessness. A history of "growing pains" in children should always lead to a suspicion of rheumatic fever, and the heart should be examined from time to time until one is assured that endocarditis has not developed.

To one more common mistake I must draw attention, and that is in the diagnosis of flat-foot. Over and over again we meet with people who have been under treatment for years for what has been supposed to be chronic rheumatism in the feet, and, on making an examination, discover that the pain and lameness are entirely due to this cause. Only a week ago a gentleman told me that he had consulted many physicians and visited almost every bath on the continent in the hopes of getting rid of his lameness, until he finally found a man who detected the real cause of his symptoms and prescribed boots for flat-foot with a complete cure.

Before leaving the subject of errors in diagnosis, I feel I must say a word about how best to avoid them. We are none of us perfect, nor can we hope to become so; even the best diagnosticians make many mistakes. We can, however, by adopting and always following a method, reduce our errors to the smallest point. The great essentials are to secure a complete and connected account of the past history of the patient and of his present illness and by a painstaking physical examination to determine the present condition of all the functions of the body. Then, by weighing well and sifting the evidence thus procured, the nature of the disease in most cases will be conclusively

shown. When, however, doubt still exists, the method of exclusion leads to the best results. Write down or mentally note all of the diseases to which any of the facts adduced might possibly point, and then, passing each in review before you, exclude, if possible, one after another by some fact in the history or physical condition incompatible with the assumption of that disease. By this method you are narrowed down to one against which there is the least evidence, and this is most likely to be the true solution. Time and further study of the case are often needed before a positive conclusion is reached, but by always following the above method one obtains a mental picture of every problem in diagnosis, which will aid one, as new features develop, to reach in time the correct solution.

CASE REPORTS OF SYPHILIS, WITH REMARKS.*

By JAMES ROSS, M. D., Dermatologist to the Victoria General Hospital, Extra-Mural Lecturer on Skin and Genito-Urinary Diseases, Halifax Medical College.

Case I.—J. H. M., aged 47, a ship carpenter. When first seen, on October 24th, 1902, he complained of a "breaking-out" on the back part of the thigh, which had existed for three years. When examined, there was found to be a serpiginous eruption, with a well-defined margin and three or four small, punched-out ulcers, situated at intervals near the outer border of raised margin. The eruption was semi-circular in form and was about six or seven inches in length. This condition had been diagnosed as "King's Evil"—so the patient said—by his former medical attendant. At all events, he had received no internal treatment for the disease, which gave the picture of a deep serpiginous or ulcerating syphilide. On increasing doses of iodide of potassium, with local antiseptic treatment, the eruption disappeared and the ulcers filled up nicely. The initial lesion had been acquired ten years previously, which was followed by secondary symptoms, but treatment had not been persevered with.

Case II.—A. J. M., aged 49, a farmer. First seen on February 9th of this year, complaining of sores on the back. Two and a half years before the sores first appeared, gradually spreading till a large area was covered. When I first saw him there was a widespread margin, and scattered here and there were ulcers of different sizes. The skin over which this spreading eruption had travelled was thin, white and parchment-like, due to the scarring produced by the serpiginous ulceration.

The patient said eruptions began a few days after an accident, when his left forearm and thigh had been fractured by being thrown from a team.

There was a history of a chancre twenty years ago, but he did not remember having a rash or other symptoms of syphilis. After prescribing iodide he rapidly improved; in six weeks no sign of eruption, and ulcers had completely filled up.

Case III.—A young lady, aged 26. First seen on May 13th of this year, complaining of a rash on arms, legs and body. The history, as given by the patient, was that about the 1st of March last a fine rash of a pinkish color appeared, affecting most of the body, which was accompanied by much itching and burning. The spots gradually got larger and brighter, and the itching became more intense. The rash, when I first saw it, was very extensive, covering the arms thickly as a large papular rash, varying from a pea to a five-cent

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piece, and covered by grayish scales. Some on the back, which was also extensively covered, were even larger, but showing the same characteristics. The color was the well-known raw-ham shade. The palms of the hands also showed several discrete lesions having a punched-out appearance, but superficial, which is most characteristic of syphilis. There was likewise marked glandular enlargement present.

