

of ileum, and the sigmoid. Intestinal resection was a case of extensive adhesions following an ovariectomy, three years ago. The gut was so completely bound down and constricted that it was necessary to remove twenty-six inches, the end-to-end joining being also made with the button. Mesenteric cysts, two in number, were incised, packed and drained until closed. The desmoid tumor case was one of those very rare forms of growth affecting the abdominal walls in women. The growth usually follows a pregnancy, and is found, in most cases, in the inguinal region. It is non-malignant, but repeated operations are frequently required to remove it. In this case three operations were performed before the growth was headed off and cured.

Many of the cases here tabulated had multiple operations at one "sitting," such as perineorrhaphy, curetting, etc. The list includes twenty-two different operative procedures:

Appendectomy	16
Salpingo-oophorectomy (pus)	20
Nephrolithotomy	1
Ventrofixation (uterus)	2
Desmoid Tumor	3
Colostomy	2
Vaginal Vault Drain	1
Ovariectomy (for cyst)	5
Femoral Hernia (cure)	2
Tubercular Peritonitis	1
Hysterectomy, Abdominal	4
Confirmatory Incision	1
Ectopic Gestation	1
Nephrorrhaphy	3
Intestinal Adhesions	2
Intestinal Anastomosis	1
Intestinal Resection	1
Strangulated Femoral Hernia (1 died)	2
Mesenteric Cyst	2
Cholecystotomy	2
Vaginal Hysterectomy	1
Nephrotomy	1
Total	74

The responsibility of the abdominal surgeon is peculiarly binding and great, as many operations are performed to restore comfort and not for the purpose of saving life, yet the dangers incident to the performance of any abdominal operation are always present, and should always be weighed in every case. Many, many times in the midst of an operation, the mind of the surgeon will revert to the scenes of the little family circle of the patient whose confidence and life he has in his hands. Often the dear little ones of the mother or father on the operating-table will pass in mental review before him, thus reminding him, as it were, of his duty and responsibility. Many times he will ask himself, in these anxious moments: "Will I be able to save and return this parent, restored to health, to those dear little ones left at home, at an age when parental guidance means not only immediate comfort and happiness, but the molding of their future?" Perchance the patient is a little tot, the whole life and joy of its fond parents—for disease does not discriminate in selection, and only too often we are compelled to operate on these little unfortunate sufferers. Can any one feel that he is warranted in assuming this responsibility unless, by a thorough training and an equal knowledge of all the intricacies of this responsible class of surgery, he feels competent to meet any emergency and to quickly resort to the proper method of meeting the same?

APPENDICITIS.

A CONSIDERATION OF SOME OF ITS CAUSES.

Read before the Cambridge Society for Medical Improvement,
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Perhaps in the whole realm of medical science no subject that has had its birth within the last decade has elicited more discussion among professional observers, and has obtained a wider interest with the masses than has that of appendicitis. It seems, therefore, that from whatever point of view any of its different phases may be presented, something may be gleaned that will prove of value for the better understanding of the complications which it may involve.

In some of the earlier reported cases much importance was attached to the occasional presence of a fecal concretion, or of a foreign body within the appendix. The rarity, however, of finding such foreign matters, or of securing adequate evidence that extraneous elements are really controlling factors has led to the disregard, in large measure, of the view that they have any marked effect in the production of the disease.

Catarrhal inflammation has been mentioned as a cause, especially that form of the condition occurring in diarrheal disease. If it be true that appendicitis is dependent upon such morbid processes, the number of cases amounting almost to an epidemic, would be expected to follow during some of the months comprised within the heated term, or within some of the seasons or conditions favoring intestinal disturbance.

