

The Anorectal Fistulous Abscess and Fistula*

STEPHEN EISENHAMMER, M.B. (Ed.), F.R.C.S. (Eng.)

Johannesburg, South Africa

IN 1953, the author⁴ first drew attention to the long-existing misconception of the classical high anorectal submucous abscess. In 1954,⁵ it was stressed that satisfactory treatment of anorectal fistulas depends on the fundamental fact that the abscess and fistula are the same condition, and he combined them under the single denomination of the *fistulous abscess*. It was also stated that, with few exceptions, all anorectal abscesses and fistulas arise from infection of the anal tubular glands that open into the crypts of Morgagni.

By 1956, the author⁶ had observed the consistent anatomic pattern of the high anorectal intermuscular fistulous abscess and its lower counterpart, the prevalent low intermuscular lesion arising in the midportion of the anal canal, at the level of the anal crypts. This led to formulation of a new concept and a classification which was enlarged upon in 1958⁷ (Fig. 1).

Etiology and Pathology

The intermuscular space lies between the internal anal sphincter and its continuation—the circular muscle of the rectum—medially, and the external anal sphincter with the conjoined longitudinal tendon on its inner surface, laterally. Above, in the rectum, the longitudinal muscle alone lies laterally. Invasion of this space by infection holds the key to surgical management of this complex disorder. The internal sphincter, which forms the inner wall, acts as an impermeable barrier to infection of its internal anal surface. This conclusion was reached because, over a period of 14 years, the author had never encountered deep abscesses following the severest forms of submucosal inflammation above the

pectinate line when complications developed following submucous injection of 7 to 9% phenol in oil for the purpose of sclerosing internal hemorrhoids. These complications varied from an inflammatory mass to abscesses, necrosis, and even gangrene of the injected area. Yet, despite gross infection of the inner surface of the internal sphincter, it never penetrated this muscle barrier to involve the intermuscular space. Vulnerability of this space is owing to the crypts of Morgagni and their associated deep anal glands. The crypts, varying from six to eight in number, exist at the pectinate line in the midportion of the anal canal and are most prominent posteriorly. Opening into these crypts are the ducts of branched tubular glandlike structures, lined by stratified columnar or transitional epithelium, known as anal or intramuscular glands.

As early as 1880, the French anatomists, Herrmann and Desfosses,¹³ described these small glands of the terminal portion of the rectum and mentioned their possible role in the causation of abscess and fistula. Lockhart-Mummery¹⁵ recorded his discovery of the intramuscular glands and attributed abscess of the ischioanal fossa to their involvement. Bremer¹ claims that an average of six or eight glands open into the crypts of Morgagni. The main ducts extend outward and usually downward and may terminate blindly in the submucosa. Others penetrate the internal sphincter to form an ampulla from which several branches may extend and terminate in the intramuscular connective tissue or the longitudinal muscle. Tucker and Hellwig²¹ have ably demonstrated these anal glands in their microscopic studies. Hill, Shryock and ReBell¹⁴ observed that an occasional gland, extending cephalad, is of simpler unbranched

* Received for publication July 13, 1965.

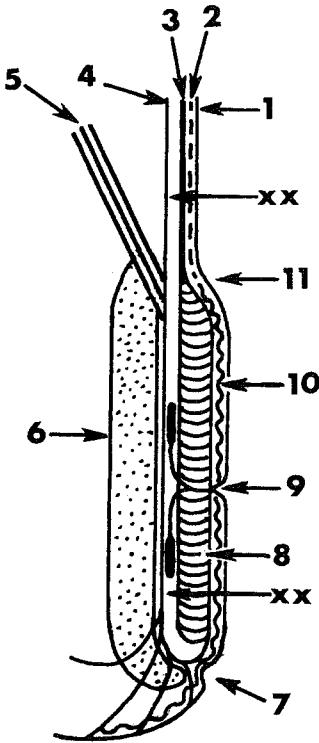


FIG. 1. Coronal section of anorectal wall with composite view of deep cephalad and caudad anal gland terminating in anorectal intermuscular space (XX). 1. Mucous membrane. 2. Submucosa. 3. Circular muscle of rectum. 4. Longitudinal muscle of the rectum. 5. Puborectalis muscle. 6. External sphincter ani. 7. Anal intermuscular depression. 8. Internal sphincter ani. 9. Pectinate (crypt) line. 10. Superior hemorrhoidal plexus, below pectinate line—inferior plexus. 11. Anorectal ring.

structure in contrast to those that are directed caudally. Morgan and Thompson¹⁶ described the various terminal fibers of the conjoined longitudinal muscle and claimed that cryptoglandular intermuscular infection could follow these fibers to the perianum or the ischio-rectal fossa. Shropshear¹⁹ concurs in this opinion and considers that inflammation of the crypts may burrow along these fibroelastic septa and reach the *anal intermuscular interstice* which is the gateway to the perianum and the ischio-rectal fossa. Parks^{17, 18} wrote that these racemose glands of widely ramifying ducts spread downward most commonly and

terminate blindly in the submucosa. He did not observe spread above the level of the crypts. In his studies, he found that in two-thirds of the specimens, one or more branches entered the internal sphincter, and in half, the branches crossed the sphincter completely to terminate in the longitudinal layer. He found that these glands are distributed equally around the anal circumference and all open into crypts.

In Figure 1, two superimposed deep anal glands are shown, opening into a crypt, extending upward and downward, respectively, in the intermuscular space. The main concentration of large crypts is situated posteriorly. Next in order is the anterior commissure and, laterally, the crypts are least developed. In 1964,⁹ I asserted that often the initiating factor in abscess formation is an acute infective accompanying diarrhea, which forces liquid feces into the main duct of an intermuscular gland and causes obstructive suppurative adenitis. Not uncommonly, a superficial infected gland, revealed by a discharge from a crypt, is encountered in routine examinations. Our Negro population is prone to infective diarrhea and, in them, there is a correspondingly high incidence of abscess and fistula.²

In the deep and less common proximally directed simple tubular gland, infective liquid feces is less likely to be forced upward, and this accounts for the relative infrequency of the high intermuscular abscess, compared to the frequent low intermuscular abscess (Fig. 2). It is thus agreed that the acute infection of the deep-seated anal gland, through its connecting crypt, in the closed-off intermuscular space is the cause of both the abscess and its fistula. The superficial anal glands do not cause lesions of surgical significance.

The theory of the cryptoglandular origin of the primary anorectal fistulous abscess is supported by the fact that never is the internal orifice of a primary fistula found

anywhere other than at the crypt entrance in the pectinate line, at approximately the midlevel of the anal canal.

Classification

Primary Anorectal Fistulous Abscess:

The term *fistulous abscess* is used because the acute stage represents the abscess and the chronic stage represents the fistula and the two terms are inseparable. The former is the parent of the latter, which develops after evacuation of the cavity of the abscess by spontaneous rupture or surgical drainage. Resolution then proceeds and finally a residual chronic granulomatous fistulous tract remains. In over half the fistulas, only an external sinus is apparent. The internal opening cannot always be discovered; it may actually be closed. Less often the internal orifice of the crypt alone is patent, and even less frequently both orifices may be patent. In longstanding cases, multiple external sinuses may exist.