The appearance of the eruption on the body might easily have been mistaken for psoriasis; but on careful examination I found that the condition present was a papulo-squamous syphilide, which in some of the older books was termed "syphilitic psoriasis."

This patient gave no history to throw further light on the subject. She evidently had some idea as to the nature of the trouble, but resented any suggestion as to the most probable way in which it was contracted. It had been diagnosed as eczema and also psoriasis, no suspicion of the real trouble ever entering the minds of the other two doctors who had previously examined her. And no wonder:—here was a case much resembling psoriasis guttata, with a history of intense itching, but nothing further to clear up the mists of doubt The complaint of itching I did not place much reliance on, and thought it evidently a blind to throw unsuspecting diagnosticians off their guard. However, I ordered an antipruritic lotion, which she said gave her much relief. Mixed treatment was also prescribed, and soon rapid improvement followed. When last seen, five weeks after starting treatment, the rash had disappeared, leaving nothing but slight pigmentation.

Regarding Case II.: whether the accident to this patient had any connection with the eruption which followed, it is difficult to decide, though it is known that an accident to a syphilitic person is sometimes followed by some manifestation of the disease at the site of injury. The patient referred to believed he fell on his back, but the fractures received were naturally of more moment. At all events the eruption started about a week after the accident, while lying on his back, so that possibly the continuous pressure over the same situation may likewise have had some influence as an exciting cause.

I remember a very interesting case which was under the care of Dr. Chisholm at the Victoria General Hospital some years ago. A young man, about 18 years of age, was kicked on the knee by a horse one year previously; breaking down of the tissues and deep ulceration followed. He had been treated faithfully with tonics, and different antiseptics used locally, but to no avail. When he arrived at the hospital, the ulcer was about six inches in diameter and considerably deep at the centre of the floor. A consultation was held to consider the advisability of amputation. Noting the punched out appearance and other typical manifestations present, I suggested iodide of potassium, which was

soon followed by improvement and cure. There was no history to be obtained, but the picture was there nevertheless. It is probable some inherited taint was present in this case.

Two years ago a woman consulted me about a rash on her arm, which, on examination, proved to be a superficial serpiginous syphilide, that on appropriate treatment disappeared. Some six months afterwards her husband consulted me about a sore finger. Six weeks before I saw him, he and another fellow on board a steamer had an altercation in which his opponent bit his forefinger. It swelled up and considerable thickening developed around the site of injury. Antiseptic and other treatment had been carried out by another doctor, but still the wound did not heal nor the induration disappear. Remembering the case of his wife, I administered iodide of potassium and it was remarkable how soon recovery ensued.

There is no doubt that considerable carelessness is manifested at times in the diagnosis of syphilitic cases. Why should we not put every doubtful case on antisyphilitic treatment? History does not always help us, as evidenced by Case III, and others to which I have alluded. Never mind who the patient is or from what particular "good" family has he come. There may be a syphilitic taint somewhere, either inherited or acquired.

Then there is the other extreme. There are practitioners to be found in this enlightened century who have only to see or even hear of some kind of sore on the penis to jump at the conclusion that it is the initial lesion of syphilis. There are others again who are consulted by a patient with some kind of a profuse rash over the body to at once conclude it is of syphilitic origin, particularly if the patient has been known as "one of the boys."

A patient came to me some years ago with a well-marked rash of seborrhœic eczema on the front and back of chest. There was not much trouble in the diagnosis, but he then told me that three other medical men had called it a syphilitic rash for which he had been swallowing mercury pills for many months. The rash at times slightly improved but nevertheless persisted under the treatment mentioned. The patient was very anxious to tell all, but was positive that he never had any other venereal trouble but gonorrhœa. However, the knowledge of contact with women of all kinds and the presence of a rash was enough evidence for some medical men he had consulted.