Another view put forth as to the cause is, that the appendix vermiformis is a functionless vestige of organs once necessary for the conservation of our ancestral forms of life, and that by the lapse of time and the alteration of conditions, such evolutionary changes occurred in the organism as to leave this part of the intestinal tract a mere relic or representative of a rudimentary apical portion of the cecum. The vermicular process, though evincing an analogy of conformation with that of some lower forms of animal life, has by some been regarded as of low vitality, and is therefore more susceptible to changes, and prone to become the seat of morbid processes. The condition which is here alluded to is in some respects not unlike that of the mammae, the uterus, and its adnexa after the occurrence of the menopause. The functional activity pertaining to the development of the several organs having been accomplished, the highly vitalized condition takes on retrograde changes, and thus fails to afford protection against the inroad of disease.

In this connection it might not be uninteresting to refer briefly to some of the features of the appendix vermiformis, and to endeavor to inquire how firmly such a view can be substantiated. In doing this I deem it proper at first to refer to some of the points enunciated by Professor Haeckel at the Cambridge Congress of Zoölogy, which was held in August, 1898, as reported at the time by the London correspondent. Professor Haeckel, after making mention of recent discoveries of fossil remains in Java, Madagascar and Australia, which render more complete the evidence in the several steps in evolution, said substantially that all mammalia were of monophylitic origin, that is to say, that their origin was from one common parent form, from *Monotremata* upward to man. He

said that all living and extinct mammalia which have been studied, were descended from a single common ancestral form that appeared in the Permian or the Triassic period. He considered this form or type of animal life to be derived from some Permian, or not unlikely carboniferous reptile allied to the *Proterosauria* and *Theriodontia*, which was descended from a carboniferous amphibian of the group *Stegocephala*. These amphibians in turn were derived from Devonian fishes, and these in their course from the lower vertebrates. The chief fact brought out by Professor Haeckel is that man is a primate, and that all orders of primates, such as lemurs, monkeys, anthropoid apes and man, had their descent from one common stem.

In the discussion of this subject it is not necessary for our present purpose to trace descent from more remote ancestors, for we are thus assured beyond a reasonable doubt that all mammalia upward to man had their origin from one parent form; from a primitive form of *Monotremata*. If we now examine the alimentary canal of a fowl—a present representative, in some respects, of this type—we shall find that there are two long cecal tubes, which have their openings in the intestine at points not far from its termination. The axes of these tubes form an acute angle to the axis of the intestinal tract. Their function seems to be to assist in furnishing an abundance of watery or fluid secretion for facilitating absorption by the vessels of the intestinal mucosa and for expediting the extrusion of effete matter. The same anatomic arrangement is found in the parrot. The cecum in man is a short, spacious pouch, into which the ileum opens; the appendix opens on the inner side of the bottom of the cecum. Its diameter is said to be of an average of about three lines. The blood-supply of the appendix is derived from a vessel that has its course near the free concave margin of the mesentery and is a branch of the ileocecal artery. Its coats are thick and of firm consistence; its mucous tissue is supplied with a large number of solitary glands. In structure the appendix may be said to resemble very closely the intestine.

By some writers the appendix has been described as a rudiment of a more extended cecum found in all mammiferous animals with the exception of man and the higher class of *Quadrumania*, such as the orang-outang and chimpanzee, and among marsupials the wombat. According to Quain, the coats of the appendix vermiformis are as thick as those of the cecum, with which they are continuous, for both are lined with mucous membrane, and the muscular fibers of the one are prolonged into the other. In early periods of fetal life no distinction is perceptible between them; they form a long tube projecting between the folds of the small intestine, and are continuous above with the colon. But toward the time of parturition this part of the canal becomes constricted for about two-thirds of its length, the rest retaining its normal size; and so that peculiar conformation is established which we find at last in man and one of the highest species of the *Quadrumania*, in whom it may be regarded as a rudiment of the tubular diverticulum which is found in the rest of the mammalia. In herbivorous mammalia the cecum often attains to the size of the large intestine. In such instances of development its capacious dimensions not only greatly favor liquefaction of the coarser ingested foods, but afford a broader surface for absorption.