The primary anorectal fistulous abscess may be caused by a mixed pyogenic infection, predominating *Bacillus coli proteus*, staphylococcus and streptococcus, intestinal anaerobes, and occasionally a fulminating *Clostridium welchii* gas-forming infection of the ischiorectal fossa. It is a nonspecific primary group, in contrast to the group caused by specific lesions such as tuberculosis, actinomycosis, Crohn's disease, carcinoma, trauma, foreign bodies, and other secondary disorders of pelvic or pararectal origin (Fig. 3).

With some important changes herein described, I prefer my original simplified classification, reported in 1956,⁶ which divides the primary anorectal abscess into three main groups: internal, external, and combined—the surgical management of which is parallel. In Figure 3, a composite diagram is represented of the acute abscess, and superimposed by exit arrows is shown the chronic or fistulous stage of the disease, which has the corresponding designation of its original parent abscess.

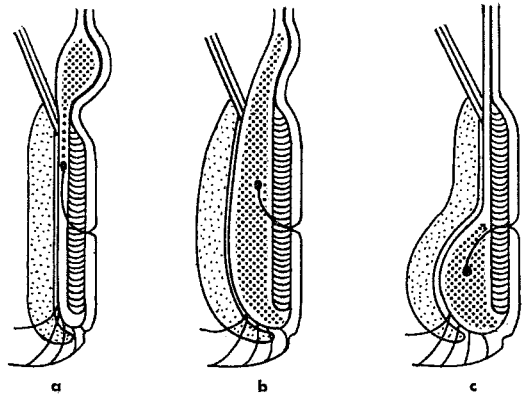


FIG. 2a. Intermuscular fistulous abscess. Early high classical acute anorectal intermuscular fistulous abscess. *b.* Fully-developed acute high abscess pointing subcutaneously. *c.* Acute low intermuscular fistulous abscess.

Internal Group:

1. The high intermuscular abscess. When this type of abscess occurs anteriorly in women, it has been termed the anovulval high intermuscular fistulous abscess.⁸
2. The low intermuscular abscess. Generally, this type is a direct lesion, the course of the abscess passing to the outlet of the intermuscular space at the anal margin or perianum, in a straight line.
3. The submucous abscess; the mucocutaneous marginal abscess.

The high and low intermuscular abscesses arise from corresponding cryptoglandular unit infection. The submucous abscess may be caused by hemorrhoidal injection or infected hematoma. The mucocutaneous or marginal abscess may be caused by infected hematoma or infection of a superficial anal gland. The latter two lesions are superficial, involve corresponding anatomic spaces, and generally become resolved spontaneously.

External Group:

1. The acute ischiorectal abscess. This is a primary lesion caused by lymphatic or blood-borne infection arising in the loose, fatty tissue of the roof or highest part of the fossa. Occasionally a fulminating anaerobic gas-forming infection occurs.
2. The subcutaneous or perianal abscess is due to local tegumentary disease.

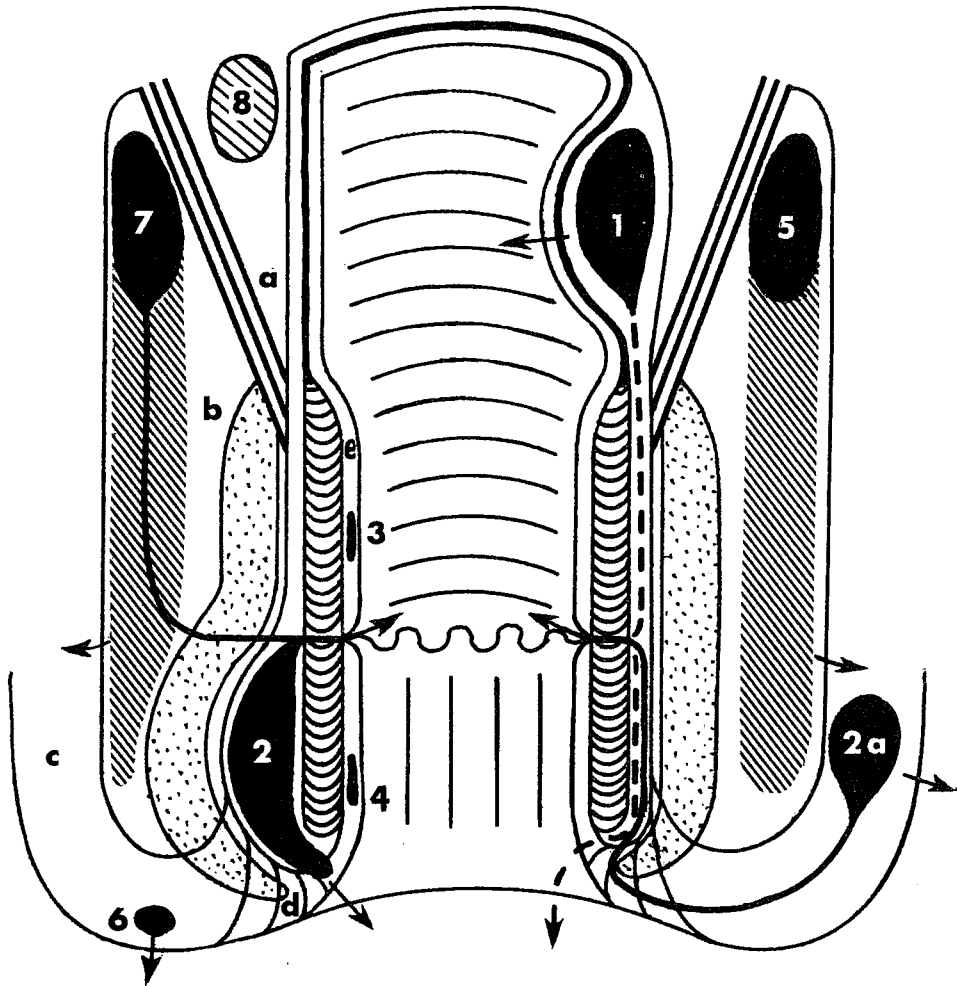


FIG. 3. Composite diagram of acute anorectal fistulous abscess; superimposed arrows indicate chronic fistula stage. *a.* Pelvirectal or supralevator space. *b.* Ischio-rectal space. *c.* Perianal or subcutaneous space. *d.* Marginal or mucocutaneous space. *e.* Submucous space. 1. High intermuscular fistulous abscess. 2. Low intermuscular fistulous abscess. 2*a.* Low intermuscular subcutaneous ischio-rectal fistulous abscess. 3. Submucous abscess. 4. Mucocutaneous or marginal abscess. 5. Ischio-rectal, primary fistulous abscess. 6. Subcutaneous or perianal abscess. 7. Cryptoglandular ischio-rectal fistulous abscess. 8. Pelvirectal abscess.