Another patient consulted me some years ago suffering from angioneurotic œdema, which involved the tongue and different parts of the face. Many years previously he had contracted some sores on the penis, which his medical adviser diagnosed as of syphilitic origin, and without delay prescribed mercury, which patient had faithfully kept up for a long period. Sometime after he got married and raised a family of as healthy looking children as can

be seen anywhere. One morning, finding half of his tongue swollen and also part of his face, he hastened to his medical attendant of many years before, who told him this was a manifestation of the old disease, so mercury and iodides were once more called into action. However, the swelling would come and go, no improvement taking place from the remedies mentioned. He then consulted me, and I came to the conclusion that the trouble from which he was then afflicted was of a different nature, and, after thorough questioning, likewise concluded the patient never had syphilis. He was an intelligent man, gladly answering questions and sure of the conditions which had years ago existed. There had been several sores present, which, with a clear history of a short incubation stage, pointed to chancroids.

Again there are patients who have had syphilis and who manifest some other skin affection which is at once diagnosed by the medical attendant as of syphilitic origin. Why should not such a patient be affected with a skin disease entirely remote from syphilis?

Not long since a case in this city suffered from a very severe skin affection, which resulted in death. There was a suspicion of a syphilitic history, yet mercury and iodides did no good. When the death certificate was written, the disease was stated as———following syphilis. The contents of that document became widespread,—and possibly may have proved a valuable object lesson. It is probable, however, that the disease which proved fatal had no connection with syphilis, unless, of course, the tissues, modified by syphilis, rendered him more susceptible to the encroachment of some other serious malady. At all events, the authorized treatment was of no avail. Examples of lowered vitality predisposing to other diseases are a common experience in the daily routine of most practitioners.

To recapitulate: it would be advisable to give all doubtful cases antisyphilitic treatment, but always insist on watching the further progress of the case.

On the other hand, do not rush to prescribe mercury when viewing an initial lesion of the genitals, but rather "make haste slowly" until sure of your diagnosis.

THE
MARITIME MEDICAL NEWS.
A MONTHLY JOURNAL OF MEDICINE AND SURGERY.

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Editorial.

THE LAW AND THE DOCTORS.

There appears to be a tendency, or rather a determination, on the part of the legislatures of the provinces to exploit the members of the medical profession for the public interest, not only without any remunerative recognition of their services, but even under threat of fine or imprisonment for non-compliance. It would seem that the scriptural adage, "the laborer is worthy of his hire," does not apply when it becomes a question of medical remuneration. Why this is so is hard to determine, but the fact cannot be disputed. It may be that doctors, both individually and collectively, have been so lavish of their gratuitous advice to the public in matters affecting public health or weal, that legislators have come to consider that they (the doctors) were only waiting for an opportunity of showing how readily they would spend their time and take trouble in doing public work, and that without money and without price.

Or, it may be, the legislators may look upon the medical profession as a body of men more likely to submit to imposition and injustice than to take the trouble to determinedly stick together and fight for their rights. For it is only by determined and persistent unity of action that battles of this nature can be successfully fought.

The above remarks have been called forth by the fact that a few days ago some sixteen doctors in St. John were arraigned before the Police Magistrate, for the *crime* of not having reported within five days of its occurrence, the birth of any child at which they had assisted. The doctors determined to fight the case, and it is believed they will win. The penalty for non-compliance is a fine not exceeding twenty dollars, or imprisonment. By this law the doctors are not only compelled to make these notifications for nothing, but are also

compelled to act as informers against their own patients; for, while in most cases there is no objection to the publicity of a birth, every medical man will recognize the fact that there are others where publicity is the last thing sought for by the parent.

The matter of vital statistics is placed by the B. N. A. Act under the control of the Federal Parliament, and in this connection only two provinces—Ontario and New Brunswick—have undertaken to usurp authority which does not belong to them. It is therefore confidently hoped that the Act will be shown to be *ultra vires*.

By the Public Health Act, at least in some of the provinces, the doctors are called upon to notify all cases of infectious disease that come under their notice, not only without remuneration, but under a severe penalty for non-compliance. We believe this to be all wrong and unjust. If the services of the doctor are so important and so necessary, surely they are worth paying for. If vital statistics are necessary, if they cannot be collected without the doctors' help, then pay the doctors for collecting them. We believe they can be and are collected without this help. In the old country, from whence, probably, our Public Health Acts are obtained, the doctors must notify all cases of infectious disease that come under their notice, but they are paid half-a-crown for every case so notified. The consequence is that the law works smoothly; the doctors are satisfied, and the authorities receive the information. One important result of the system as practised in this country is that many cases of infectious disease are not reported at all, and this will always be the case when unwilling and unpaid services are demanded under threat of fine or imprisonment.