Neither in man nor in any of his ancestors, however remotely in the past they may have lived, could such a development of the cecum have existed. Man, as descended from the *Monotremata*,¹ has developed along other and independent lines of progression. He never belonged to the class of *Quadrumania*. None of his progenitors has had at any period a foot that might be regarded as prehensile with an opposable great toe. Ever since the parent form underwent division from the common stem the various parts have become more and more highly specialized, and organs have been developed for the performance of particular functions. The reason why the wombat is an exception is no doubt because that animal feeds not on herbage, but on roots, which require for their digestion a less amount of intestinal tract.

Were we to entertain any doubt as to the ancestral origin or rightful possession of the appendix in man, reference to the structure of fishes would show that that class of animal life has for the most part numerous ceca in the intestine. These cecal pouches correspond most nearly to the appendix in man. From the general prevalence of cecal tubes now found in fishes there can scarcely be a doubt that such blind ducts did exist in the old Devonian fishes, the ancestors of the carboniferous amphibians, that were in turn the progenitors of the ancient *Sauria* and *Theriodontia*, from which came the parent of the *Monotremata*, the common stock of all mammiferous animals, as the various orders of living beings have been classified by Professor Haeckel.

My apology for going into the subject before us somewhat in detail is from the fact that much misapprehension, I fear, has sometimes prevailed respecting the life of mankind being in danger because he has in his organism the vermiform appendix.

Drummond, in his "Ascent of Man," while speaking of the relics of the human organism, says that

¹ By *Monotremata* is here meant one of the three classes of mammalia possessing a single cloaca, in which the terminal ducts of the genital, urinary and alimentary organs center. Eggs are laid by the female, like those of the bird and the lizard. The young are hatched or brought forth as are the offspring of feathered oviparous vertebrate races generally, and are nourished by an aqueous exudation from the undeveloped rudimentary mammae. One of the best types of the sub-class of this variety is that extraordinary animal, the duckbill—or Australian duck-mole—the *Platypus* of Dr. Shaw and the *Ornithorhynchus*, as described by Geoffroy. The duck-mole here referred to is an aquatic mammal, first found in New Holland; its feet are webbed and it has a bill in many respects like that of a duck. Its eggs are hatched as are those of the fowl. Another sub-class of mammals embraced in the division of the *Monotremata* is the *Echidna hystrix*, known as the toothless oviparous Australian porcupine ant-eater. In this class of mammals the young are brought forth by an egg which is hatched within the body of the mother and then excluded alive. The marsupial mammals are regarded also as non-placental; their young are brought forth at an early stage and are nourished by the secretion from small udders within the marsupial pouch. The other sub-class of mammalia is represented by the *Placentalia*, and it embraces man as well as other orders that have advanced in the scale beyond the *Monotremata* and the marsupialia. It may here be remarked that as man reached in his ascent the stage of the *Monotremata*, he was undoubtedly by the favoring influences of environment, rapidly developed, merged and transmuted without any connecting link, without having relation to the anthropoids, in the form, substantially, in which he now appears. I am not unaware that other animals besides those mentioned in the paper have the vermiform appendix. Kirk, in his "Handbook of Physiology," p. 358, makes mention of the appendix as existing in the rabbit, and says that the part consists largely of Peyer's glands. He also says it is to be noted that Peyer's patches are largest and most prominent in childhood and in young persons. In a late edition of "Gray's Anatomy" appears the statement that the appendix is first seen low down among the mammals in the marsupial group, as in the wombat. No sign of it again appears until the ichneumon and the hog are reached, but not then is it a proper appendix. It is next seen in lemurs and in the higher apes, as in the chimpanzee, orang, gibbon and the gorilla. The same authority, however, holds to the popular view that the appendix in man is a functionless and dangerous structure. How different is this conception of the character of the appendix from that implied in the account which Piersol gives in his work on "Normal Histology," where it is stated that in the vermiform appendix of some animals, and in some cases also in man, the follicles form a continuous zone of adenoid tissue; that the lymphatic, lymphoid or adenoid tissue usually occurs as circumscribed masses known as lymphatic nodules or glands. The lymphatic tissue wherever found is composed of element, the connective tissue, the reticulum and the small round cells. These elements, the lymphoid or adenoid cells become the lymph corpuscles and the colorless blood-cells on their escape from the denser reticular tissue into the lymph-current and their subsequent entrance into the blood.

