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The Surgical Anatomy and Disorders of the Perianal Space

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THE perianal space is situated at the termination of the anal canal. Morphologically it represents part of the proctodæum. Clinically it is the area where painful lesions of the lower bowel occur. To understand and treat these maladies an accurate knowledge of its anatomy and physiology is needed.

Contents of the space.—The space contains the subcutaneous part of the sphincter ani externus muscle, the external hæmorrhoidal venous plexus, and fat. It is enclosed by sensitive skin and prolongations of the longitudinal muscle of the bowel (fig. 1).

The subcutaneous sphincter ani externus muscle.—This is the sole encircling muscle of the terminal part of the anal canal (fig. 2). It is a separate and distinct portion of the tripartite external sphincter ani muscle. The other two parts encircle the upper part of the anal canal surrounding the longitudinal and circular muscles of the rectum. The subcutaneous external sphincter ani muscle is separated from its fellows and the rectal musculature above by the intermuscular septum, a termination of the longitudinal muscle.

On its inner surface it is covered by the skin of the anal canal, on its lower aspect by the skin of the anus. Intervening between the muscle and these skin coverings is the corrugator cutis ani muscle and the external hæmorrhoidal venous plexus. On the outer side it is in contact with the perianal fat. The muscle is palpable throughout its whole extent. When in spasm it stands out conspicuously (fig. 3).

It is supplied by the inferior hæmorrhoidal nerves which cross the posterior half of the perianal space on each side. They are mixed nerves and mainly motor, but they also convey the sensory impressions from the skin coverings of the space. The muscle is under both voluntary and involuntary control. Its main function is to prevent by contraction foreign bodies from entering the rectum. It is seen to go into painful contraction in lesions involving the coverings and contents of the space. The most striking example is fissure-in-ano.

In defæcation it should dilate. Apart from this it has no active or indispensable part in defæcation. In the human being it can be cut in any way without ill-effect upon defæcation or continence. Continence depends on the rest of the anal musculature.

Clinical facts.—The subcutaneous sphincter ani externus is the structural cause of fissure-in-ano. If there were no subcutaneous sphincter there would be no fissure. Fissure does not recur when the muscle has been cut, so this operation is followed by permanent cure. For the proper functioning of the muscle it should relax and dilate to allow the solid formed stool to pass through. It needs the daily dilatation of solid fæces to keep it dilatable. Should this mechanism fail through the habitual use of a daily aperient, especially of the saline type, then the accidental passage of a hard stool pushes the undilated muscle in front of it, stretches the delicate skin of the anal canal and causes a breach. Proctocain or other anæsthetic solutions paralyse and relax the muscle if injected into both sides of the perianal space and so around the inferior hæmorrhoidal nerves.

The circular fibres of the subcutaneous external sphincter ani are exposed where the fissure penetrates through the fibres of the corrugator cutis ani muscle (fig. 13*c*).

The main tracts of fistulæ following infection of the perianal fat enter the anal canal usually above (the low anal fistulæ) but sometimes below the muscle (the subcutaneous fistulæ) in the proportion of three low anal to one subcutaneous (fig. 14B).

It will be seen later on that the muscle can be cut with advantage in fissure, in perianal abscess and in both anal and ano-rectal fistulæ.

The skin of the anal canal and skin of the anus.—The inner and lower aspect of the perianal space is covered by two varieties of skin. The lower ½ in. of the anal canal is transitional skin. The skin of the anus is true skin with sebaceous, sweat glands and hairs. The two types of skin can be identified by their appearance (fig. 4). If the skin of the anal canal appears at the verge or margin of the anus it is evidence of early prolapse of the pile (fig. 12 III).

The outstanding clinical characteristic of this lining is its *sensitivity*. It is the sentinel that guards the rectum and it is most sensitive to painful stimuli. Its sensitivity is the reason why lesions of the perianal space and its contents provide most of the painful lesions in proctology. The mucous linings of the anal canal and rectum lying above are not sensitive to painful stimuli, and so lend themselves to painless, submucous sclerosing injections. Stimulation of the skin causes reflex contracture and closure of the external sphincter ani especially the subcutaneous part. Lesions of the skin such as fissure or hæmatoma of the external hæmorrhoidal venous plexus cause spasm of the underlying muscle which in turn increases the pain of the causal lesion. There is some evidence that the corrugator cutis ani contributes to the exquisite pain of perianal hæmatoma.

It may be useful to point out that the normal skin lining is not sensitive to digital examination by the lubricated finger or instrument, providing there is no lesion of the perianal space. The patient draws away or holds himself tightly because the inserted finger causes the defæcation reflex and the patient becomes embarrassed. He should be assured that defæcation cannot occur.

There are two methods of examining the skin of the anal canal to demonstrate its concealed lesions, viz. digital and instrumental. The lining can be seen as it is everted by digital traction on the skin of the anus, while the patient helps by straining down. Tubular, slotted or duck-billed specula will demonstrate the normal lining or the presence of a tiny hæmatoma, fissure, polyp or sinus. If the lesion is painful a perianal anæsthetic is necessary to prevent suffering.

Redundancy of the skin over a large distensible hæmorrhoidal venus plexus at the site of the three hæmorrhoids is often seen. In these cases there need be no hesitation in removing enough skin in the skin cut of hæmorrhoidectomy to get flat wounds to insure satisfactory healing by second intention.

Healing of the skin of the anus after operation is sure and satisfactory. Large areas of perianal skin can be removed, as in removal of skin tags and in the treatment of ano-rectal fistulæ (fig. 5). It is wise never to remove the full circle of skin. Indeed it is never necessary. Stricture would follow and, at the sensitive skin level it is difficult to treat.