Interno-external Group (Combined):

1. The indirect or irregular types of low intermuscular fistulous abscess consist of:
 - a. The low intermuscular subcutaneous ischio-rectal fistulous abscess. This abscess is caused by a posterior cryptoglandular infection. It curves outward at its point of emergence from the intermuscular space to the subcutaneous floor of the middle or posterior third of the ischio-rectal fossa. At a subsequent exacerbation, it may spread from a postcentral crypt to the opposite side as a superficial horseshoe fistula.

- b. The anosrotal low intermuscular fistulous abscess. This type may arise from an anterior cryptoglandular infection and spread upward in the subcutaneous tissues close to the perineal raphe and finally, after repeated spreading abscesses, it may involve the scrotum.
- c. The long-tract anteroposterior low intermuscular fistulous abscess. This abscess arises from a midposterior cryptoglandular infection and the abscess, on its emergence posterolaterally from the intermuscular space, curves forward in the marginal space and erupts anteriorly in the perianum (Fig. 4).

2. The cryptoglandular ischioirectal fistulous abscess. This type arises from infection of a cryptoglandular unit that spreads directly outward into the deep aspect of the ischioirectal fossa. It is caused by an aberrant anal gland,¹⁵ or cryptoglandular infection, extending along the fibroelastic fibers traversing the external sphincter;¹⁶ or it is caused by infection spreading outward from the anal intermuscular interstices.¹⁹ By observations made during surgical operations, it has been established conclusively that this type of abscess always arises from a crypt in the pectinate line and spreads directly through the anal wall. When the infection is subacute, it leads to a localized deep ischioirectal fistulous abscess, but when it is virulent or fulminating, it spreads rapidly as a diffuse infection. The most common lesion is the localized posterior cryptoglandular ischioirectal fistulous abscess. The anterior counterpart occurs more rarely.

The diffuse, virulent, rapidly spreading ischioirectal abscess may best be described as the anterior unilateral type and the posterior bilateral ischioirectal fistulous abscess or classical posterior horseshoe lesion. Thus, the localized and diffuse lesions are originally identical, but differ because of the degree of virulence of the infection.

In general, the ratio of fistulous abscess in men, to that of women, is about 6:1, and is owing to the greater strength of the anal sphincter muscles in the former and the resultant greater degree of pressure during defecation.

The frequency of occurrence of the various types of fistulous abscess expressed in percentages is as follows: high intermuscular, 8.0; high intermuscular anovulval, 0.5; low intermuscular, 82.0; submucous, rare; mucocutaneous, 1.0; low intermuscular subcutaneous ischioirectal, 2.0; low intermuscular long-tract anteroposterior, 0.5; low intermuscular anoscrotal, 1.0; cryptoglandular ischioirectal, 3.0; ischioirectal, 1.0 and subcutaneous or perianal, 1.0.

More than 90% of the total lesions are of infective cryptoglandular intermuscular origin. The posterior crypts are responsible for the majority of the infections.

Diagnosis

Acute Anorectal Fistulous Abscess: The general symptoms consist of malaise and

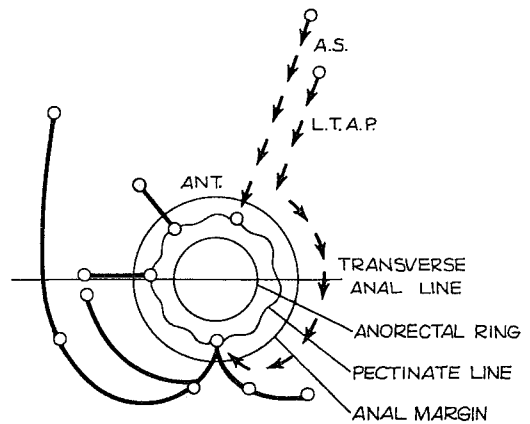


FIG. 4. Diagram illustrating Goodsall's rule. Superimposed arrowed tracts represent: (1) anoscrotal (A.S.) intermuscular fistulous abscess; (2) long-tract anteroposterior (L.T.A.P.) fistulous abscess.

pyrexia, and those that are localized are pain of persisting and increasing severity that finally becomes throbbing in nature. Swelling and tenderness are the two important clinical signs. At the commencement of the examination, the physician should always ask the patient to identify, with the tip of the index finger, the point of maximum pain and tenderness. This will help in determining the site of origin. When the lesion is early, external palpation is performed next to ascertain the area of induration which is unlike the late lesion in which inflammation is obvious. In the classical acute high abscess, nothing may be seen externally, but can be discovered immediately by internal digital examination.

The Internal Group of Abscesses: *The High Intermuscular Abscess:* In the early stage it may be a well-defined internal lesion with no external signs. Usually, digital rectal examination will reveal a localized, rounded, tender, fluctuant swelling above the anorectal ring or levator shelf, occurring more commonly in the posterior quadrant. The corresponding anterior abscess is less definite, owing to the absence of the levator shelf. In the later stages, if the abscess has not ruptured above

or through a crypt, it proceeds downward through the intermuscular space and presents at the anal margin. In the advanced stage, the rounded, distinct mass above the levator shelf may be somewhat obscured, and the abscess may merge into a generalized brawny induration which is palpable bidigitally and may mimic a deep postanal abscess. How does this high abscess differ from a deep ischio-rectal lesion? Actually it is an internal anorectal abscess which may be palpable inside the canal. On the other hand, the ischio-rectal fossa abscess is an extrarectal lesion and is palpable only internally through the rectal wall, perirectal tissue and levator muscle. It is more easily detected by bidigital palpation. The intermuscular abscess causes distinct spasm of the internal sphincter muscle in its upper part where suppuration is deep to it. A primary ischio-rectal fossa abscess never causes internal sphincter spasm (Fig. 3).

In women, the *anovulval high anterior intermuscular abscess* lies to the side of the rectovaginal septum and bulges anteriorly into the deep aspect of the lower part of the labia majora above the anorectal ring. It is easily palpable bidigitally between the rectum and vagina and may be confused with a primary vulval abscess.

The *low intermuscular abscess* arises from a crypt at the dentate line, passes down the lower half of the intermuscular space to the anal margin, and accounts for more than 80% of the total. Bidigitally, it is palpable between the distal part of the anal canal internally and the perianal tissues externally. There is edema of the overlying mucosa and the internal sphincter is spastic. In all intrarectal digital palpation, one should always compare the affected with the unaffected side. Proctoscopic examination may reveal that pus leaks from the crypt, and, not infrequently, instrumentation may cause the abscess to rupture through the involved crypt.

Submucous and *mucocutaneous* or *marginal abscesses* are clearly local lesions.

The External Group of Abscesses: Generally, the primary true *acute ischio-rectal abscess* develops in the central roof part of the fossa of a slow infection. A fulminating type, due to anaerobes, also occurs. In the late stages of pregnancy, the infection may be virulent and may spread rapidly, especially anteriorly, deep to the vulva. The entire perianal region of that side may be involved and the abscess may point in the center of the fossa. Ischio-rectal roof space induration may be revealed by internal palpation indirectly through the rectal wall, perirectal tissues, and the levator ani muscle above the anorectal ring, especially when comparison is made with the contralateral normal side.