caution is required in affirming as to the inutility of any character, since its seeming uselessness may only mean that we do not know its importance. He classes the vermiform appendix of the cecum as a vestigial organ, and says that it is now not only of no use to man but it is a veritable "death-trap." He further remarks that in herbivorous animals this blind tube is very large, longer in some cases than the body itself, and is of great use in digestion. In man, he says that it is shrunken into the merest rudiment. He regards it as an easy receptacle for the lodgment of foreign bodies. Drummond quotes from Sutton, who says that the appendix is covered with peritoneum; that it possesses a muscular coat, and is lined with mucous membrane. In the early embryo it is equal in caliber to the rest of the bowel, but at a certain date it ceases to grow, *pari passu*, with it, and at the time of birth it appears as a thin tubular appendix to the cecum. In the newly born child it is often absolutely as long as in the full-grown man. This precocity, he remarks, is always an indication that the part was of great importance to the ancestors of the human species. It is to be regretted that the authority here cited has not told us in what ancestor of the human species the appendix was so important. Did the writer or the author mean to tell us that it was the understanding that the human species descended from herbivorous animals?

There can be no doubt that the cecal tubes, as already stated, were of considerable importance in the common parent form from the *Monotremata*. This we see as exemplified in the intestinal arrangement of the common fowl. So, too, there can hardly be any question that these structures were of advantage to the carboniferous reptile and to the Devonian fishes, but it may be seriously doubted whether this peculiar anatomic development was of any greater service to those ancestral types than to man, the latest and highest development of all. The precocity of development of an organ in the fetus does not seem to be always a sure indication that the part was of a greater importance to the ancestors than to the descendants, else we should be led to infer that the head and upper extremities, which in the fetus are often developed faster than the feet or lower portions of the body, were of much more use to the carboniferous reptile than to man.

It has long since been recognized that the cecum has been the seat of inflammation and ulcerative perforation, frequently giving rise to peritonitis. Most of the inflammatory processes involving the appendix vermiformis were formerly ascribed to the presence of concretions, hardened feces, and to other insoluble bodies that had gained admission within the canal. Suppuration originating in the cellular tissue about the head of the cecum and in the vicinity of the appendix had also been observed. Rokitansky and others of the older pathologists had occasionally observed mishaps that had befallen the appendix. I am not aware, however, that such lesions were any more frequently observed than were defective states of development or morbid conditions appearing in other portions of the intestinal canal. From observations made in veterinary medicine, it appears that the herbivorous or mammiferous animals that have the lengthened cecum in place of the so-called "relic," evincing an analogue of conformation, are far from being exempt from dangerous attacks of intestinal inflammation.

According to some of the latest authorities, the cases of appendicitis in which foreign bodies are found are rare, consisting of only about 4 per cent., and though fecal concretions are observed in a greater proportion, the fact proves but little, seeing such matter is so often absent in the higher grades of inflammation of the appendix, and is so frequently met with in cases of autopsies of persons who have died from other diseases.

The main factors concerned in the causation of appendicitis must be attributed to the effect of mechanic injuries and to bacterial agency. The influence of the latter I need not discuss to any great length, but only wish to say that there must probably be a solution of the continuity of the normal structures of the appendix before micro-organisms can work pathologic change.

