Fistula in ano

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FISTULA IN ANO

Senior Thesis

Omaha, Nebraska
April 1935
Julius B. Christensen - B. Sc. in Med.

Submitted to the Faculty of the University of Nebraska College of Medicine in partial fulfillment of the requirements for Degree of Doctor of Medicine.
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HISTORY

The term "fistula," from the Latin word meaning a reed or pipe was probably applied to the condition because of the existence of the tube-like channel through which gas of feces escape in a complete fistula. A complete fistula may be defined as an unhealthy or non-granulating sinus with two openings, one on the surface, usually near the anus, and the other in the rectum.

(36) Among the instruments unearthed at Pompeii are several for the performance of operations for fistula showing that the treatment was known in the First Century A.D.

It is interesting to note that even as early as the Twelfth Century B.C. that we have brief reference (27) to fistula in the code of Hammurabi. The first very complete and surprisingly good writing on anal fistula (1) is found in Adams' translation of the works of Hippocrates. This ancient writer described the condition and its various treatments much the same as an article on the same subject is written today. Hippocrates thought that trauma and abscess were the causes of fistula. "Any work such as rowing, horseback riding, etc. in which the blood is believed to become stagnant in the nates and becoming corrupted it suppurates resulting in formation of fistulae." He advised early drainage of an abscess.
even open "while still unripe" to prevent fistula formation but once formed he then gave details of various forms of treatments, modifications of which have been used since that time. He described in detail a method of probing with garlic stem. The non-operative procedures of ligation using horse hair and raw lint was given as the method of choice in the majority of cases, however, if ligation failed then one was directed to resort to the more drastic surgical procedure of cutting down on the tract. The wound is to be allowed to heal by granulations from the bottom. The use of the syringe and caustic substances are advocated to distend the tract.

Hippocrates recognized that abscess is often the forerunner of fistulae. He gave the classical symptoms and signs of rectal abscess. When a diagnosis is made according to Adams' translation "the patient is to put into a hip bath of hot water, and sixty grain of the grana gnida are to be infused in a hemina of wine, with half a hemina of oil, and injected. This brings away phlegm and faeces." (Grana gnida is the fruit of the Daphne gnidium. Its use here is as a stimulant.)

Erotian, Aretaeus, Galen and a legion of others wrote on the subject as time passed. (27) Celsus 400 years later advised the use of both scalpal and ligatures, the former to open the main sinus and ligature to be used in the side tracts. He pointed out the dangers of incising to a high internal
opening and used a tent in such cases.

(27) Paulus Aegineta, one thousand years after Hippocrates, probed the fistula, pulling the end of the probe out of the anus and cut down on the sinus. He did not like ligation treatment.

John Arderne, in the Fourteenth Century A.D. wrote several works on surgery, which have been collected and edited by Sir D'Arcy Power. Arderne was the first writer to give a list of fistula cases cured, and he was not averse to tackling complicated ones. He cured "one that was called Thomas Broune that had 15 holes, eight on one side and seven on the other by which the Wynde went out with egestious odour." Some of the holes were distant from the anus "by the span of a hand-brede of a man."

(27) Peter Lowe writing in 1612 described fistula in ano very well and gives three methods of curing the condition: burning the fistula away, cutting and ligature. He favored ligature because he thought it less dangerous and secondarily because in his experience incontinence was less likely to develop than if cautery was used.

(45) Perrin noted in his study of the History of rectal surgery that all the later writers favored one type of treatment or other giving only small points in favor of any one. Even at the present time the treatment is still debated although the perfection of anesthesia and operative
technique has given surgery the lead in the forms of treatment.

In the early part of the Eighteenth Century Heister gave a good classification much as is used by surgeons today. He also advised the use of injection of milk to make a diagnosis in some cases. This is similar to use of injection in diagnosis as is used at the present time. He believed that rectal abscess was the forerunner of fistula and untreated would always result in one. He advocated use of a probe and a finger in the anus to determine the site of internal opening if possible. He recognized and gave a very grave prognosis to fistulae connected to diseased bones. He also gave a good description of fistulae connected to the urethra, bladder, scrotum, etc. He expressed the opinion of many of the earlier men that closure of the fistula had a bad effect on other conditions such as gout or tuberculosis and should often be left alone. He gave many of the excepted causes of rectal abscess and fistulae but did not describe the rectal columns or crypts.