The *subcutaneous* or *perianal abscess* is purely a tegumentary lesion and exhibits these signs.

Interno-External Group of Abscesses: The *low intermuscular subcutaneous ischio-rectal abscess* arises as a low posterior intermuscular abscess that curves outward and points in the subcutaneous floor of the middle or posterior third of the ischio-rectal fossa. If of postcentral cryptal origin, bilateral involvement may occur with a superficial *horseshoe* effect. The inflammatory mass is a superficial subcutaneous lesion of the ischio-rectal fossa which curves inward to its point of origin from the posterior intermuscular space, where irritative spasm of the internal sphincter muscle extends to the crypt of origin, and may reveal a discharge of pus. The roof of the ischio-rectal fossa, palpable internally above the anorectal ring, is normal.

The *anoscrotal abscess* is an anterior low intermuscular lesion that spreads upward in the subcutaneous tissues close to the perineal raphe and finally, after repeated abscesses, involves the scrotum. The original abscess is subacute and the cryptoglandular intermuscular origin may be difficult to discover.

The *long-tract anteroposterior intermuscular fistulous abscess* is a rare lesion

that arises in a posterior cryptoglandular infection; the abscess curves outward from the intermuscular space, forward in the marginal space at the anal margin, and erupts anterolaterally in the perianum. Careful internal bidigital palpation will reveal that the induration passes backward. Sphincter spasm occurs posteriorly, and possibly there is an enlarged crypt discharging pus.

The *cryptoglandular ischiorectal fistulous abscess* represents the deep space infection of the ischiorectal fossa proper, and occurs in two forms: the localized, subacute abscess and the diffuse, acute, rapidly-spreading abscess.

The *localized* subacute ischiorectal abscess generally occurs posteriorly, and the corresponding anterior deep apical ischio-rectal abscess occurs more rarely. The posterolateral abscess pushes the anal canal forward. It is easily distinguishable from its internal, common low intermuscular counterpart by being palpable internally from above the anorectal ring, through the rectal wall, perirectal tissue and the levator ani, and below, through the tissue situated behind the anal canal. The crypt of origin may discharge pus on manipulation.

The anterior abscess is similar, with the exception of its different anatomic site.

The *diffuse* acute cryptoglandular ischio-rectal abscess is a rapidly-spreading lesion, with associated gas-forming organisms. Usually it occurs posteriorly. It spreads rapidly anteriorly on the side of its origin and to a lesser degree through the posterior sub-sphincteric space of Courtney,³ or the deep postanal space of Gorsch,¹¹ to the opposite fossa. The superficial inflammation tends to involve the complete perianum, being maximal at the site of its cryptoglandular origin, and the patient indicates that this is the most tender and painful area. Internal digital examination above the anorectal ring reveals the extent of the bilateral deep ischio-rectal involvement. The crypt

of origin discharges gas and pus on manipulation.

The acute diffuse anterior cryptoglandular abscess is confined to its own side and can only spread posteriorly to involve the whole fossa. The maximum degree of tenderness and inflammation occurs anteriorly at the site of origin where the crypt may discharge gas and pus.

Chronic Anorectal Fistulous Abscess or Fistula: The fistula is the chronic stage of the corresponding parent abscess after it has ruptured either internally or externally or formed the so-called blind internal or blind external sinus. Only rarely does it rupture both internally and externally. While the sinus is patent, there is a discharge. Periodically there may be an exacerbation. When no surgery has been performed, the fistula, with rare exceptions, does not change its character. The internal source of origin is constant and this applies also to the general pattern of the lesion. With the passage of time the fistulous tract becomes more definite and cordlike. In more than 50% of cases, the internal crypt of origin is nonpatent and the external sinus alone is present.

In the acute primary fistulous abscess, we are dealing with a well-defined and constant pathologic entity, with a set and predetermined pattern. The fistula that follows is also of that type, but when faulty surgery is performed, new planes of infection are opened up and there follows the complicated or complex type of fistula. Henry Thompson,²⁰ in discussing the orthodox concept of anal fistulas, divided them into two groups: 1) complex or difficult to deal with, 5%; and 2) simple or easy to deal with, 95%.

It is not difficult to distinguish the simple from the complex fistula. The tract of the former can be palpated as a thick fibrous cord, extending from the external sinus toward the crypt through which, usually, a blunt probe can be passed from externally toward the crypt internally, and occasion-

ally through the patent opening. In the complicated type of fistula, no tract may be palpated subcutaneously and the probe may pass, parallel to the long axis of the anal canal, upward for a distance of 6 to 8 cm. to the roof of the ischio-rectal fossa. On outward pressure, digital rectal examination usually reveals, above the anorectal ring, a definite chronic induration of the roof or apex of the fossa compared with the soft tissues of the opposite side.

Complicated anorectal fistulas develop as a result of ineffectual, often multiple, surgical procedures performed to cure simple primary fistulous abscesses, and there follows a disruption of nature's anatomic barriers, allowing the infective process to spread abnormally and develop such complications as high-level internal openings and secondary high ischio-rectal fossa involvement.

To the complicated fistulas also belong variants such as those caused by trauma, foreign bodies, tuberculosis, Crohn's disease, actinomycosis, carcinoma and other secondary lesions of pelvic or pararectal origin.

In the intermuscular group of fistulas, which represents more than 90% of the total, the constant source of infection is the involved anal gland site in the intermuscular space at the midlevel of the anal canal with its connecting crypt, which generally is nonpatent. This chronic infection of the deep surface of the internal sphincter causes the hard, *boardlike* change in the normally soft elastic internal sphincter. This is a most important pathognomonic internal localizing sign. Another less conspicuous phenomenon is that the crypt of origin of the intermuscular fistula is retracted into a funnel by the pull of the fibrous chronic granulomatous tract leading deep to the internal sphincter. The author⁹ terms this the *funnel or herniation sign* of the involved crypt.

Probing a tract must always be done with a featherlike touch, otherwise false

channels may be made which, grossly, complicate the issue. For the purpose of examining the internal opening, simple blunt crypt hooks of half-circle or angulated type are best. For external probing, shortened urethral catheters or small urethral bougies are suitable. A set of lachrymal probes and standard round or blunt fistula probes are also helpful.

The Internal Group of Fistulas: The *high intermuscular fistula* may be of two types. When the abscess ruptures superiorly above the anorectal ring, there is a serous or purulent discharge, and the patient complains of discomfort or pain. Digital examination may reveal an area of chronic inflammation in the affected area above the levator ledge and chronic spasm of the upper part of the corresponding internal sphincter muscle. The high opening may be palpable or visible as a granuloma. On proctoscopic examination, the sinus opening and possibly the crypt of origin may be discovered.