Unlike stricture of the mucosa it is inelastic and painful to dilate. In removal of hæmorrhoids, intact skin bridges or bars of at least ¼ in. wide should be left between the three skin cuts to insure healing (fig. 6).

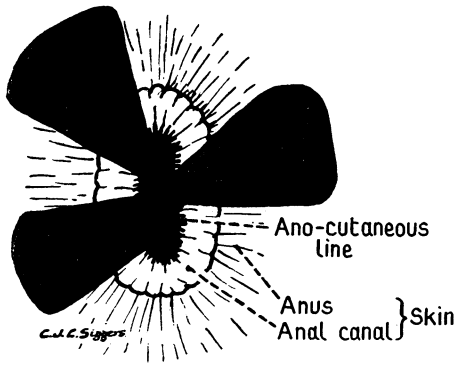

Fig. 6.—Black areas represent the trimmed skin cuts after removal of the three primary hæmorrhoids. Light areas—the intact skin bridges.

Of Nature's three methods of healing that of second intention can be accepted with confidence for the skin of anus and anal canal. Neatly trimmed flat wounds will always heal. First intention is uncertain and succeeds in but a few cases so it should be abandoned for this area. Evidence of failure of the method of third intention is seen in the unhealed fistulæ which all call for treatment by the method of second intention.

Healing of wounds of the skin of the anal canal is slow compared to the healing of the skin of the anus. W. B. Gabriel has recognized this fact in planning his operation for fissure. A large area of the quickly healing skin of the anus is removed to prevent its healing before the smaller bare area of the skin of the anal canal heals (Gabriel, 1937). It is a curious fact that this transitional skin between mucosal lining and true skin should be so reluctant and hesitant to heal.

The skin of the anus is the site of pruritus ani in all its manifestations. It is here that the pleasure and relief by scratching turns into the pain of smarting and burning. The injection of novocain and proctocain into the perianal space causes anæsthesia of the skin and for a time stops itching sensations. The skin now untraumatized by scratching can return to normal, especially if bathed and treated. It is rarely that Ball's operation of cutting the nerve supply to the perianal skin by dissecting it from the underlying space is now done. Although 255 cases of pruritus ani attended St. Mark's Hospital from 1938 to 1941, only one case was operated on by this method. Patient persistence in the remedial measures described ultimately gives relief.

I have made no mention of the crypts of Morgagni which are lined by the skin of the anal canal. Maybe others can throw light on "cryptitis" which receives much attention in American practice and literature. In certain suspected cases of cryptitis, I have had the crypts examined but found no microscopical evidence of inflammation. The columns of Morgagni belong to the anal mucosa.

Fissure-in-ano.—This is a painful vertical abrasion of the skin of the anal canal or of the skin of the anus, so it might be named *fissure-at-anus* as well as *fissure-in-ano*. It is a stubborn fact of clinical experience that healing is uncertain. Indeed months may pass and healing be absent or unsound. The vertical slit varies greatly in length and depth. It may be but an eighth of an inch in length and situated in the anal canal just below the mucocutaneous junction. Here it is difficult to see on account of pain and spasm demanding a perianal anæsthetic injection for exposure. The fissure rarely extends upwards beyond the mucocutaneous junction which is the region of the attachment of the longitudinal muscle and so the submucous space is rarely opened. More commonly the ulcer extends downwards to the skin of the anus when it may be half an inch long and easily seen by gently separating the anal verge. It now has the tell-tale sentinel pile.

The depth of the ulcer varies. In some only the skin is broken and the radiating fibres of the sensitive corrugator cutis ani muscle are visible. In others the ulcer penetrates

the corrugator muscle, exposes the venous plexus or even the circular fibres of the subcutaneous sphincter ani externus (fig. 13). The perianal space has now been opened and subcutaneous abscess or fistula can occur. These anatomical and pathological facts may give us valuable data for prognosis and treatment. To relate them is a profitable field for further clinical research.

It is the practice to treat uncomplicated fissure first with perianal injections of proctocain. If this does not give relief or if there are subsequent recurrences, then operation, which gives permanent relief, should be undertaken. The patient willingly co-operates in measures which will prevent a recurrence of such dread pain. Recurrences are likely to occur if the inherited or acquired anatomical abnormality of the part is associated with perverted bowel function. Division of the subcutaneous external sphincter ani and enlargement of the skin wound is the radical cure. We may now fairly claim to know both the cause and cure of fissure.

The longitudinal muscle.—Whereas the circular muscle of the rectum ends simply and abruptly at the lower third of the anal canal in a well-defined margin, the longitudinal muscle ends in a more complicated way. It attaches the rectum to surrounding structures and ends in four fibromuscular expansions, viz.: The septum of the ischiorectal fossa; the intermuscular septum; the corrugator cutis ani muscle; the recto-urethralis muscle (fig. 7). The first three surround the perianal space except at its outer aspect. They influence diseases in this area.

(1) *The septum of the ischiorectal fossa* extends outwards from the lower part of the longitudinal muscle across each ischiorectal fossa dividing it into an *ischiorectal space* above and the *perianal space* below.

The thickness, strength and extent of this fibromuscular fascia vary in different subjects. Its presence is easier to demonstrate than its extent and connexions. It contains varying amounts of muscle fibre, seen in microscopical sections cut by Dr. Cuthbert Dukes. This septum must be stabbed with the knife if the finger is to be inserted easily to the top of the ischiorectal fossa to expose the levator ani muscle or the puborectalis muscle. This is a step in the operation to expose the prostate from the perineum. The septum prevents infection which starts in the perianal space from spreading upwards. It also confines for a time the deep and difficult ischiorectal abscess. Surface signs of inflammation only become apparent when the septum is penetrated and the perianal space involved.