He described in detail three methods of treatment. They are still in use and have all been more or less popular by various men since 1757 the time of his writing. He favored what was called a new method. This was the use of the knife and the grooved director. He gave in detail also a technique of ligation by use of silver wire. It is interesting to note that Heister advised
before operation "bleeding and purging a few days. But in weak habits, they ought to be omitted and the patient rather supported with a strengthening diet." He writes also quoting from Dionis, a French surgeon, who records a popularity of the fistula of King Louis XIV of France. "The French were so proud and fond of being in the fashion, when their King Louis XIV had a fistula, that they boasted of the disorder as a point of honour, and would even undergo the operation when there was no real necessity." His writing is concluded with a good discourse on the necessary bandaging after care and diet of the patient.

Robert Allan wrote his book in 1819 bringing out all the old ideas with some additional thoughts. He sites the factor of poor circulation in cases of fistula complicating hemorrhoids. His idea on the failure of a fistula to heal spontaneously in the greatest majority of cases is due to the unrest of the sphincter muscle and reflex spasm, and because of this strongly advised severance of the sphincter muscle in the surgical treatment. He advised surgery in all cases stating that the more conservative treatment by ligation required too long a time (five weeks) and in the end was much more painful than to lay the tract wide open at a single setting. He recognized the importance of causing the wound to granulate up from the bottom and the dangers of allowing any bridges of granulation tissue to form.
If the wound was slow to granulate in, he used solutions of copper-sulphate to stimulate the tissues.

**GROSS PATHOLOGICAL ANATOMY**

A complete fistula presents four features of interest, namely, (1) the external opening, (2) the internal opening, (3) the main track, and (4) the offshoots or extensions from the main track.

The external opening.—A great deal of information can be obtained in regard to the probable type and nature of a fistula by observing the size, position and number of the fistulous apertures, to be seen in the perineal region. As a general rule if the opening is small and contracted and especially if it is situated within an inch of the anal verge the fistula is probably subcutaneous in type. Should the opening be large, irregular in shape with undermined edges and especially if the surrounding skin is of a reddish-purple hue the fistula is most probably tuberculous in origin. When the opening is surmounted by a tuft of granulation tissue such as is often observed at the orifice of a sinus leading down to carious bone, a deeply seated fistula such as a ischico-rectal or the para-rectal is indicated. Should the opening be situated close to the anal verge or within half an inch of it the fistula is invariably of the submucous type. When an opening is situated in the anterior part of the perineum and is nearer to
the bulb of the urethra than to the anus and especially if it is close to the middle line, a urethral fistula should be suspected and steps should be taken to ascertain whether a stricture of urethra exists. An opening situated in the posterior part of the perineum at the level of the tip of the coccyx and about an inch distant from the mid-line is suggestive of the point of issue of a retro-rectal abscess. An opening situated in the middle line between the tip of the coccyx and the anal margin is probably the vent for a suppurating retro-rectal dermoid cyst. Lastly, the presence of several external openings is an indication of the existence of offshoots from the main track, some of which may terminate in a cul-de-sac. It is important therefore, under such circumstances, that a careful search be made for offshoots which have not found an outlet on the skin surface when such fistulae are being operated on.

Although a great many ano-rectal fistulae have only one external opening, multiple openings are the rule rather than the exception in those of ischio-rectal type. In these the internal opening is situated opposite the interval between the sphincters and is often of large size. When the internal opening is large, sometimes large enough to admit the tip of the index finger, fecal matter is apt to enter it when an action of the bowels takes place, thus provoking acute inflammation along the main track of the fistula.
Miles believes that as a result of septic lymphangitis secondary abscesses are formed in the vicinity of the main track. These abscesses eventually extend to the skin surface and open there, forming secondary openings. The original external opening is known as the primary opening and indicated the termination of the main track of the fistula. Openings in connection with the same fistula which appear subsequently are secondary openings and represent the surface terminations of offshoots from the main track. It must not be forgotten, however, that external openings may not always be connected with the same fistula. It sometimes happens that two or more separate fistulae exist in the same patient, each having a separate internal opening. Instances occasionally occur in which two, three or four separate complete fistulae co-exist in the same patient.

The internal opening.—Just as external openings are always found upon the skin surface, so internal openings are always located in the interior of the bowel and are perforations of the mucous coat. As a rule they are of small size and are generally circular in outline, but occasionally they are much larger and of irregular shape, as for example when they are the result of lacerations of the mucosa such as may be produced by the partial tearing through of the pedicle of a polypus, the tearing down of valve of Morgagni, or an abrasion caused during the passage of a foreign body.
such as a fish bone. When an internal opening is exceptionally large, the fistula is usually tuberculous in origin. Miles believes that the position of an internal opening varies according to the type of the fistula with which it is associated. Thus the internal opening of a para-rectal fistula is generally situated above the level of the levatores and from two to three inches above the anal margin. That in connection with a fistula of the submucous type may be situated anywhere along the course of the main track but is generally found immediately above Hilton's white line. The internal opening of a sub-sphincteric fistula is always situated in the anal canal in one of three situations at the level of the valves of Morgagni, namely, either in the right anterior quadrant or in the left anterior quadrant or in the middle line posteriorly. The internal opening of an ischio-rectal fistula is always situated in the middle line posteriorly at the level of the interval between the external and internal sphincters. The internal opening of the inter-muscular type may be situated anywhere in the circumference of the anal canal but always at the level of the interval between the sphincters. Buie's teaching is that all primary openings are in the crypts and all openings not found there are secondary. Both of these articles were published in 1931. Miles in England. Buie in United States.