When the high abscess has passed distally down the whole length of the intermuscular space and ruptured externally, the diagnosis can be made readily.

The *low common intermuscular fistula* with its direct external sinus is diagnosed easily. The probe, by way of the external sinus, may traverse the internal crypt or stop deep within it. Its crypt of origin and the rigid internal sphincter are clearly palpable.

The External Group of Fistulas: The external sinus of the *primary ischio-rectal fistula* appears in the central part of the fossa. A probe can be passed vertically upward parallel to the anorectal long axis for a distance of 6 to 8 cm. Digital internal examination reveals chronic induration of the roof of the fossa above the levator shelf, adjacent to the lateral wall of the rectum. This can be confirmed by examining the opposite side. No signs of cryptoglandular involvement exist. If dye injection is utilized, it is better done at operation.

The *subcutaneous* or *perianal* lesion exhibits the signs of tegumentary disease.

The Interno-External Group of Fistulas:

The *low intermuscular subcutaneous ischio-rectal fistula* reveals clearly, by probing and palpation, its postcentral origin; a typical retracted crypt and a rigid adjacent internal sphincter are apparent. The subcutaneous ischio-rectal tract is always palpable.

The *anoscrotal intermuscular fistula* has an external sinus close to the perineal raphe and, in the later stages, when the fistulous tract becomes cordlike and easily palpable, the sinus is situated at the base of the scrotum. During the first 6 months, the external part of the lesion is indistinct and evidence of the intermuscular site of origin is lacking, with the exception of a watery mucoid discharge which may emerge from the crypt of origin.

The *long-tract anteroposterior fistula*, with its anterolateral external sinus, suggests the presence of a direct anterior low intermuscular fistula. Probing with a soft catheter or bougie may establish the diagnosis, but careful bidigital palpation will define a tract curving backward to a point of posterior origin where muscle rigidity and herniation of an involved crypt will be discovered.

The *cryptoglandular ischio-rectal fistula* represents the interno-external group of deep involvement of the ischio-rectal fossa proper. The posterior fistula is the most common, and it results from the corresponding localized posterior fistulous abscess. The anterior fistula is more rare and its external sinus is situated in the perianum in contrast to the direct intermuscular fistula in which the sinus is generally situated close to the anal verge. Internal digital examination reveals chronic inflammation posteriorly, behind the anal canal above the anorectal ring. The involved crypt should be palpable and from it there may be a discharge. The external sinus passes vertically upward for 6 to 8 cm. parallel to the long axis of the anal canal.

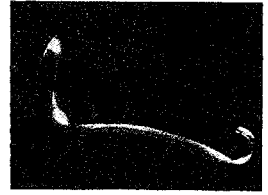


FIG. 5. Sims speculum.

Dye injection should reveal the crypt connection.

The fistula resulting from an acute diffuse anterior cryptoglandular abscess is characterized by chronic inflammatory involvement of the entire fossa of one side. An anterior external sinus, as well as a patent anterior crypt of origin, is always present, and there may be other external sinuses. Other fistula signs, characteristic of the localized type are present.

The acute diffuse posterior cryptoglandular fistulous abscess, which involves the other fossa through the posterior communicating space of Courtney,³ may, in extreme cases, extend to both anterior apices deep to its transverse perineal muscles and the triangular ligament. The chronic ensuing fistula represents the classical deep posterior horseshoe fistula. The posterior crypt of origin is always present. External sinuses, situated chiefly posteriorly, are present on both sides. Probing and internal digital palpation will reveal the full extent of the involvement.

Surgical Management

The Acute Anorectal Fistulous Abscess: The frequent *direct low intermuscular abscess* may be treated satisfactorily, utilizing local anesthesia, in a well-equipped outpatient clinic. The best exposure may be obtained by using a large single-ended true-angled Sims speculum (Fig. 5). If the crypt of origin is leaking pus, or ruptures during manipulation, a blunt hook should be passed distally by way of the crypt, deep to the internal sphincter muscle, through the center of the abscess. Next, an incision is made down upon the hook dividing the lower half of the internal sphincter and

exposing the main cavity of the abscess. The incision is then carried outward to just beyond the distal edge of the cavity. The subcutaneous fibers of the external sphincter may sometimes be divided to provide better drainage. If the incision happens to be eccentric, it may be justifiable to divide transversely the internal sphincter on the side of the undermined abscess. The standard operation actually consists of a partial internal anal sphincterotomy.

When the crypt does not discharge or rupture during instrumentation, it is preferable to perform the operation in reverse. With a large Sims speculum, fully exposing the anal canal, the abscess is incised externally over its center. A short, blunt, flat, curved artery forceps is then gently passed upward through the center of the abscess, deep to the internal sphincter, until its point rests beneath the cryptal area of origin, which automatically reveals itself. The points of the forceps are now opened and the internal sphincter is divided between them and through the defined crypt. Ligation to control bleeding is rarely required. As a general principle, it is advisable to divide adjacent prominent crypts over a hook into the wound. Overhanging hemorrhoids should be undercut or excised.

The *high intermuscular fistulous abscess* can be best exposed by utilizing a large, single-ended Sims speculum. When the abscess is localized above the anorectal ring, it can be exposed by dividing the internal sphincter muscle from the cryptal area, corresponding to the center of the abscess above, and continuing the incision superiorly into the circular muscle of the rectum. Firstly, the mucosa in the line of the incision is divided between crushing forceps or between ligatures or by applying diathermy to control bleeding.

When the high abscess appears at the anal margin, it is laid open by commencing the incision externally, performing a complete linear internal anal sphincterotomy

and extending the incision into the circular muscle of the rectum to obtain full exposure of the abscess. Care should be exercised to make the incision over the center of the abscess.

The *high intermuscular anovulval abscess* is treated by observing the same principles.

Submucous and *marginal abscess* tends to become resolved spontaneously.

A *primary ischioirectal abscess* is laid open and drained by an incision commencing anteriorly and curving backward over the center of the fossa to its posterior border, where it is straightened out and carried away from the coccyx (Fig. 6a). The medial wall of the wound may be in a better position if, at its center, a right-angled incision is carried to the anal verge, and sometimes actually through the anal wall to a crypt if the abscess appears to extend to this area. This would strongly suggest cryptoglandular origin of these abscesses.

When an acute ischioirectal abscess is encountered in a patient in a late stage of pregnancy where the anterior involvement, deep to the vulva is maximal, it is prudent to drain the main body of the abscess only. A deep incision, carried anteriorly toward the vulva, may lead to uncontrollable hemorrhage.

The *low intermuscular subcutaneous ischioirectal abscess* is managed according to the principles outlined previously, laying it open from the external abscess, through the intermuscular space to the crypt of origin or vice versa.

The *anoscrotal low intermuscular abscess* requires great care to lay it open to its correct site of origin. If the crypt is patent or discharging serum or pus, the problem is not difficult, and the operation can be performed from within. Infection of the intermuscular space is minimal and will probably consist only of an enlarged colloid-appearing anal gland.