(2) *Intermuscular septum.*—This extends transversely inwards from the lower end of the longitudinal muscle between the lower border of the circular muscle of the bowel, or as it is here called the internal sphincter ani which lies above, and the subcutaneous external sphincter ani muscle which lies below. It is attached to the mucocutaneous junction of the lining of the anal canal. It divides the internal from the external hæmorrhoidal plexus. With the septum of the ischiorectal fossa, the intermuscular septum forms the upper boundary of the perianal space and, when intact, prevents the spread of infection from the perianal space into the submucous space above. The septum is the main tethering force which holds the hæmorrhoid in its place (Milligan *et al.*, 1937). Failure to perform this function is seen in third degree hæmorrhoids (figs. 8, 8a, and 8b). The groove between the internal and external hæmorroid is then lost. A stretched, absent or inefficient septum becomes the indication for operative removal of the prolapsed hæmorrhoid for no amount of submucous reattachment of the pedicle of the internal pile by submucous injections can replace the work of this fibromuscular septum.

(3) *Corrugator cutis ani muscle.*—This muscle is attached to and closely underlies the skin of the anal canal and skin of the anus. It is a prolongation downwards and outwards of the intermuscular septum in a radiating sheet. With the skin it covers the lower aspect of the perianal space. The muscle itself is very thin but can always be identified by its attachment to the skin, for traction on its exposed or cut surface pulls on the skin. Identification and complete division of the corrugator muscle indicate that the proper depth has been reached in the skin cut in hæmorrhoidectomy and that a clean dissection of the external hæmorrhoidal venous plexus off the exposed subcutaneous external sphincter can then proceed (fig. 9). It is a sensitive muscle and in perianal injections of anæsthetics the patient should be warned when the needle traverses the muscle. It should be infiltrated with anæsthetic solution when there is to be a skin cut under local anæsthetic. With the skin it prevents in most cases the natural release of the painful blood clot in perianal hæmatoma. Infections under this muscle cause fistulæ whereas abscesses under the skin alone usually discharge and heal.

The muscle is exposed in fissure and its radiating fibres seen or it may be penetrated by the fissure (fig. 13).

(4) The fourth extension of the longitudinal muscle of the rectum is the *recto-urethralis muscle.* This so-called muscle is however not related to the perianal space. It is an attachment of the longitudinal muscle closely and firmly to the triangular ligament, to the urethra, and to the apex of the prostate. It lies in the mid-line between the lower borders of the puborectalis muscle and only becomes apparent as the dissected anterior surface of the rectum is retracted backwards.

The external hæmorrhoidal venous plexus.—Although often circular in outward appearance the external hæmorrhoidal venous plexus is arranged in segments or compartments and corresponds to the three primary piles of which it may be looked upon as a termination. Like other structures in this region it may be large in size or but poorly developed (fig. 10). Its outer border is well defined encircling the anus. Its upper or inner border is at the intermuscular septum inside the anal canal. Here at the mucocutaneous junction it joins the internal hæmorrhoidal venous plexus. The outer and inner borders indicate the landmarks and limits for the skin cut in the operation of hæmorrhoidectomy (fig. 11).

The plexus is collapsed and flat at rest but during straining as at every morning stool it becomes distended and stretches the overlying skin which then becomes redundant (fig. 12). Patients are sometimes alarmed at the size of a harmless distended plexus. By exerting a pull on the tethering intermuscular septum and corrugator cutis ani muscle the distended external hæmorrhoidal plexus becomes a causative factor in the prolapse of hæmorrhoids.

In large long-standing piles the external hæmorrhoids corresponding to the three primary piles appear at rest as separate tags or "bags" of skin which greatly distend when straining occurs. If thrombosis in these occur, then fibrous tissue replaces the circulating blood and permanent fibrous tags remain.

Perianal hæmatoma, the five-day painful self-curing lesion of the plexus, is situated as a rule deep to the corrugator cutis ani muscle, but the protruding globular isolated spontaneous variety are superficial, and for their excision the corrugator muscle is not cut. Intra-anal hæmatomata under the skin of the anal canal can be painful and uncomfortable as well as concealed in the tightly closed anal canal.

Patients are more terrified of a recurrence of a painful thrombosed external hæmorrhoid than the daily prolapse of internal piles. It is happily unusual for this complication to be repeated. In many cases it only occurs once in a lifetime. One would have expected that injection and thrombosis of the vessels in the corresponding internal hæmorrhoid would stop distension of the external hæmorrhoid with blood and so prevent thrombosis. I have not found this so in practice.

The external hæmorrhoid receives a variable vascular supply through the perianal space from vessels in the ischiorectal fossa. The extent of this supply is seen in the number of arteries cut and requiring ligature in the skin cuts for removing piles. Whereas in many cases there are no bleeding arteries, in occasional cases as many as nine spurting arteries require ligation in each skin wound. The post-operative hæmorrhage which sometimes occurs in hæmorrhoidectomy after the patient returns to bed is usually from one of these arteries in the skin cut. It can be easily seen and ligated. It is unusual at this stage for bleeding to occur from within the anal canal because of a slipped pedicle ligature. Bleeding, if it does occur, is noticed on the operating table.