Surely this matter is worthy of the attention both of the profession and the legislatures; not alone in the interest of justice to the profession, but also that the public health may receive the fullest benefit that the carrying out of the Health Act is calculated to give.

Society Meetings.

N. S. BRANCH BRITISH MEDICAL ASSOCIATION.

The annual meeting of the Branch was held at the Halifax Hotel on the evening of October 28th, at 8.30 p. m., the President, Dr. G. M. Campbell, in the chair.

The minutes of last meeting were read by the Secretary and approved; likewise the report of the retiring Council, with the attendance of members last season, was read.

The election of officers then took place, and resulted as follows:

President.....Dr. W. F. Goodwin.
Vice-President .....Dr. C. D. Murray.
Secretary.....Dr. W. D. Forrest (re-elected).
Treaurer.....Dr. A. I. Mader (re-elected).
Council...Drs. Hawkins, Ross, Trenaman, Murphy, Chisholm, G. M. Campbell and Flinn.
Representative on the Council and Parliamentary Bills Committee...Major H. S. Peeke, R. A. M. C.

Personals.

Dr. M. J. Wardrope has removed from New Campbellton, C. B., and located at Springhill.

The following physicians have changed their residences this month:

Dr. H. M. Hare from 108 Agricola Street to 35 Hollis Street.

Dr. H. D. Weaver from 41 Spring Garden Road to 40 Brenton Street.

Dr. A. I. Mader from 229 Pleasant Street to his handsome new house, 59 Morris Street.

Dr. J. N. Mack from 57 Hollis Street to 229 Pleasant Street, formerly occupied by Dr. Mader.

Dr. D. T. C. Watson, formerly house surgeon at the V. G. Hospital, has started practice at 132 Spring Garden Road.

Major H. S. Peeke, R. A. M. C., who for some years has been medical officer of the Station Hospital in this city, leaves next month for England, to resume duty at some station in the old country.

Major Peeke has always taken much interest in medical affairs in Halifax, and will be much missed by his many professional friends. He has been appointed representative on the Council and Parliamentary Bills Committee by the Nova Scotia Branch of the British Medical Association.

Dr. T. A. Wallace has lately returned from a trip to some of the American cities.

Dr. R. Evatt Mathers has been detained in New York for some weeks owing to the serious illness of his mother. We are glad to state that late reports inform us that there is considerable improvement in Mrs. Mathers' condition.

Obituary.

Dr. J. A. E. Steeves.—The death of Dr. James A. E. Steeves, of St. John, took place somewhat suddenly on the 14th inst., at Phœnix, Arizona. Six weeks previously Dr. Steeves had started south on his wedding tour. He had not been well for some time, and it was the intention for himself and his wife to remain in the South for the winter, as it was thought a more moderate climate would greatly improve his health. They first went to San Antonio, Texas, but an outbreak of yellow fever there caused their removal to Phœnix. The deceased was 42 years of age, and was a son of the late Dr. J. T. Steeves, who for years was Superintendent of the New Brunswick Lunatic Asylum. He associated himself with his father, and upon the latter's death remained in charge until the appointment of Dr. Hetherington as Superintendent. After that he located in St. John, devoting his time to private practice, giving special attention to nervous diseases.

Dr. Steeves was a careful and sympathetic practitioner, and held the regard of both fellow medical associates and the community generally.

He had been a good runner in his day, and as a billiard player won more than a local reputation. "Jimmy" Steeves, as he was familiarly known by a very large number of friends, will be much missed and much mourned for his many good qualities of heart and mind.

Book Reviews.

A Treatise on Materia Medica and Therapeutics. By Rakhaldas Ghosh, L. M. S., *Cal. Univ., Lecturer on Materia Medica, Calcutta Med. School*, 1903. Published by Hilton & Co., Calcutta. Price 5 shillings.