As already intimated, the appendix in the human subject is as seemingly well vitalized as are other portions of the organism. Its walls, as before stated, are firm; the part is covered with peritoneum. It has a muscular coat and is lined with a mucous membrane. The blood-supply is from a considerable artery—the ileocecal—and this in turn is given off from the superior mesenteric. It will be remembered that the epithelium of the appendix is of the columnar variety, containing solitary glands, which are really intestinal lymphatics, and are of the nature of the agminated glands or of those comprising Peyer's patches. These glands, when appearing as solitary bodies in the large intestine, are most numerous in the cecum and in the appendix vermiformis. They are without doubt largely connected with the important function of lymphosis and hematosiis, for they are abundantly furnished with capillaries and lymphatic vessels; these form a plexus around the sacculi of the glands and thus present features akin to the lacteals. In portions of the intestine these glands are found closed, though at intervals they undoubtedly open to discharge their contained secretion. The solitary glands, as said before, are quite abundant in the cecum and the vermiform appendix; they are prominent on the surface and are perforated by a minute opening upon their free surface. Of late much attention has been paid to the nature and character of glandular tissue.

Poehl² discovered in the thyroid gland an organic principle he denominated "spermin." Other authorities claim that the thyroid gland secretes a product capable of overcoming toxic substances resulting from metamorphosis of tissue within the body. The elaboration of this material by the thyroid gland is essential to the proper development and preservation of the organism. The same healthful influence has been attributed to the glandular secretion of the thymus, the prostate, and to the ovaries. Undoubtedly, all glandular secretions exercise a similar conserving energy on the parts of the body with which they are in immediate connection. The therapeutic effect of the thyroid extract, whose active principle was discovered by Bauman³ and named by him "thyreoidin," is also suggestive of the importance of the function pertaining to glandular tissue. It has long been thought by some physiologists that the odorous matter of the excrement is due to the secretion of the appendix as well as to that of Peyer's glands. Rotch⁴,

² Boston Medical and Surgical Journal, Vol. cxxxix, pp. 462-3.

³ Journal of the American Medical Association, Vol. xxxi, p. 1209.

⁴ Pediatrics, 1898.

under the head of "The Normal Development of the Appendix Vermiformis," attaches much importance to the lymphatic glands about the cecum as possible starting-points of inflammation. He quotes Tuffier as stating that the lymphatics of the front of the cecum follow the anterior ileocecal artery to empty into two glands which he has found constantly in the superior ileocecal fold, and which in the child are very distinct. The posterior glands are also found constantly on the posterior and inner wall of the cecum itself, beneath the peritoneum. They also form, he says, a group of from three to six glands.

In man, as in some of the higher *Quadrumana*, the lymph follicles in the vermiform appendix form a continuous zone of adenoid tissue. From this it would seem that there can be no question that, after inflammation has been set up in the glandular tissue about the cecum, involving to a considerable extent the appendix, the muscular tissue may become so swollen, relaxed, or weakened as to allow fecal substances to pass through its aperture from the cecum into the canal.

Catarrhal inflammation, as said before, can scarcely be considered a cause, for when that form of inflammation attacks the appendix it is usually the result of an extension of a morbid condition from the cecum or other portion of the intestinal canal. The extremes of age or the differences of sex fail, for the most part, to afford satisfactory evidence of causation, especially when we come to consider the countless number of persons of either of these classes escaping the consequences of such mishaps.

The more direct cause must then be sought in the effects of accidents, injuries, traumatism, mechanic disturbances, or from irritation from within, continued or repeated, whereby the parts become for the time being so devitalized as to favor the development of morbid processes through the agency of micro-organisms. The observation of Professor Rotch, already referred to, on the importance of the lymphatic glands about the cecum as starting points of inflammation of the vermiform appendix, should not be lost sight of. Another point that should be borne in mind is the fact that when, in cases of appendicitis demanding surgical treatment, the failure to find the appendix or the omission to remove it because it is not within easy reach or because too much violence may result to other structures, will not always seriously interfere with the patients' recovery.