Fat in the perianal space.—The perianal space contains smaller and more compact particles of fat than that in the ischiorectal space which is large and loose (fig. 7). The perianal fat is continuous outwards with the superficial fascia of the surrounding buttocks. The space is the most common site of infections in this region. Inflammation always ends in the easily recognizable perianal abscess.

The spread to the anal canal is usually at the intermuscular septum, and the probe in the abscess cavity will be felt for under the anal lining at this point even if it has not made an internal opening. When the probe is felt under the lining it is best to cut the subcutaneous external sphincter ani. Infection in this space also spreads by direct extension round the space but on rare occasions it extends outwards into the superficial fascia of the buttock (fig. 17). It never spreads deeply into the ischiorectal space above. The most extensive outward spread presents a very simple surgical problem for no anatomical difficulties are encountered in the incisions to make a flat wound necessary for healing.

Fistula-in-ano.—In a previous paper (Milligan and Morgan, 1934) fistulæ were classified into two main types: those with the main tract extending above the ano-rectal ring.

the *ano-rectal fistulæ,* and those with the main tract below the ano-rectal ring, the *anal fistulæ.* Of these latter there were *high anal* and *low anal fistulæ* depending on the relation of the main tract to the intermuscular septum.

The fistulæ which involve the perianal space are the low anal and the subcutaneous; fortunately for simple diagnosis, for easy surgical treatment, and for rapid healing they are the most common, viz. 76·2% (fig. 14).

Fistulæ in the perianal space usually reach the anal canal above the subcutaneous external sphincter at the intermuscular septum. It is to this palpable landmark, viz. the intermuscular septum, that the point of the probe following the main tract of the fistula in search of the internal opening can confidently be directed (fig. 15).

To produce a flat wound which will heal by second intention it is necessary to cut the subcutaneous external sphincter ani.

Ano-rectal fistulæ.—The long time required for healing of the deep wounds following the extensive operation on these fistulæ tries the patience of both surgeon and patient. It has been noticed that healing is hastened when together with the ano-rectal main tract there is an opening into the anal canal necessitating division of the anal muscles below the ano-rectal ring. The longest delay in healing appears to be when there is no opening into the anal canal and no pathological reason to cut anal muscles. We have found it aids the healing of the deep wounds left after the present surgical treatment of ano-rectal fistulæ if the subcutaneous sphincter is deliberately cut. The perianal space in that area is as it were abolished, and a more shallow wound produced (fig. 16).

Injection of local anæsthetics into the perianal space (fig. 18).—For pruritus ani, for fissure-in-ano, for hæmorrhoidectomy this has become a valuable procedure. The injection acts as a nerve block as well as a local anæsthetic. If the solution fills the perianal space it bathes the inferior hæmorrhoidal nerves which cross the space from the outer wall. The injection needle can traverse the space on each side of the anus through a single anæsthetized skin puncture about ½ in. behind the anus. The needle pierces the corrugator cutis ani muscle on each side as it enters the space. The patient only feels the prick in the skin and the two pricks through the corrugator. He should be warned that he will feel no further pain. If a watery solution of procaine precedes the anæsthetic in oil the total pain is small. If the solution is injected superficial to the corrugator muscle, swelling under the skin occurs. It is unwise to inject the oily solution in this plane; necrosis of the skin has occurred as a result.

Though infection after injection is a rare event, yet if the solution is confined to the perianal space and not injected into the ischiorectal space, infection, if it should occur, could be easily dealt with surgically.

(Figs. 6, 7, 8, 8b, 9 and 11 are reproduced by permission of the *Lancet.*)

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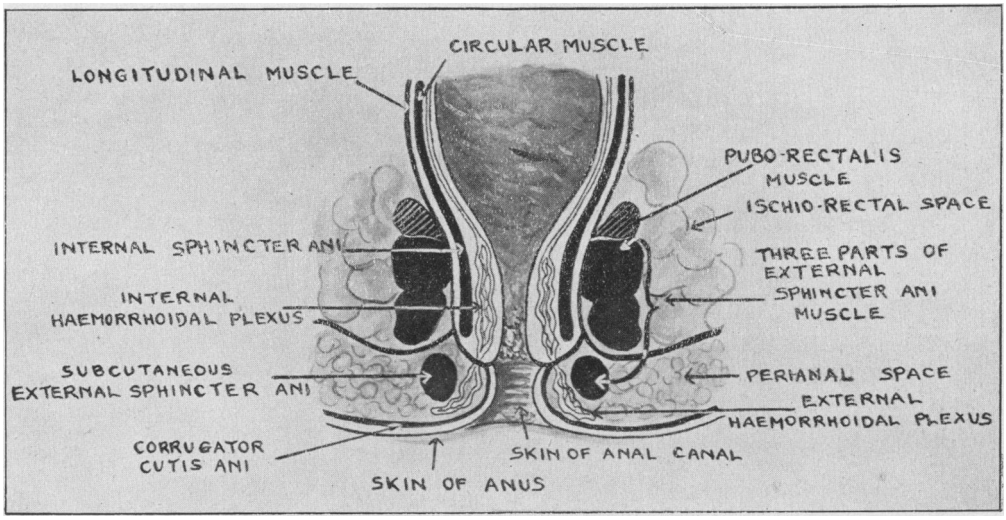

FIG. 1.—Diagrammatic coronal section of anal canal to show relations of perianal space.