The second volume of Dr. Ghosh's work is at hand. The preface, written by C. P. Lukis, F. R. C. S., breaks the sad news of the author's death, and his last request not to let his work die. Evidently the author was familiar with all the best authorities, and was a man of great experience as well. Very few points of value have been omitted that could have been embodied in a work of such convenient size.

After giving the official preparations under each, according to the B. P., the unofficial preparations are grouped, and also modifications of the drug forming new preparations. This is convenient, and helps one who is not familiar with the bewildering mazes of organic chemistry to locate, at least approximately, these new compounds. In giving the official preparations, the author does not indicate the ingredients of the compound ones, as they were given in the first volume. This is somewhat inconvenient. The spelling needs a good deal of revision. A number of Indian drugs that are novelties to us are described. It seems to us that the two volumes could be combined, if certain modifications, on the lines indicated by us in review of the first volume, were made. If skilifully done, the resulting volume would not be too unwieldy for the convenient use of students. While regarding the general excellence of the work, one regrets that the author did not live to see the success it is likely to make.

International Clinics. A Quarterly of Illustrated Clinical Lectures and especially prepared Original Articles by leading members of the medical profession throughout the world. Volume II, Thirteenth Series, 1903, published by J. B. Lippincott Company, Philadelphia; Canadian Agent, Charles Roberts, 1524 Ontario Street, Montreal.

The principal topic in the present volume treats of "The Summer Diarrhœas of Children," comprising over sixty pages. Six well-known authorities deal with this important subject; its causation, prevention, symptomatology and treatment being ably discussed. No progressive practitioner can fail to be profited after perusing the six chapters dealing with this important class of disease.

"The Symptoms and Treatment of Disease of the Pancreas," by Dr. Eugene L. Opie, of Johns Hopkins University, and "The Diagnosis and Surgical Treatment of Disease of the Pancreas," by Drs. J. B. Deaver and G. B. Muller, of Philadelphia, are valuable contributions which deal with conditions somewhat hazy in the minds of many physicians.

Dr. Leopold Levi, of Paris, writes on his experience with "Trunecek's Serum in Arteriosclerosis," and also mentions cases and results obtained by others. The study of this serum, he says, is still far from complete, but it is of interest to show what we can hope to obtain from this method.

Other articles of merit are, "A Recent Advance in Therapeutics: Local Treatment," by Dr. Charles Bouchard, of Paris; "The Rest Treatment: When Indicated and How Conducted," by Dr. J. Madison Taylor, of Philadelphia; aud "Abdomino-Pelvic Diagnosis: Abdominal Swellings," by E. Stanmore Bishop, F. R. C. S., of Manchester, Eng. Numerous finely executed plates and figures throughout the volume more fully enhance the value of the text.

Notes.

CLINICAL NOTES ON DYSEMIA.—By Louis J. Gravel, M. D., Physician-in-chief to the Hotel Dieu Hospital and Chief of the Laboratory. Montreal, Canada.

The word anemia is a misnomer and serves to perpetuate an erroneous idea of the conditions to which it is applied. It had its origin at the time when scientific medicine was in its infancy; before the microscope and other instruments of precision had elucidated the physiology and pathology of the blood and blood-forming organs. In those days the pallor of the skin and mucous membranes was attributed to "a diminution of the amount of blood," and even at the present day there are physicians who still share in this fallacy. From a pathological standpoint, the chief features of the so-called anemic state, are the morphological and chemical changes in the blood,—its qualitative

deterioration. It, therefore, has been suggested that the term dysemia (bad blood) would more closely describe the conditions present. However, a word which has the sanction of usage for so many years cannot be easily displaced, and will probably long survive in medical nomenclature.

There is only one criterion on which to base a diagnosis of dysemia, and that is the changes in the blood. The other symptoms to which much significance was formerly attributed,—pallor of the skin and mucous membranes, rapid pulse, and palpitation, general weakness, vertigo, and the like,—are of doubtful value, since they are present in various conditions in which the state of the blood is normal. Thus, for instance, they may result from purely psychical causes,—fear or anxiety,—or occur in the course of chronic digestive disorders, or neurasthenia.