W. J. Mayo believes that when the internal opening
occurs in a crypt lying anterior or posterior to an imaginary line drawn, with the patient in the lithotomy position, transversely so as to bisect the anus into anterior and posterior halves usually produces different types of fistulae. Infection of an anterior crypt spreads directly outward and results in a sinus close to the anal margin which leads directly inward to the infected crypt. The strong fascia between the posterior border of the external sphincter and the coccyx prevents pus, following infection of a posterior crypt from burrowing directly to the surface. As a result, it may burrow inward in any direction through the ischio-rectal fat and form single or multiple tortuous sinuses, often as far as 10 to 15 cm from the original infected crypt. These tracts, however, almost invariably communicate with the originally infected crypt, usually situated near the middle of the posterior half of the ano-rectal margin.

In the majority of cases there is only one internal opening to each complete or blind internal fistula, but occasionally there are two. When a second internal opening of a fistula exists it is generally situated at a higher level along the course of a submucous track extending vertically or obliquely upwards from the lower opening. When more than one internal opening is discovered at the same level each opening belongs to a separate fistula. If there is an internal opening at the level of the interval between the internal and
external sphincters and a second opening is found higher up with no intervening submucous track, both of them are internal openings of a para-rectal fistula.

The main track.--The main track of an ano-rectal fistula is the contracted but unobliterated cavity of the abscess which preceded it. It extends from the internal opening to the primary external opening and may take a straight, curved or torturous course. Its anatomical position in regard to the coats of the terminal portion of the rectum and of the tissues in its immediate vicinity determines the type of the fistula. The exact position of the main track of a fistula in regard to the muscular apparatus controlling the outlet of the rectum is of the utmost importance from the point of view of surgical treatment. Failure to recognize that all fistulae are not of the same type is responsible for the disastrous consequences that sometimes result from operative treatment.

Goodsall suggested a rule that is not infallible but is of definite help in ascertaining where to search first for the primary opening. He stated: "All fistulae with their internal openings behind a line drawn transversely through the center of the anus, have their internal openings in the middle line behind; and that in cases in which the external aperture is anterior to this line, the inner opening is directly opposite the external one.

The majority of fistulae are complicated by offshoots
or extensions from the main track. These offshoots are formed when the external or internal openings are temporarily closed by inflammation, granulations or pressure causing the discharge to seek new outlets since it rapidly accumulates and creates a pressure. These offshoots have a dissecting action and follow the path of least resistance. At points where they near the surface they may break through giving rise to a secondary opening. The number of tracks and openings so formed may be unlimited, so that in the course of time a labyrinth of intercommunicating channels are formed. Some types of fistula are more prone to ramification than others. All fistulae are at first unilateral, but secondary offshoots may extend across the middle line so that the fistula ultimately becomes libaterally disposed. The offshoots from the main track are not necessarily confined to the same anatomical locality; thus, the secondary tracks in connection with an ischio-rectal fistula may be entirely located in the subcutaneous tissue; a complex fistula resulting, to which the designation "fistula of the ischio-rectal fistula type with subcutaneous extensions", should be applied. Again, an offshoot from an ischio-rectal fistula may be located in the submucous tissue, when an "ischio-rectal fistula" with submucous extension results. It is important when operating upon different types of fistula, to bear in mind the possibility of offshoots existing in lymphatic areas other than that
in which the main track is situated.

By reason of the fact that the lymphatics on both sides are symmetrically disposed Miles put forth the idea that an offshoot extending across the mid-line to the opposite side would set up a fistula with a pattern the exact replica of the original. The most common type of fistula in his experience to extend to the opposite side is the ischio-rectal, though the submucous type may occasionally do so.