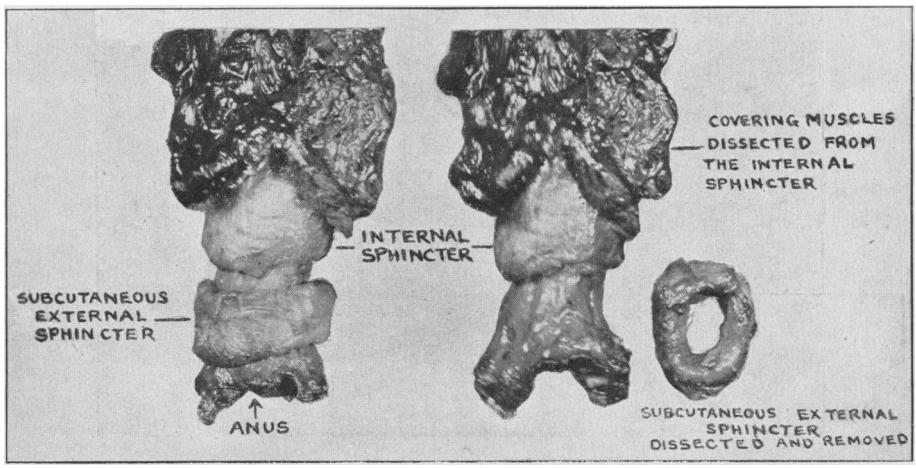

FIG. 2.—Photographs of dissected rectum showing internal sphincter and subcutaneous external sphincter ani muscle.

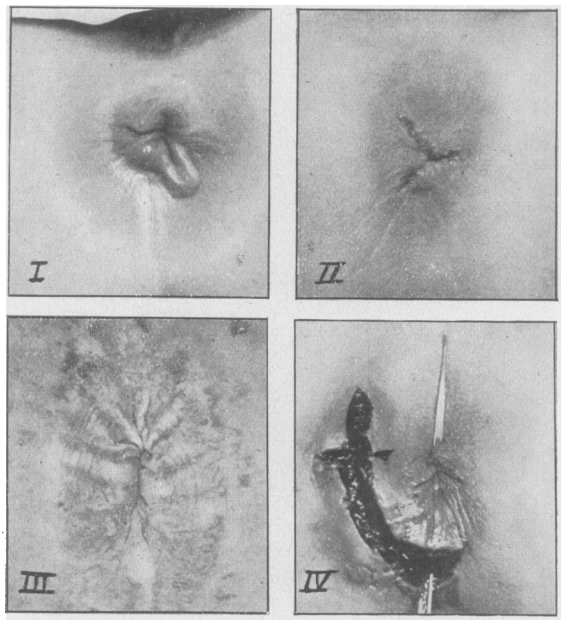

FIG. 3.—Contrast photographs to show the contracted and conspicuous subcutaneous external sphincter in fissure-in-ano. I. Fissure-in-ano. II. Untrimmed cuts in hæmorrhoidectomy. III. Pruritus ani. IV. Low anal fistula.

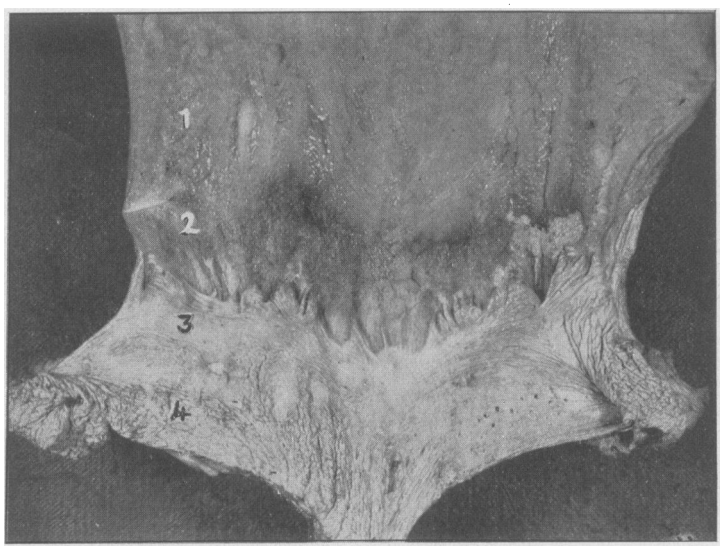

FIG. 4.—Anal canal and rectum opened from behind. The four linings are shown. 1. Rectal mucosa. 2. Anal mucosa. 3. Skin of anal canal. 4. Skin of anus.

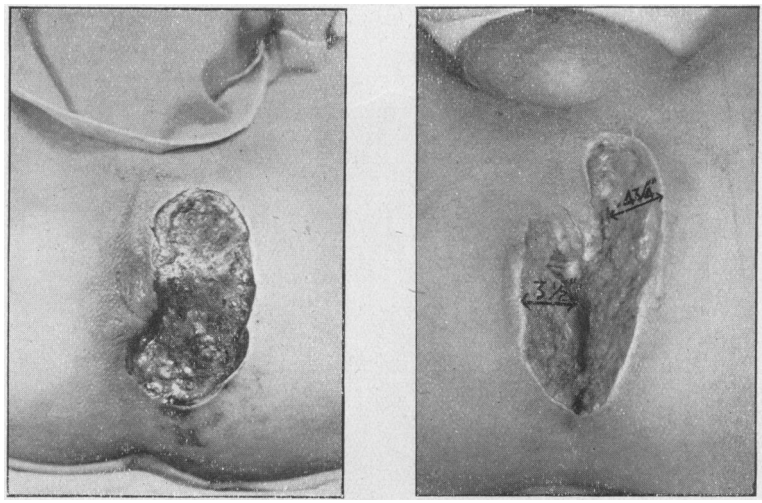

FIG. 5.—Anal and ano-rectal fistulæ wounds after operation, showing the large area of skin of anus and anal canal that can be safely removed. About one quarter of skin of anus is here left intact.