To estimate the degree of dysemia the diminution in the percentage of hemoglobin is of the greatest importance, and this may range within wide limits, even to one-fifth of the normal proportion. Next in importance is the reduction in the number of red blood corpuscles, which, however, is perceptible only in the more marked cases. In the severe types of the disease reductions to 50 per cent are quite frequent. There is also a change in size and shape of the red blood-cells, known collectively as poikilocytosis, in the pronounced form of dysemia. Usually the corpuscles are diminished in size and their shape becomes irregular; there may be granular deposits in their protoplasm. Sometimes there may be found in the blood the so-called normoblasts, which are nucleated red cells, resembling those present in the red bone marrow. The latter have been specially observed in dysemia, following profuse losses of blood, but in any case are of no significance.

These remarks apply only to the simple types of dysemia and not to the progressive pernicious forms, characterized by changes in the blood-forming tissues. As pointed out by Ehrlich and Lazarus in an excellent article on this subject, to which I am indebted for much information, the radical difference between the simple and pernicious varieties of dysemia is that in the former the regeneration of blood takes place in a physiological manner, while in the latter it reverts to the embryonic type, as shown by the presence of foreign elements. The majority of cases of simple dysemia are secondary to diseases attended with malassimilation, tissue waste, hemorrhages, and profuse discharges, while it is important to remember that it is often due to a condition of autotoxemia, or to the absorption of toxins generated by bacteria. It is, therefore, not enough to make a diagnosis of dysemia, but the primary cause should be sought and removed if possible.

The treatment of the changed condition of the blood consists in the adoption of an appropriate regimen,—a nutritious dietary, fresh air and sunshine,—in connection with the administration of iron supplemented occasionally with arsenic. Hydrotherapy is a very valuable auxiliary in some cases. The patient should rest as much as possible, and in severe cases should take a vacation in the mountains. Long before modern hematology had its beginning, iron was administered on empirical grounds, and all that modern medicine has contributed to the therapy of dysemia is the introduction of ferruginous compounds, which are not only superior in efficacy to those in former use, but free from their objectionable features. The chief disadvantages of the older iron preparations were their disturbing effect upon the digestion, their tendency to produce constipation, and their destructive action upon the teeth. It is a notable achievement of pharmaceutical chemistry to place at the physician's disposal organic ferruginous compounds, which approximate closely in composition to the form in which iron is contained in the red blood-globules. The most prominent preparation of this kind is Pepto-Mangan (Gude). This consists of iron and manganese in the form of peptonates, which, representing albuminous elements in their last stage of digestion, are immediately absorbed and assimilated, without undergoing any previous transformation in the gastrointestinal tract. The presence of manganese in combination with iron in Pepto-Mangan is based upon the fact that both of these elements are found associated in the red globules.

Having had my attention directed to this preparation through the reports of leading authorities in European and American journals, I subjected it to a thorough test in the Hotel Dieu Hospital, Montreal, and have briefly recorded here the histories of a number of typical cases in order to demonstrate its efficiency in dysemia, as shown by the rapid increase of the hemoglobin percentage and number of red blood-cells.

CASE I.—A woman, aged 25 years; dysemia. Time of administration, 30 days. First count, 3,376,400 red corpuscles to the c. mm.; second count, 4,400,300 to the c. mm. Hemoglobin: first examination, 51 per cent.; second examination, 70 per cent.

CASE II.—A girl, aged 20 years; dysemia. Time of administration, 30 days. First count, 2,630,200 red corpuscles to the c.mm.; second count, 3,970,000 to the c.mm. Hemoglobin: first examination, 40 per cent.; second examination, 60 per cent.

CASE III.—A man, aged 25 years; dysemia, following typhoid fever. Time of administration, 30 day. First count, 2,500,200 red corpuscles to the c.mm.; second count, 3,950,000 to the c.mm. Hemoglobin: first examination, 39 per cent.; second examination, 50 per cent.