An interesting instance of inflammation of the vermiform appendix, the result of traumatism, occurred in the following case:

Case 1.—A woman, unmarried, aged 19 years. When I was called I found her in bed suffering from severe pain in the right hypogastric region and in the right iliac fossa. The patient had complained of chills and there had been febrile reaction. The temperature was moderately elevated, varying at different parts of the day from 100 to 101.5. The rigidity of the rectus muscle, as well as that of the abdominal parietes generally, was not excessive, though there was more tension of the parts on the right side and in the right iliac fossa than there was on the left side. The pain was not limited to any special point, but was diffused over the abdomen, as if originating from the superior mesenteric nerve centers and from points along the great sympathetic ganglia, about the region of the umbilicus. There had been nausea, but the vomiting was not distressing. A thickening or an exudation could be felt extending from the McBurney point outward toward the ileum. The patient for the next eight days, while under the influence of gentle laxatives, sedatives and hot fomentations, appeared to improve. After that she suddenly grew worse and presented characteristic symptoms of suppurative appendicitis.

It was at this time that I succeeded in obtaining from her

the history of an injury. It appears that some three weeks before making my first visit, the patient, while crossing a street near Commonwealth Avenue in Boston, was struck by a rapidly-moving bicycle. She was thrown down; the force of the blow seems to have been imparted to the tissues on the lower portion of the abdomen and a little to the right of the median line and to the left of the right iliac fossa. The patient recovered herself, returned that day to Cambridge, and though suffering severely at the time, the accident, it is now strange to say, had so completely escaped her memory as not to be recalled by questions in reference to her receiving an injury to the parts near the seat of pain. There were no visible marks of a contusion or of any internal injury.

Next day, with the assistance of Drs. Currie and Cunningham, I made an incision over the point of the greatest tenderness, which was in the right linea semilunaris. The tissues about the head of the cecum were swollen and inflamed, affording evidence that suppurative processes had taken place. The appendix at its attachment to the posterior aspect of the cecum was sought for and was found unusually long, inflamed, stretched, adherent, extending to the right, where it had evidently been raised or displaced at the time of the accident, by the violence impinging upon the deeper structures of the iliac fossa, and by the morbid processes that had afterward ensued. After the excision of the appendix the cavity was irrigated with warm, sterilized water, and drainage was established by the use of iodoform gauze. Suppuration was finally overcome, chiefly by hot douches, and by the liberal use of peroxid of hydrogen.

Since then the patient has been in fair health. She has married and is now advancing toward the close of her first pregnancy.

Another case of appendicitis, the result of a blow from a rapidly-moving carriage wheel upon the parts about the cecum, occurred upward of a year ago.

Case 2.—A man, aged 34 years, whom I had the opportunity to see in consultation. Ten days after the accident an incision was made at the most prominent part of the swelling, which was embraced within the point of election for operation as recommended by McBurney. The structures about the cecum, containing the lymphatic glands and supplied by the ileocecal artery were involved in the suppurative processes. The appendix was red and swollen. The part was removed, and drainage, as in the other case, was maintained. After the lapse of some five weeks the patient had practically recovered.

I have reported these two cases because, as I believe, they were the direct result of traumatism, and the parts, injured as they were, became the immediate foci of infection.

These cases, taken in connection with other facts, suggest the thought that inflammation of the vermiform appendix is the result, as said before, for the most part, of mechanic disturbances, or of prolonged or repeated irritation whereby the tissues become devitalized and the neighboring lymphatics become originating points of the morbid process. It seems scarcely necessary to mention how such factors may arise; suffice it to say that the many occupations and trades can contribute to this result. There are numerous sources for giving rise to undue pressure, such as the result of habitually carrying articles of luggage, of wearing improperly fitting clothing, or of the habit of assuming unnatural or constrained positions of the body or of the lower extremities. Any or all of these may at first appear trifling, but when long indulged in, may serve to interfere in no small measure with the function of the vascular element and thus give rise to disease that may be transmitted to the cecal appendix.

Puerperal Infection.—A. de Pourtalés concludes, from a study of six fatal cases, that we must distinguish between primary septic phlebitis and secondary infection from a thrombus already formed at the placenta site. He found putrefaction bacteria with the streptococci in these decayed thrombi. In one case two months had passed without fever, when a streptococcus infected thrombus in the vena cruralis started a general septicemia.—*Archiv f. Gyn.*, Vol. lvii, No. 1.