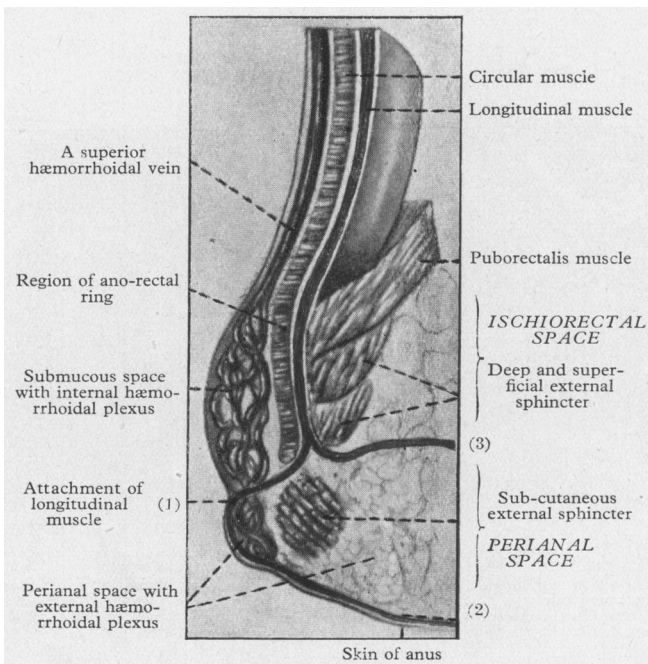

FIG. 7.—Showing the terminations of the longitudinal muscle (in red): (1) Intermuscular septum. (2) Corrugator cutis ani muscle. (3) Septum of the ischiorectal fossa. Recto-urethralis not shown.

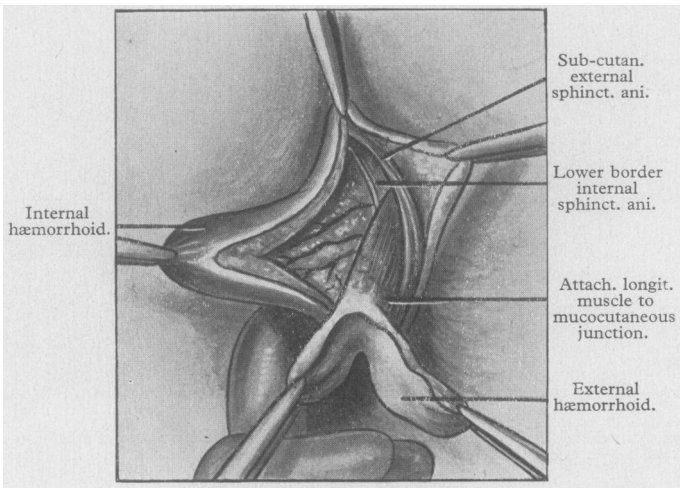

FIG. 8.—Dissection to show attachment of longitudinal muscle to the middle of the pile.

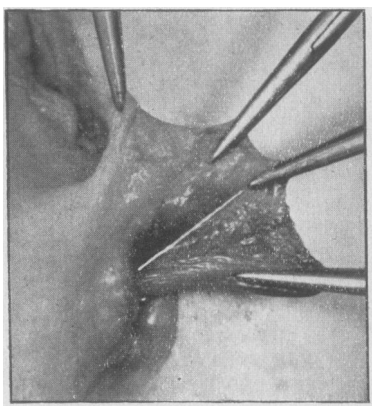

FIG. 8a.

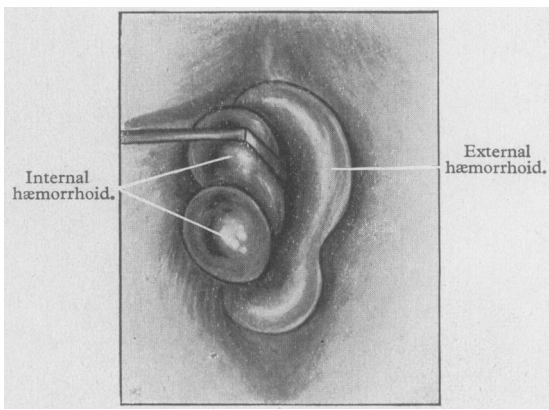

FIG. 8b.

FIG. 8a.—A prolapsed anterior pile, with stretched longitudinal muscle diagrammatically indicated, compared with a prolapsed thrombosed pile (fig. 8b).
FIG. 8b.—Prolapsed thrombosed intero-external left lateral hæmorrhoid. Note the presence of deep groove between external and internal hæmorrhoid where the longitudinal muscle is still effective.

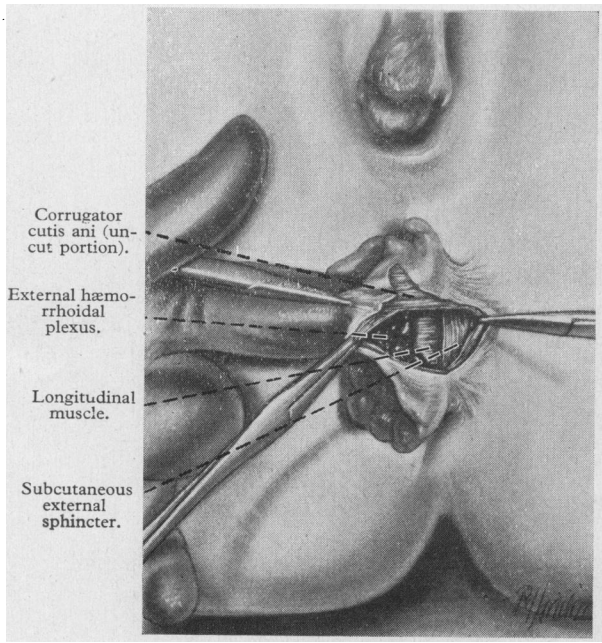

FIG. 9.—The cut corrugator muscle, showing the right depth for dissection of the external hæmorrhoid.