ORIGIN OF FISTULA

Buie of May Clinic believes that one of the most important points in the care of fistulae is to get a better understanding of the origin of the condition. He states "one of the chief reasons for failure to cure anal fistulas is misconception as to the point of origin of the disease." He sites an article by Lockhart-Mummery for example which began as follows: "the primary cause in all cases is an abscess in the tissues surrounding the rectum." Buie condemns this statement as being only partly true. "It is the abscess which most often brings the patient to the Doctor but in most instances a careful history will show that the patient has been aware of a sense of fulness or tenderness for a period before the abscess formation." Material taken from his latest work at the Mayo Clinic is based on the idea of cryptitis being the etiologicat factor of greatest importance in
by far the majority of cases of fistula. Smith speaks
of this as the anatomic cause. He has reference to the
formation of the anal crypts. Probably as a result of
the mechanical requirements at the time of the fusion
of the proctodeum and the hind gut, the widest part of
the crypt is directed upward. Because of their direction
and disposition of the crypts, they are easily traumatized
and infected.

Landsman believes that, since this region of the
junction of the somatic and visceral layers are often
the site of malformation and anomalies, we can consider
this the weakest part of the anal canal.

In order to justify the theory that infected anal
crypts are the source of anal fistulae, it must be
contended that all fistulae have internal openings.
How is it possible, then to find crypts of normal
appearance with an active fistula in ano? This apparent
paradox can be explained. When abscess has formed and
ruptured, the release of pressure and the establishment
of a point of discharge makes it theoretically possible
for the tract extending from the anus to the abscess
to become inactive and fibrous, and healing may sometimes
result. In this way the crypt could heal, close and,
in time show no apparent evidence of disease. This I
believe to be the explanation of the so-called incomplete
external fistula, of which surgeons have been unable to
demonstrate an internal opening. Suffice it to say that
it is practically always possible to discover the diseased crypt, and in those rare instances in which there does not seem to be any apparent involvement it is usually possible to connect the abscess with the probable point in the anal canal which was responsible for the disorder. In such instances one is justified in excising one or more of the crypts in the suspected anal quadrant in order to eliminate the dormant tracts. Occasionally, an abscess may occur in the perineum as a result of direct lymphoid involvement originating in an anterior anal crypt. In such instances a definite tubular tract may not exist, and the infection might have been carried from the anus through the lymphoid chains which extend away from the anal margin. In cases of this kind, all tissues covering the abscess should be cut away, and the tissues between the abscess and the superficial anal tissues should be excised down to and including the anterior anal crypt.

Out of 1000 cases in the Mayo Clinic with fistula (13) reported by Buie cared for on the basis of cryptitis as the greatest etiological factor, all cases were ultimately cured.

The development of an anal fistula has been divided into four stages, and the abscess does not appear until the third stage. The first stage is that of involvement of the anal crypts. These little pockets are surrounded by lymphoid tissue and are formed by the junction of the
skin with the mucous membrane. The former overlaps the latter in a serrated margin known as the pectinate line (linea dentata) which is made up of the papillae of Morgagni. The crypts are susceptible to the same traumatic influences that attack other portions of the rectal outlet. Anything that produces a break in the tissues about the anal crypts, with a subsequent admission of such organisms as Escherichia Coli, Proteus Vulgaris, Staphylococci or Streptococci, or such foreign substances as a fecalith, seeds, fibers and the like, may result in development of infection of the crypts, and this is capable of developing into fistula. Often the trouble has been started by one or another of the following agencies: the strain and stretching of the passage of a large formed stool; the irritation of excessive diarrhea, or the trauma of a fall or of a foreign body such as a fish bone. Thus the infected crypt becomes edematous, the papilla becomes hypertrophied and adherent over the crypt, and this nidus of infection is the beginning of the fistula.

The second stage is that of burrowing. The infection in the crypt begins to expand, and with its spread the process extends by burrowing out into the tissues adjacent to the anus. There are several courses which these tracts may pursue, but approximately 85% of them pass either through the external sphincter or internal to it between it and the internal sphincter.
The third stage is that of the ischio-rectal abscess. After the infection has passed through or between the muscles, the irritation produces a spastic condition of the anal muscles, and except in those instances in which there is a great destruction of muscle fibers, this spasm prevents a return flow of the pus toward the anus. Consequently, there is an accumulation external to the muscles, and the abscess develops in the loose tissues of the buttocks, the ischio-rectal space or the pelvis.

An abscess in formation should be treated with hot Sitz baths to relieve pain and to localize the pathology. As soon as fluctuation is noticed it should be opened and drained. Only after acute inflammation has subsided should a radical operation be performed.