CASE IV.—A woman, aged 39 years; dysemia. Time of administration, 30 days. First count, 2,750,400 red corpuscles to the c.mm.; second count, 3,500,000 to the c.mm. Hemoglobin: first examination, 35 per cent.; second examination, 60 per cent.

CASE V.—A woman, aged 35 years; dysemia, following miscarriage. Time of administration, 30 days. First count, 2,800,000 red corpuscles to the c.mm.; second count, 3,300,000 to the c.mm. Hemoglobin: first examination, 33 per cent.; second examination, 45 per cent.

CASE VI.—A young girl, aged 17 years; dysemia, following typhoid fever. Time of administration, three weeks. First count, 2,495,270 red corpuscles to the c.mm.; second count, 3,300,200 to the c.mm. Hemoglobin (percentage of normal amount): first examination, 35 per cent.; second examination, 45 per cent.

CASE VII.—A young boy, aged 16 years; dysemia, following typhoid fever. Time of administration, three weeks. First count, 3,670,000 red corpuscles to the c.mm.; second count, 4,600,300 to the c.mm. Hemoglobin (percentage of normal amount): first examination, 40 per cent.; second examination, 65 per cent.

CASE VIII.—A man, aged 30 years; dysemia, following amputation of the leg. Time of administration, three weeks. First count, 2,360,400 red corpuscles to the c.mm.; second count, 3,500,200 to the c.mm. Hemoglobin (percentage of normal amount): first examination, 30 per cent.; second examination, 70 per cent.

CASE IX.—Woman, aged 24 years; dysemia, following pneumonia. Time of administration, three weeks. First count, 2,600,250 red corpuscles to the c.mm.; second count, 3,400,000 to the c.mm. Hemoglobin (percentage of normal amount): first examination, 35 per cent.; second examination, 70 per cent.

CASE X.—Woman, aged 20 years; dysemia, following miscarriage. Time of administration, three weeks. First count, 2,502,600 red corpuscles to the c.mm.; second count, 4,006,200 to the c mm. Hemoglobin (percentage of normal amount): first examination, 40 per cent.; second examination, 65 per cent.

CASE XI.—Man, 32 years; dysemia, following typhoid fever. Time of administration, three weeks. First count, 2,300,000 red corpuscles to the c.mm.; second count, 3,640,160 to the c.mm. Hemoglobin (percentage of normal amount): first examination, 33 per cent.; second examination, 62 per cent.

CASE XII.—A girl, aged 16 years; dysemia. Time of administration, four weeks. First connt, 2,290,700 red corpuscles to the c.mm.; second count, 3,800,200 to the c.mm. Hemoglobin (percentage of normal amount): first examination, 40 per cent.; second examination, 60 per cent.

CASE XIII.—A girl, aged 16 years; dysemia. Time of administration, four weeks. First count, 2,430,300 red corpuscles to the c mm.; second count, 4,000,300 to the c.mm. Hemoglobin (percentage of normal amount): first examination, 40 per cent.; second examination, 65 per cent.

Comparing my results with Pepto-Mangan (Gude) with those obtained from other chalybeates of this class, I have been led to give it decided preference. As already stated, the only reliable means of diagnosticating dysemia is by the examination of the blood, and for the same reason the only way of testing the efficiency of a ferruginous preparation is by making blood-counts and estimating the percentage of hemoglobin. On the ground of my findings, as shown by the histories of the cases cited, the results of such tests have been uniformly satisfactory and entitle the preparation to a leading place in ferruginous medication.—*Buffalo Medical Journal*, Aug. 1903.

AGALACTIA OR DEFECTIVE LACTATION.—The latast researches of medical science regarding the soluble ferments of mother's milk have forcibly brought before the profession the great and important question of the feeding of the child by its mother.