The *long anteroposterior intermuscular*

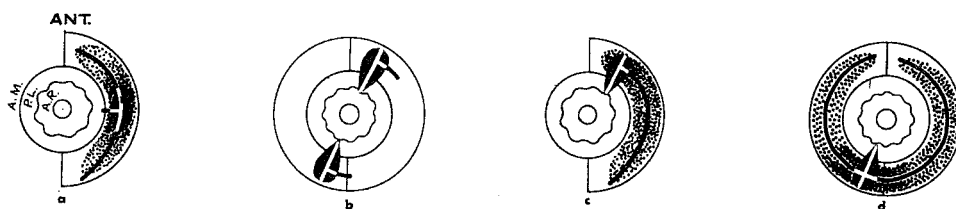


FIG. 6. Ischioirectal fossa fistulous abscesses (transverse sections). *a.* Acute primary ischioirectal fistulous abscess with operative incisions. A.M. = anal margin; P.L. = pectinate line; A.R. = anorectal ring. *b.* Anterior and posterior localized cryptoglandular ischioirectal fistulous abscess with operative incisions. *c.* Anterior diffuse cryptoglandular ischioirectal fistulous abscess with operative incisions. *d.* Posterior diffuse ischioirectal fistulous abscess (posterior horseshoe lesion) with operative incisions.

acute abscess follows the general principle of laying it open from its external limit through the intermuscular space to its crypt entrance. The wound edges may gape excessively and may have to be tacked down by interrupted sutures.

The *cryptoglandular ischioirectal fistulous abscess* presents itself in the subacute localized or acute diffuse form. The localized posterior or anterior abscess should be laid open from its internal discharging crypt, which may rupture if the largest Sims speculum is used and pressure is applied from without on the abscess. A crypt hook should be manipulated through the crypt into the center of the abscess, a linear incision is carried outward and the full thickness of the outer portion of the anal canal over the center of the abscess is divided into the ischioirectal fossa. In the case of an anterior abscess, a transverse incision is also extended posteriorly (Fig. 6*b*).

The acute diffuse cryptoglandular ischioirectal abscess, of the anterior or unilateral type, is laid open by dividing its area of origin as in the localized lesion. The remainder of the fossa is drained by carrying the incision posteriorly from the original exposure (Fig. 6*c*).

The posterior diffuse abscess spreads to the opposite fossa by way of the posterior communicating space. Its area of origin is laid open from its crypt outward through the whole thickness of the anal wall, as in the localized abscess. Full drainage is ob-

tained by making incisions bilaterally and carrying them forward. Additional incisions may be required to complete the exposure (Fig. 6*d*).

If it is absolutely necessary for a patient to continue working, it is justifiable to merely drain the acute fistulous abscess, through a small incision, with the patient under the influence of local anesthesia, in the office and leave the cure of the ensuing fistula for a later date. Also, if the surgeon is puzzled by an acute abscess, he is justified in making an incision at the site of pointing, with the patient under the influence of local anesthesia, and allow the developing fistula to help clarify the diagnosis. A primary, nonspecific, acute abscess, if left alone, disallowing administration of antibiotic agents, which only retard and prolong progress, will always erupt at a correct natural point (if hot baths and heat are employed) and need never cause anxiety. Only the virulent, rapidly-spreading, deep infection of the ischioirectal fossa demands immediate surgical treatment.

The Abscess Cavity and Postoperative Treatment

At first, the abscess cavity should be curetted lightly. This is followed by careful cauterization with copper sulfate, to which method the author attaches great importance. In this manner necrotic, granulomatous and residual anal gland tissue is removed and, at an early stage, this provides clean, healthy wounds. The entire

cavity should be filled with copper sulfate crystals of finger-tip size. Then gauze is placed over the crystals and steady digital pressure is made for 5 minutes. This chars the entire surface, which becomes a greenish-black color. Sulfadiazine powder, with 0.5% acriflavine, is next insufflated carefully into the wound, after which it is filled with vaseline gauze. A soft latex tube, about 8 mm. in diameter, with openings cut in the side, is next inserted intrarectally to provide for escape of gas and to facilitate dressings. A massive dose of long-acting penicillin is administered post-operatively, and a 3-week course of a long-acting sulfa compound is prescribed. In virulent infections of the ischio-rectal fossa, additional injections of penicillin and streptomycin compound are administered twice daily for 5 days. In these massive infections, varidase, oral, tablets may be given for the first 3 days to accelerate clearing of the inflammation and removal of necrotic material. The soft latex tube is removed on the third night after operation, when an aperient is given. Baths and full ambulation are now permitted.

The patient with a simple low intermuscular abscess, which is treated in the office with the patient under the influence of local lignocaine infiltration anesthesia, is allowed to go home immediately, where he cares for himself according to instructions, and reports back in a fortnight. Hospitalized patients generally leave the hospital on the fifth day. Patients with large wounds of the ischio-rectal type are taught how to syringe the wound with a rubber bulb and vulcanite nozzle while lying in the Sims position. They use a detergent antiseptic solution and apply gauze soaked in acriflavine emulsion twice a day. This plan is followed for 3 to 4 weeks when healing has become far advanced. Early ambulation is stressed as a means of promoting rapid healing. Sphincter exercises are prescribed for 6 months after healing is com-

pleted. Scrupulous hygiene, utilizing the bidet douche after defecation, is required.

The Chronic Anorectal Fistulous Abscess or Fistula: The *low intermuscular fistula*, the offspring of the corresponding acute abscess, accounts for over 80% of fistulas. At operation, exposure is obtained by using a large Sims speculum. A blunt probe is passed from the external sinus through the entire tract into the anal canal and through its internal crypt opening; or, if the opening is not patent, the point is inserted deeply into the crypt of origin or may actually be forced through it.

Cure can be effected by laying the tract open from the crypt to the external sinus. The source of the fistula and the reason for its persistence is the crypt, plus the deep infection of the anal gland lying in the intermuscular space. It can be exposed by a partial internal anal sphincterotomy with continuance of the incision through the remaining portion of the fistulous tract to its external sinus. The dark-brick brown granulation tissue lining the tract is curetted away throughout its entire length to the divided crypt. By excising the fibrous walls of the tract, healing is accelerated. If it is old and cordlike, an incision is made from the internal orifice and is continued over the tract, to encircle and free the external sinus. By grasping the cordlike tract with strong forceps and putting it on the stretch, it can be dissected easily up to its internal orifice. The last intermuscular portion is cored out and excised with its crypt of origin. Parks¹⁷ states that cure of fistulas is effected by removal of the *infecting source*, the infected anal gland and the surrounding *intersphincteric abscess of origin* which lies deep to the internal sphincter, in the midportion of the anal canal, and he concludes that its extirpation, which is the crucial factor for cure, is performed by making an oval excision of the mucosa, the internal sphincter, the intermuscular tissue, and the cryptoglandular unit with its surrounding abscess. This he

terms a *partial internal sphincterectomy* of the abscess-bearing muscle and he therefore claims that the author's (S.E.) partial internal sphincterotomy will cure only a proportion of the fistulas. Furthermore, he says there will certainly be a recurrence if the intersphincteric abscess, lined by anal gland epithelium, is not thoroughly excised.