The fourth stage, the abscess increases in size and, depending on its situation it may rupture either externally, on the surface of the skin, or into one or more of the pelvic Viscera. Landsman contends that the abscess in obedience to accepted physical laws, simply gravitates in the direction of least resistance. In most cases the terminal part of the alimentary tube, with its thin fascial covering and soft muscular walls is the route of involvement. If this affords insufficient drainage, the tendency is for the pus to work its way out to the skin surface, at the base of the ischio-rectal fossa. It may burst through the apex of the
fossa, separate the visceral layer of the pelvic fascia over the upper surface of the levator ani, and become an iliac abscess, or break through into the ampulla of the rectum, and discharge its contents into the bowel. It may tunnel anteriorly into the bladder or vagina, or posteriorly into the parietal layer of the pelvic fascia and the bone, and reach the buttocks through the great sacrosciatic foramen. The latter are cases with multiple external openings.

CLASSIFICATION OF ETIOLOGY

Fistula may be classified according to etiology. In the following classification the causes are given in the order of greatest frequency:

First, trauma. Cryptitis as an etiological factor has already been discussed. It is accepted by the majority of the latest workers who have made a study of causation of fistula. The cases of trauma of external origin are of course much more rare (2% of cases) and usually come as a result of a fall on some object which may tear or bruise the mucous membrane of the lower bowel, or may be the result of the careless use of the colon tube or enema tip. Those of internal origin have been discussed in the factors acting in the condition of cryptitis. The possibility of bruising or tearing from some object passing down the intestinal tract is mentioned by nearly all authors. Kelsey reports cases where fish bones
were found in the abscess at the time of operation. Foreign bodies and other traumatic causes are more apt to cause injury in cases of stricture of the rectum. 

Other traumatic possibilities which, strictly speaking, come under neither the heading of external nor internal sources are as follows: the possibility of bruising of the mucous membrane of the rectum or even laceration during child birth. The possibility of bruising or laceration of the mucous membrane of the rectum during the unskillful handling of mental sounds or catheters in the male patient. Alexander, who made a careful and extensive study believed that the source of infection in a perineal abscess in men is always from the urethra. It will be well to keep in mind such possibilities. He mentions tracts connected with the glands of the bulbous or membranous portion, fissures of the mucosa of the urethra or the result of more or less extensive rupture of the urethra from external or internal violence. The possibility of traumatic injury to the rectum during abdominal operations especially where there are pelvic adhesions, and also the possibility of injury to the rectum in performing a super-pubic prostatectomy should be remembered in cases following such surgical procedures.

A common factor is ulcerations of the mucous membrane which may form on the folds or may be superimposed on internal hemorrhoids. Due to the poor
circulation and very often associated mild inflammatory process the local tissue resistance is lowered. Injudicious injection treatment of hemorrhoids with sluffing and necrosis are ideal conditions for the formation of blind sinuses and fistulae.

Malignancies of the rectum not infrequently are the site of ulcerations and, therefore, are to be considered as an etiological factor. One must bear in mind this more serious possibility when presented with a case, which comes in under observation solely, by virtue of existence of a fistula.

Tuberculosis is another common etiologic factor but is not as frequently the cause as was originally thought. In a review of the literature on the causes of fistula I noted nearly every author speaking of the wide spread belief of the connection of fistula and tuberculosis. This is true of many of the medical workers as well as the general public. Some interesting notes on this belief are given by Mathews. He says "I have often been asked if the cure of piles would not result in consumption, and I have often had the objection preferred to curing fistula that, if the discharge was stopped, it would go to the lungs. I find, too, that patients have been prejudiced against the operation for the cure of fistula by some physician who has worked against it, lest they have consumption as the consequence. Of course, to the learned
physician this would be pure nonsense; yet the prejudice exists, and we are forced to use a sensible argument to refute it."

Bushe makes a statement typical of the opinion of the medical profession in the early 19th Century. In his treatise he observes, "it is very apparent that a great many fistulae depend upon disease of the lungs, therefore we should not operate upon them, else the healing will give rise to an increase of the pulmonary disorder and curtail life." (30)

Hirschman, one of the present workers in proctology, comments in one of his articles concerning the apparent connection between fistula and tuberculosis. He believes that this is due to the fact of the tuberculous patients resisting powers being far below par. Abscesses in the anorectal region tend to fistula formation frequently enough in those individuals who have a normal resisting power; therefore it stands to reason that this should be more so in those suffering from any of the wasting diseases, and particularly the most common one, tuberculosis. The tuberculous patient's intestinal tract is constantly flooded with tubercle bacilli, and an abscess cavity communicating with the bowel forms a convenient location for them to locate and propagate. The old idea that the operation for tuberculous fistula has any bad influence on the patient's pulmonary condition is absolutely untenable. As a matter of
fact, the local symptoms and inconvenience, caused by the fistula make the patient much more irritable and add to his already overwhelming burden.