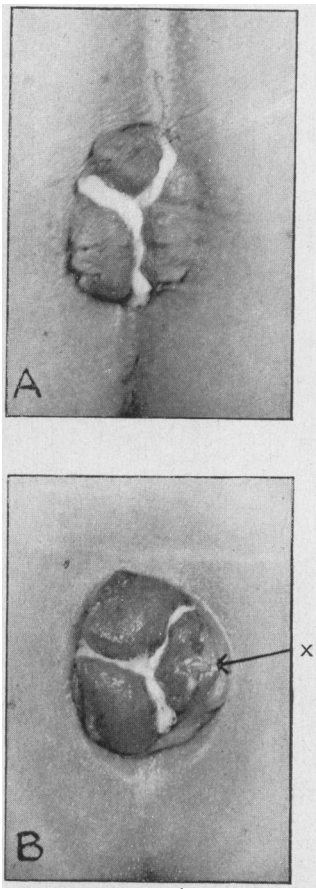

FIG. 10.—Photographs to show the variability of external hæmorrhoidal plexus. (A) Three distended external hæmorrhoids. (B) Three prolapsed internal hæmorrhoids. (X) Note undeveloped external hæmorrhoids.

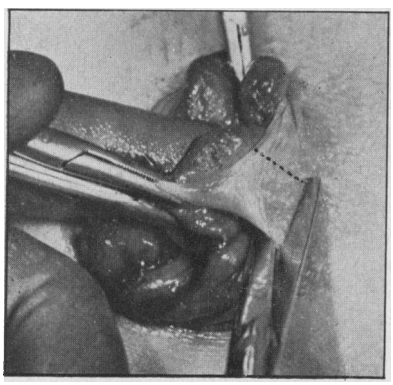

FIG. 11.—Skin cut in hæmorrhoidectomy. From upper to outer border of external hæmorrhoidal plexus.

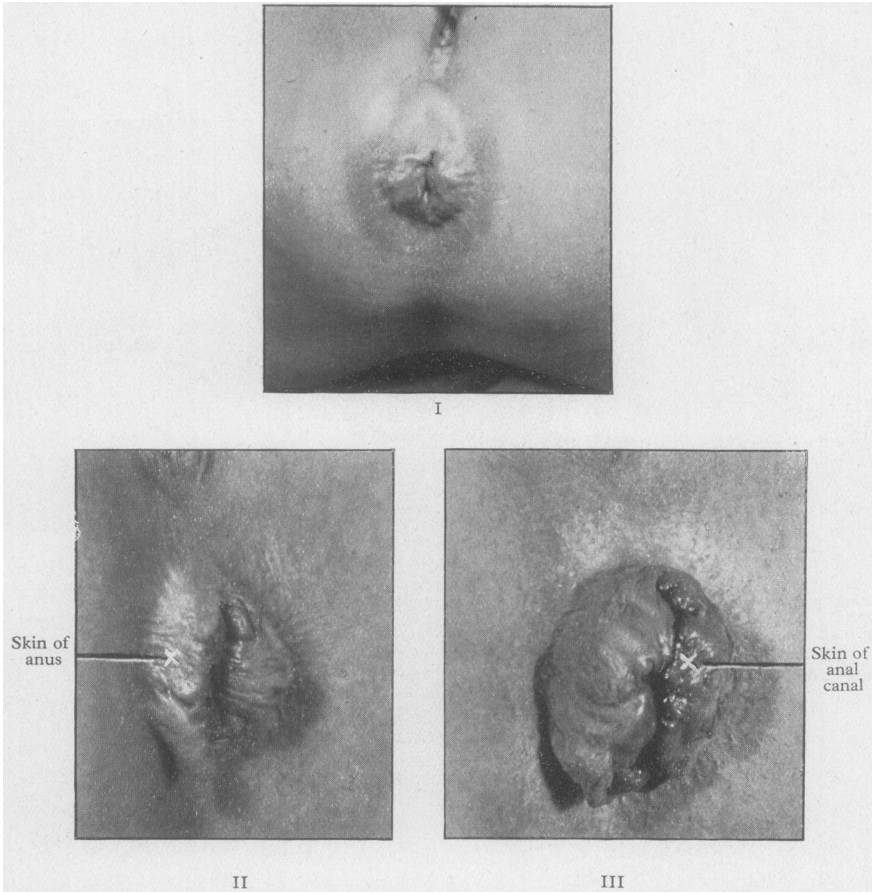

FIG. 12 (I, II, III).—Degrees of distension, eversion and prolapse of the external hæmorrhoidal plexus, on straining.