The fistula does not persist because of the abscessed anal gland but, owing to the simple fact that once chronic infected material is established in the deep intermuscular dead space, connected with the anal canal by a patent or permeable crypt, it will maintain the fistula in an active state. Chronic lesions have a fibrous granular tube connecting the crypt with the external sinus with complete loss of identity of the anal gland of origin. True chronic primary ischio-rectal fistulas possess identical structure and no gland or intersphincteric abscess exists. The anal gland with its crypt is the original source of infection but, beyond that, it is of little importance. A cure is effected by laying the area open by a partial internal anal sphincterotomy, extending to and including the involved crypt. By curetting, excision, or cauterization with copper sulfate, the infected material, including residual glandular epithelium, is destroyed. If further ducts or small cystic or colloid gland areas persist, they are marsupialized and thus will cause no further trouble. If infected material were injected into the intermuscular space through a crypt, a simulated fistulous abscess would result. The simple surgical approach, outlined previously, gives a rate of cure of 100%. The Parks procedure is highly individualistic and only serves to complicate a very simple surgical operation.

The *high intermuscular fistula* varies with the character of the acute abscess.

If it ruptures superiorly into the rectum above the anorectal ring, cure can be effected by laying open the area, from the cryptal area of origin, through the upper half of the internal sphincter and into the

chronic abscess situated above, including its related granulomatous sinus. To avoid bleeding, the mucosal incision should be performed by diathermy.

If the fistula is draining through its crypt of origin, the operation can be performed in the same manner.

When the high abscess takes a downward course and erupts externally, the tract should be laid open by a total internal sphincterotomy. The lower half of the internal sphincter may be conserved if the external tract, including the cryptal area, can be cored out and the remainder of the fistula can be laid open from the pectinate line upward, according to the method described.

The *interno-external cryptoglandular* indirect varieties of the low intermuscular fistulas are the *subcutaneous ischio-rectal*, the *anoscrotal* and the *long-tract antero-posterior* types. They are managed according to the standard principle except that the external wound is closed to the anal margin with interrupted sutures. When the fibrous tract is cordlike, it may be treated by dissecting it out externally and coring out the intermuscular part, including its crypt of origin. This may appear to be an attractive procedure, but saving the lower half of the internal sphincter is relatively unimportant.

The English authors such as Goligher,¹⁰ Graham-Stewart,¹² and Watts, Bennett and Goligher²² have attributed unwarranted importance to the functional disturbance caused by partial internal anal sphincterotomy in the management of anal fissure. They made no selection of cases and no mention was made of detailed postoperative care to offset ordinary problems.

With the exception of the extent of localized and diffuse types of *cryptoglandular ischio-rectal fistula*, surgical management is basically the same. The posterior type of localized fistulas is the most common variety of this group. It has an external sinus in the corresponding area of the

ischioanal fossa. A probe can be passed through the fistula vertically upward and external to the anal canal for a distance of about 6 cm. to the roof of the ischioanal fossa. A hook, inserted through the patent internal crypt, may be made to touch the probe inserted through the external sinus. If in doubt, injection of a dye may reveal the internal sinus. Laying open the fistulous tract is commenced externally and carried to the roof of the involved part of the fossa. The probe, inserted through the crypt of origin, can be passed directly through the entire wall of the anal canal into the apical area of chronic granulomatous infection. Granulation tissue should be curetted carefully. The fibrous walls of the fistula should be excised next, including the entrance tract with its crypt of origin. If there is sufficient sphincter above, an immediate incision of the full thickness of the lower half of the anal wall, through the crypt entrance into the main wound, is performed.

When muscular competence is in doubt, a seton may be introduced and removed by incision 14 days later.

The internal cryptal orifice of the excised transmuscular sinus may be closed with fine suture material and left to drain into a plastic recess in an ischioanal fossa—a technic to be described under “plastic saucerization of the ischioanal fossa.”

Surgery of the *diffuse anterior ischioanal fistula* is performed along the same lines as surgery of its anterior localized counterpart, with the exception that the procedure of laying open should extend posteriorly as in the case of the acute diffuse abscess and, in addition, it will require partial plastic saucerization.

The *posterior bilateral cryptoglandular ischioanal fistula* or *posterior horseshoe fistula* requires a partial plastic ischioanal saucerization operation. Division of the anococcygeal ligament may be required, and the cryptoglandular transmuscular

origin should be managed as outlined previously.

Parks¹⁷ described his method of conserving the external sphincter when the tract passes transversely through the anal wall. It consists of removing the source of the infection by partial internal sphincterectomy, and he claimed that the secondary tract, extending through the external sphincter into the perianum, will automatically heal if freely drained and curetted. In the case of the low intermuscular fistula, this method will prove successful, but it requires several weeks of hospitalization for the purpose of making needed revision. The standard technic is simpler and cures the condition immediately, but this method is not applicable in cryptoglandular ischioanal fistulas because there is no intermuscular or intersphincteric abscess.

The infective process of the primary ischioanal fistula commences and persists in the deepest part or roof of the fossa. This site of origin can be exposed by a long, curved incision, running from the front to the back over the center of the fossa. The fistulous tract is exposed to its apex, after which careful curettage and excision of the fibrous walls is performed. The possibility of an anorectal connection should be kept in mind, and injection of dye may be made at the commencement of the operation. The principle in this connection is to *gutter* the roof of the fossa backward by undercutting the two flaps by wedge excision of fatty tissue to provide for suture of the skin to the depths of the wound. If the middle of the medial flap is incised transversely into the lateral side of the anal verge, it is helpful when fashioning the skin flaps of a partial plastic saucerization.

Complicated Fistulas

Often, complicated fistulas are caused by faulty surgical procedures performed on simple primary nonspecific fistulous abscesses. The remainder are due to the spe-

cific type of fistula, trauma and foreign bodies when there is always an associated high involvement of the ischio-rectal fossae.

In the case of the neglected and severely infected processes, one side of the ischio-rectal fossa may appear as hard as a rocky mass with multiple sinuses. Internal palpation reveals a rigid and markedly indurated anorectal wall on that side, extending above to the roof of the ischio-rectal fossa. This advanced infective process may involve both fossae, the anal canal and surrounding tissues, and all may appear as one *frozen* mass. This is not uncommon in our Negro population, which has a high incidence of anorectal disease. Several infected crypts may open into the mass. There is a strong suggestion that the origin of this type of fistula may be tuberculous, and is later replaced by an intense fibrotic reaction accompanying a mixed infection only. The coccyx may be involved, especially if tuberculosis is present.