In an article published by Fansler and Peter of the Glen Lake Tuberculosis Sanatorium at Oak Terrace, Minnesota, they found fistula in only five per cent of the patients, and of this five per cent, only eighty-two per cent of the rectal fistula were proven tuberculosis in origin, the proof being based on smears made from sinuses and guinea pig inoculations or the presence of typical tubercle formations found in the fistula themselves.

Other writers give the incidence of tuberculosis as an etiologic factor in three per cent of the fistulae which come under their observation. Fansler and Peter state they were able to diagnose seventy-eight per cent of the tuberculosis fistulae at the time of operation by the presence of macroscopic tubercles in the fistulous tract.

Smith comments in his article on anorectal fistulae concerning tuberculosis as an etiological factor. He believes that the tuberculous infection of fistula does not occur as commonly as was formerly believed and that it seems probable that tuberculosis represents a secondary invasion rather than a primary infection so that treatment is the same as in those having only the pyogenic organisms.
It seems that the more recent workers believe tuberculosis to be a secondary invader.

The same problem of trying to prove etiology is presented in a case reported by Duncan. On operation of one of his cases the fistula was found to contain numerous thread worms and ova. He believed these to be secondary invaders rather than primary but can offer no proof one way or another.

Shipley in Graham's Surgical Diagnosis makes this statement: "Tuberculosis is a predisposing factor and fistula is much more common in tuberculous individuals than in healthy ones. Not all fistulae in tuberculous patients are tuberculous, however."

Mathews in 1893 states that his opinion is that tuberculous bacilli in a fistula are secondary. I believe him to be one of the earliest to make this statement.

CLASSIFICATION ACCORDING TO SHAPE AND POSITION

Fistulae which are purely anal or rectal are of several varieties and may be named from their shape and number of openings as follows: the first, "complete," which has an opening into the skin and one into the rectum or anus. This may be a simple, straight or slightly tortuous tract, or it may be a quite complex affair with many communication sinuses, which may have blind endings or rather elaborate communication passages.
situated in the subcutaneous tissue and extend over to the opposite side of the anus.

Second, a "blind-internal," fistula which has an opening into the bowel but no opening on the skin. It is the opinion of the latest workers that all fistula in their original state come under this heading, and that it is due to the subcutaneous dissection of the infected material in the fistula that the other forms are developed.

Third, the "complete internal," fistula which has both of its openings in the bowel. Occasionally a tract will burrow from its source under the pectinate line between the anal muscles and up under the rectal wall, forming an abscess which adheres to it and ultimately ruptures through into the rectum. In addition to this the tract may extend externally under the buttock and rupture through the skin, as illustrated on the right side. It is such a case that one is easily misled, because when the probe is inserted into the external sinus the point of the probe or the solution will come through above the anus. Unless the true origin of the infection is appreciated one will make the error of regarding this high sinus as the starting point of the fistula. It is well to know of this high sinus, provided it is clear that it is merely a subsiding of the main tract coming from the anal canal, even as the limb is which extends to the external sinus.
Fourth, the "horse-shoe shape" or "complete external" which has both of its openings in the skin. The particular form, unquestionably at one time had an opening into the bowel, and frequently one is surprised at operation to find a sinus extending from the toe of the horse-shoe to the rectum. A careful search should always be made for such a communicating sinus.

(17)

Fifth, Colt includes the "blind-external" which has a communication with the skin but none with the bowel.

If the surgeon is careful in the search for the internal opening in many instances, that which was diagnosed as a blind external fistula proves at operation to have an internal opening and therefore comes under the classification of complete fistula. (14) "All anal fistulas have internal openings."

SYMPTOMATOLOGY

The symptomatology is usually quite definite and typically as follows: The patient first complains of an itching or uncomfortable feeling in the region of the anus which gradually increases and later develops into a severe throbbing pain. The area about the buttocks becomes quite painful. The patient may or may not experience chills, fever or other general symptoms of infection. All of these signs and symptoms
are more or less completely relieved and disappear with the rupture of the skin and discharging of considerable sero-saguneous fluid or the discharge through the rectum. As long as free drainage continues the patient will be symptom free with the exception of local irritation and some slight discomfort. As soon as the drainage stops the symptoms will in most cases begin to return although some may go for months or years without recurrence of symptoms. During this period of quiescence the patient may believe that his condition has spontaneously cured itself.

Once established, pain is rarely mentioned except when the openings apparently have healed and a fresh collection of pus formed. This new abscess either broke through the old opening or found some new more or less remote point of exit. In this way multiple openings and offshoots are formed.