It has always been, and will always remain, an undisputed fact that the proper and only really satisfactory food for the infant is that which is supplied to it by nature, and for the complete assimilation of which the organs of its digestive tract are especially adapted. It is undoubtedly regarded as a misfortune, of greater of less importance according to the debility or strength or the child, whenever the physician has to resort to artificial methods in the alimentation of a young baby. Observation has demonstrated that no substitute for the mother's milk has fulfilled its task, and that the

mortality figures amongst infants fed by artificial means have not sensibly diminished. Consequently, it is self-evident that there is some great gap, some physiological difference between the two methods of feeding that cannot be satisfactorily bridged. It has been demonstrated beyond reasonable doubt that this gap is caused by the deficiency of the artificial substitute in the blood-enzymes, the soluble ferments, which have so important a bearing on the powers of assimilation of the infant.

Admitting this fact, many physicians are making the mother more and more the principal object of that attention which the child has hitherto almost exclusively monopolized.

In summing up the general facts in the case, it is found that complete agalactia is very rarely seen, and is usually hereditary. Milk is present in the mammary gland of almost all primiparæ after parturition. Its appearance may be delayed, but not indefinitely, and when the quantity is insufficient this is caused by a disturbance of the general health. Anæmia causes the largest number of cases of delayed and insufficient lactation among primiparæ. Lack of self-confidence makes many a young mother nothing more than a dry nurse. Then follows a worse feature, for, in common with the other organs of the body, the mammary gland is developed by exercise. The primipara who imagines that she is unable to feed her child and who does not feed it, renders lactation impossible after her subsequent confinements. The habit of some women of weaning their children at too tender an age has a similar effect. The inertia of the gland leads to its atrophy.

The following quotation is of interest in this connection: "Acute affections, specific "diseases and frequent miscarriages may diminish lactation and lead to a disappearance "of the milk, but these are accidental causes and their injurious influence is not always "irreparable. When the milk is poor in quality, ascertain whether it is the conse- "quence of an accidental cause such as overwork, premature menstruation, intercurrent "disease, a delicate or a highly nervous constitution, or a constitutional cause. If it is "the latter, almost nothing can be done; but if it be one of the accidental, the secretion "may be restored in a great many cases to a normal standard. In the majority of "cases there is a general deficiency in the performance of the metabolic process due to "general physical apathy. For this condition the patient should be provided with "nutritious food and strychnia which is particularly effective." (C. Sumner Witherstine in *Analytical Cyclopedia.*)

"Beer, porter and other malt liquors, especially alcoholic beverages, are more hurt- "ful than beneficial, and any improvement that may show itself is due mainly to the "confidence in the beverage taken. The quantity of milk may be increased, but its "quality is compromised. It encourages the production of fat at the expense of the "albumen." (C. Sumner Witherstine, *Lac. At.*)

"Another error is the belief that beef tea and chicken broth are good for nursing "mothers." (Angel Money, *Australian Medical Gazette.*)

An abundant supply of the materials which go to form the milk is necessary for the mother. The most important of these materials is the albumen. The mammary gland extracts this albumen from the blood serum. It cannot take it from any other source. The albumen which the gland withdraws from the blood is the globulin which the serum holds in solution. The higher the tenor of the blood in globulin, the more abundantly will it appear in the milk.

A physiological fact not generally known is that the milk albumen is only a transformation of the serum. Several German physiologists have advanced this theory. Moreover, Mathias Duval, the eminent French physiologist, is strongly of the opinion that the albumen of milk is the albumen of the blood transformed, and he adduces in proof of this that in the first milk, or colostrum, the milk albumen is not completely formed (Mathias Duval, Cours de Physiologie, 1887.)

In order to supply the blood with the normal tenor in globulin, it is not necessary to devote every means to supplying the nursing mother with an excessive quantity of food, particularly as in many cases this is difficult owing to lack of appetite or defective digestion. The use of Lacto-Globulin enables the physician to give the mother the most efficient aid that can be used. This albumen may be considered as having a specific action on the mammary gland. Moreover, its high value in soluble phosphates has a general tonic effect on the system, and the quantity of natural amylopsin and trypsin ferments which it contains, have an important effect on the digestion of the mother and a tendency to increase the blood-enzymes in her milk. It brings on an abundant flow of milk and renders nursing an easy task. One teaspoonful dissolved in water, taken three or four timas per diem, gives to the blood-serum its proper quota of globulin which the mammary gland converts into milk-globulin.

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