Plastic Saucerization (Marsupialization) of the Ischio-rectal Fossa

The technic of this operation has been evolved for treatment of the complicated fistula. The general principle is based on the fact that the anorectum is completely surrounded by the two ischio-rectal fossae, communicating posteriorly through the space of Courtney, which harbor and maintain the infective processes arising from within or without the anal canal. The fistula can be cured or rendered inert by removing the *infectable tissue* of the fossa and exteriorizing the space and marsupializing skin margins on the medial and lateral surfaces up to the roof and apex of the empty fossa. When there is an insufficient amount of skin, a free split-skin graft may be applied a week later. If a high supralevator fistulous opening remains, it now leads to the skin surface of the exteriorized roof, and is thus marsupialized and causes little further trouble. It may even close over entirely.

This method is applicable to all fistulas

involving the deep aspect of the ischio-rectal fossa. The degree of excision of the fossa depends on the magnitude of involvement. How to deal with the actual opening in the anorectal wall has been discussed previously.

When there is gross total involvement of the ischio-rectal fossa, bold and radical surgery is required to remove the rocky, hard, fixed mass. A long, curved incision, over the center of the mass from front to back, provides the best exposure and good skin flaps. The excision must be continued until the entire fossa is cleared, from the lateral rigid pelvic wall to the anorectal wall, medially. All involved crypts should be freely opened. The fibrotic and infected muscular walls of the roof may require excision until clean infraperitoneal fat of the pelvirectal space appears. Bleeding may be troublesome and Alcock's canal may be entered. If there is bilateral involvement, the tip of the coccyx, if diseased, will require removal, and this includes division of the anococcygeal ligament. This causes the rectum to retract upward, and it requires suturing to maintain the new position. Attachment of the anterior anorectal sphincter muscle to the perineal body must always be preserved.

At times, although there is an excessive degree of deformity after this type of operation, the function is surprisingly good, especially when it is considered that in the bilateral excision, the inferior hemorrhoidal nerves are completely divided and control becomes practically autonomic. Having undergone this experience, patients are extremely grateful and are able to lead a full and active life.

Postoperative Management of Fistula-in-Ano

Postoperative management of the fistula follows the same lines as those laid down for treatment of the abscess. Operations for simple fistulas often are performed in the office with the patient under the influence of local anesthesia. Early ambulation, bathing and vaseline dressings are sufficient.

Generally, hospitalized patients are discharged on the fifth day, when they are instructed regarding self care. Patients suffering with more complicated fistulas require longer periods of hospitalization. Before leaving the hospital, they are instructed how to syringe out the wounds twice a day, with a standard, large, rubber bulb and a vulcanite nozzle, using an antiseptic detergent solution. Also, they are instructed how to apply gauze acriflavine emulsion dressings, twice daily, until the wound is ready for vaseline dressings. Long-acting sulfa compounds are also useful.

Conclusion

Etiology, pathology and surgical management, herein discussed, are based on information gained from a study of the records of over 500 patients, nearly all of whom were private, and in whom a careful follow-up study was available.

The modern approach herein outlined reverses the deeply ingrained teaching of the management of large wounds with wide skin and tissue sacrifice required to assure the wound will heal from within outward. Maximum conservatism in the sacrifice of skin is stressed throughout the presentation. Cure is accomplished by the linear or curvilinear incision utilized to provide exposure. In the cryptoglandular intermuscular group of fistulous abscesses, most of the surgical procedure is performed within the ano-rectum and healing proceeds from without inward.

Deep infections of the ischio-rectal fossae are managed effectively by a conservative plastic procedure.

Thirty per cent of the total cases were selected for ambulatory surgery, the operations being performed with the patients under the influence of local infiltration anesthesia.

Acknowledgment

I am deeply grateful to Dr. Louis A. Buie, Sr., for his painstaking editing and most helpful revision of this paper.

References

1. Bremer, J. L.: Textbook of Histology. Ed. 4, Philadelphia, The Blakiston Company, 1930, p. 289.
2. Bremner, C. G.: Anorectal disease in the South African Bantu. *South African J. Surg.* 2: 147, 1964.
3. Courtney, H.: The posterior subsphincteric space: Its relation to posterior horseshoe fistula. *Surg., Gynec. & Obst.* 89: 222, 1949.
4. Eisenhammer, S.: The internal anal sphincter: Its surgical importance. *South African M. J.* 27: 266, 1953.
5. Eisenhammer, S.: Advance of anorectal surgery with special reference to ambulatory treatment. *South African M. J.* 28: 264, 1954.
6. Eisenhammer, S.: The internal anal sphincter and the anorectal abscess. *Surg., Gynec. & Obst.* 103: 501, 1956.
7. Eisenhammer, S.: A new approach to the anorectal fistulous abscess based on the high intermuscular lesion. *Surg., Gynec. & Obst.* 106: 595, 1958.
8. Eisenhammer, S.: The anoscrotal and anovulval fistulous abscess. *Surg., Gynec. & Obst.* 113: 519, 1961.
9. Eisenhammer, S.: Long-tract anteroposterior intermuscular fistula. *Dis. Colon & Rectum.* 7: 438, 1964.
10. Goligher, J. C.: Results of internal sphincterotomy for anal fissure. *Brit. M. J.* 1: 1500, 1962.
11. Gorsch, R. V.: Proctologic Anatomy. Baltimore, The Williams & Wilkins Company, pp. 190; 195.
12. Graham-Stewart, C. W.: The etiology and treatment of fissure-in-ano. *Surg., Gynec. & Obst.* 115: 511, 1962.
13. Herrmann, G. and L. Defosses: Sur la muqueuse de la region cloacale du rectum. *Acad. Sc.* 90: 1301, 1880.
14. Hill, M. R., E. H. Shryock, and F. G. ReBell: Role of the anal glands in the pathogenesis of anorectal disease. *J.A.M.A.* 121: 742, 1943.
15. Lockhart-Mummery, J. P.: Discussion of fistula-in-ano. *Proc. Roy. Soc. Med.* 22: 1331, 1929.
16. Morgan, C. N. and H. R. Thompson: Surgical anatomy of the anal canal with special reference to the surgical importance of the internal sphincter and conjoint longitudinal muscle. *Ann. Roy. Coll. Surgeons, England.* 19: 88, 1956.
17. Parks, A. G.: Pathogenesis and treatment of fistula-in-ano. *Brit. M. J.* 1: 462, 1961.
18. Parks, A. G.: Etiology and surgical treatment of fistula-in-ano. *Dis. Colon & Rectum.* 6: 17, 1963.
19. Shropshire, G.: The surgical anatomy of the anorectal sphincter mechanism and its clinical significance. *J. Internat. Coll. Surgeons.* 33: 267, 1960.
20. Thompson, H.: The orthodox conception of fistula-in-ano and its treatment. *Proc. Roy. Soc. Med.* 55: 754, 1962.
21. Tucker, C. C. and C. A. Hellwig: Histopathology of the anal crypts. *Surg., Gynec. & Obst.* 58: 145, 1934.
22. Watts, J. McK., R. C. Bennett, and J. C. Goligher: Stretching of anal sphincters in treatment of fissure-in-ano. *Brit. M. J.* 1: 342, 1964.