DIAGNOSIS

The diagnosis of fistulae can usually be made from the history and local observation. It is usually an easy matter, especially when the fistula is complete. When this is the case, if the tissue intervening between the bowel and the external opening is palpated and compared to the other side, an indurated area, feeling like the stem of a reed, will be found running towards the bowel on the affected side, and a probe passed in
at the external opening will pass along the indurated tract towards the internal opening, which can usually be easily felt when the finger is introduced into the rectum, and which, it must be remembered, is practically always between the two sphincters.

It is not necessary for diagnostic purposes to pass the probe from the external to the internal opening. Careful examination is of little value except to determine the etiologic factor and the exact kind of fistula with which one is dealing. Many authors advocate the injection of these sinuses as an aid in diagnosis and surgical treatment in the more complicated cases. Milk, dyes and more recently lipiodol or bismuth paste have been used. Colt, of Kansas, states that in many instances, especially where the external openings are multiple or some distance from the anal aperture, it is advisable to inject the sinus with lipiodol or bismuth paste and take stereoscopic radiographs which will give one some idea as to the extent and nature of the fistulous tract.

Some advise dyes as an aid in surgical extrapation of the branching sinuses of the complicated fistula. Smith and others believe that careful examination of the tissue lining these tracts, and contrasting this tissue with the surrounding normal tissue, renders the use of dye stuffs or pastes not only unnecessary but
often a hindrance in the conscientious search for complicating sinuses.

GENERAL PRINCIPLE OF TREATMENT

The only accepted treatment for fistula today is surgery. The principle underlying this treatment is to lay the main track open together with all offshoots extending from it. Then allow the wound to heal by granulation from the bottom and not permit the epithelium to bridge over until the granulations have grown from the deepest point of the wound to the surface.

The anesthetic used does not make a great deal of difference except that the basic principles and contraindications followed in the administration of surgical anesthesia must be considered. Inhalation anesthesia is to be avoided in tuberculous patients.

Low spinals, sacral and local infiltration are all used. Inhalation may be used in the majority of cases.

The position of the patient will vary as to the likes and dislikes of the operator and differ as to the site and extent of the fistula.

Very often a complete diagnosis and study of a fistula cannot be made until time of operation following the anesthetic because of the pain and muscle spasm experienced without anesthesia.

First of all, the exact position of the internal
opening is determined by digital exploration of the anal canal, and then the course taken by the main track and the extent of the offshoots from it are carefully mapped out by grasping the para-rectal tissues between the index finger inside the rectum and the thumb upon the skin surface of the ischio-rectal fossa. The point of a probe director is then introduced into the main track through the primary external opening. It sometimes happens that the orifice is so contracted that difficulty is experienced in inserting even the smallest probe into it. In these circumstances the orifice should be enlarged by a small incision at right angles to the line of the main track. As soon as the probe-director has fairly entered the main track, it should be gently passed along it in a direction towards the internal opening. No force should be used, lest a false opening be made. When the main track takes a straight course no difficulty is experienced in introducing the probe as far as the internal opening, where the point can readily be made to protrude through it. In those cases, however, in which the main track takes a curved course, some difficulty may be encountered in reaching the internal opening, on account of the inability of the probe to adapt itself to the curves of the track. Accordingly in order to avoid making a false passage, the point of the probe should be forced through the skin at the spot where its further progress has been arrested.
The tissues overlying the probe are then divided, thus exposing a portion of the track. Cautery is used by some. It is advised by Collier to use cautery in all cases of tuberculosis to aid in prevention of local reinfection. The probe is then re-introduced into the track and passed along it until its point protrudes through the internal opening. Should the passage of the probe be again impeded by the curving of the track, the manoeuvre above described must be repeated. As soon as the grooved director has entered the anal canal, its point should be hooked down by the index finger and brought out through the anus. The overlying tissue including the muscle are then divided completely so as to liberate the probe.

The floor of the main track has then been exposed to view in its entirety and can be readily recognized by the granulation tissue lining it. A careful search is then made along the floor and sides of the exposed tract for apertures leading into offshoots. Hayden of Massachusetts General Hospital believes that whether or not the scar tissue of the tracks is completely excised is of small importance compared with the necessity of free incision and adequate after-care to prevent bridging over between the granulating walls of the wound superficially with the creation of another sinus along the course of the original one. He believes that it is desirable to curet away the unhealthy
granulations readily develop. In this process of
curetting the main track, any tracks opening into it
are quite easily brought to view by virtue of its being
impossible to curet cleanly the open mouth of such a
side tract. The unhealthy granulations lining it
remain visible after the main track elsewhere appears
clean.

When such an offshoot is found the probe should
be passed along it to its extremity and forced through
the skin at that point, should it terminate in the
cul-de-sac. When all existing offshoots have been laid
open, then it is well to trim back the skin margins so
as to widen the ditch. Finally, all overhanging or
undermined edges of tissue should be removed. Some
(43) contend that immediately following operation the
entire wound should be carefully packed to lessen
hemorrhage and stimulate granulation. This however
should be removed after about 12 hours.

After treatment can be the means of success or
failure. The primary object to be obtained is that
the wound resulting from the operation should heal
progressively from its deepest part throughout its
entire length.

In the simple case only a short period of bed
rest is necessary (2 to 4 days). The time necessary
in the more complicated case depends on the type of
case and response to operation.

In those cases in which the main track lies at a considerable depth and pursues a curved course, the surfaces of the more superficial parts of the wound are apt to come into contact with one another and adhere, unless kept apart. In this way the deepest part of the wound may escape obliteration, and the main tract of the fistula is re-established by the process known as "bridging."

(43) In order to prevent bridging Miles suggests that the surfaces of the deeper portions of the wound should be kept apart by interpassing a thin layer of cotton, wool or a strip of gauze between them. However it should not be tightly packed at anytime. Tight packing not only impedes the healing process but prevents the formation of granulation tissue, with the result that the wound heals with a depressing scar. This may be a factor in loss of sphincter control.

(8) R. R. Best of Omaha never packs the wound following operation for fistula. He always trims the edges of the wound widely. This he states requires less after care, does not require dressings and is much less painful. Frequent visits are required until the tract is completely healed. At each visit he introduces a gloved finger into the rectum and draws it out with the tip of the finger in the bottom of the tract thereby breaking up all "bridges."
1 to 5000 potassium permanganate irrigations twice daily and hot Sitz baths are routine post-operative treatment. Hot Sitz baths frequently decrease the pain and discomfort and help to keep the sinus from bridging and promote rapid granulation of the wound. Irrigations of witch hazel can be used instead of potassium permanganate.

A fistula which is healing healthily is practically free from supuration. Whenever pus wells up in the wound it is an indication that one of three conditions is present: (1) bridging has occurred at some point in the wound, (2) an offshoot was missed, (3) or a small abscess is developing from some site which has broken down the same as occurs in operative wounds elsewhere.

(23)(9) It is not necessary to be greatly concerned over contamination of the wound with material from the bowel, since the tissue in this region seems to have a degree of resistance to the organisms found normally about the anus.

(9) Following operation it is desirable to place the patient on a low residue diet and to avoid bowel movement for a period of three to five days. Then an installation of two to three ounces of mineral oil and if necessary a small enema will be helpful in re-establishing normal bowel habit.
PROGNOSIS

The outcome of cases of fistulae varies greatly. The factor of age, nutrition and general physical condition have their weight. The importance of general or focal infection and such serious diseases as typhoid fever, dysentery, small pox, measles, scarlet fever, (5) mephritis and diabetis are emphasized by Babcock. It must remembered that a fistulous tract, just as any other localized chronic suppurative process, must be considered as a very important focal infection, which, unless radically removed may gravely affect the patient's general health. The constant absorption of septic material from a fistulous area may be attended by (16) marked systemic inbalance. Many cases of sacral Neuritis, lumbar pains and disturbances of the bowel function result from a primary focus in the rectum. It must not be forgotten that the ano-rectal region is but the terminal portion of the bowel. We must remember that most infections gain admittance through the mouth or nose and that the discovery of infected accessory sinuses, teeth and tonsils marks the starting point of a very complicated process, passing down the intestinal tract, localized infection may occur at any point so that in addition to a local ano-rectal infection, careful examination may reveal an infected gall bladder, appendix or pancreas. In many instances the ano-rectal lesion is but a terminal expression of infection
disseminated from above.

The prognosis of cases treated by surgery is good. In the series reports of the recent workers all were treated by surgery. Many cases were of several years duration with multiple openings.

(27)

E. P. Hayden reported a series of 388 cases (103 women) of anal fistula in persons whose ages ranged from 20 to 60 years. This series is from cases seen at the Massachusetts General Hospital, from 1921 to 1930. 280 of these cases were traced. 37 died of intercurrent disease. Out of 81 histologic examinations but 2 were tuberculous. In this series 92% were cured by complete incision and drainage.

(13)

Buie at Mayo's Clinic reported 1000 cases all were cured, some however required more than one operation. This series included tuberculous patients, 2% of which he says, "I have found that tuberculous fistulae heal just as readily as others."

SUMMARY

1. Fistula is one of the oldest known rectal disorders. It constitutes about twenty per cent of patients with rectal disorders.

2. Fistula is always preceded by an abscess in the perianal or perirectal tissues.

4. Complete and wide incision of the fistula is necessary to effect a cure.

5. Careful attention to the post-operative management is essential to obtain proper manner of healing of the wound.
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