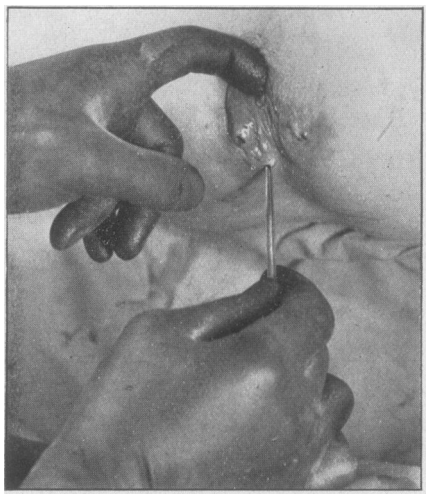

FIG. 15

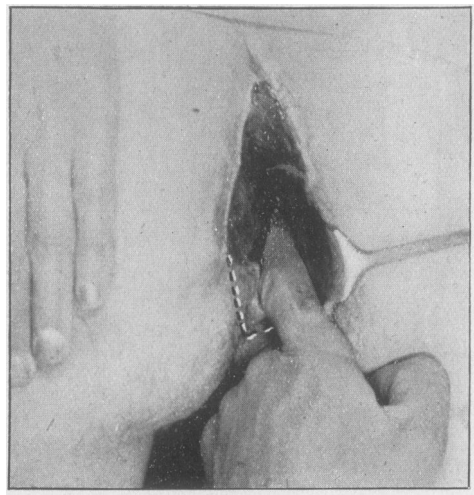

FIG. 16

FIG. 15.—Method of finding the internal opening of al ow anal fistula. The probe in the main track is directed to the palpating finger at the intermuscular septum and felt for under the lining of the canal, before searching for the internal opening.

FIG. 16.—The deep operation wound for ano-rectal fistula with uncut subcutaneous external sphincter. Suggested extension of wound outlined.

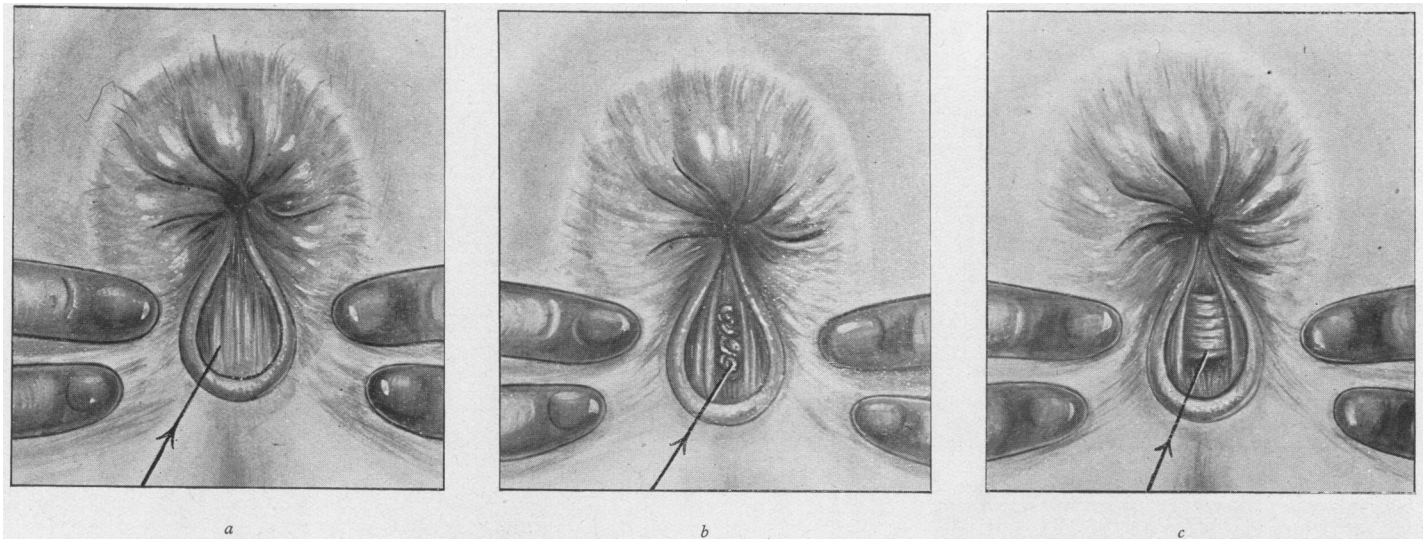

FIG. 13.—*a* Fissure-in-ano with corrugator muscle exposed.
b Fissure-in-ano with external hæmorrhoidal plexus exposed.
c Fissure-in-ano with subcutaneous external sphincter exposed

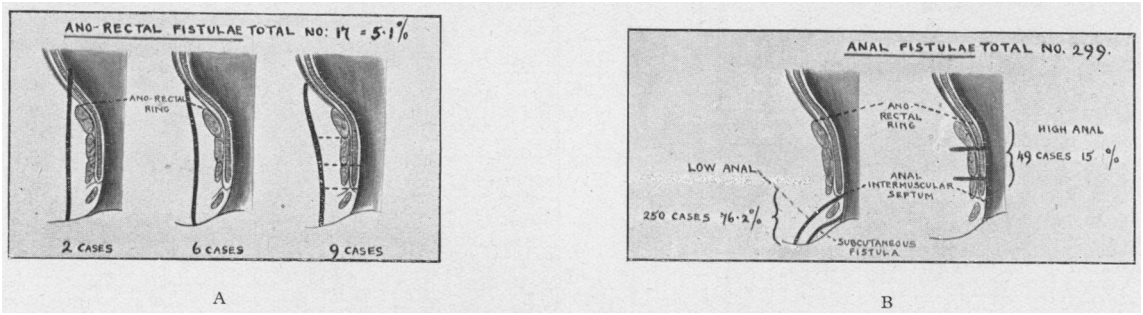

FIG. 14.—Cases of fistulæ-in-ano, 1939–1941, St. Mark's Hospital. (Total cases 328.)

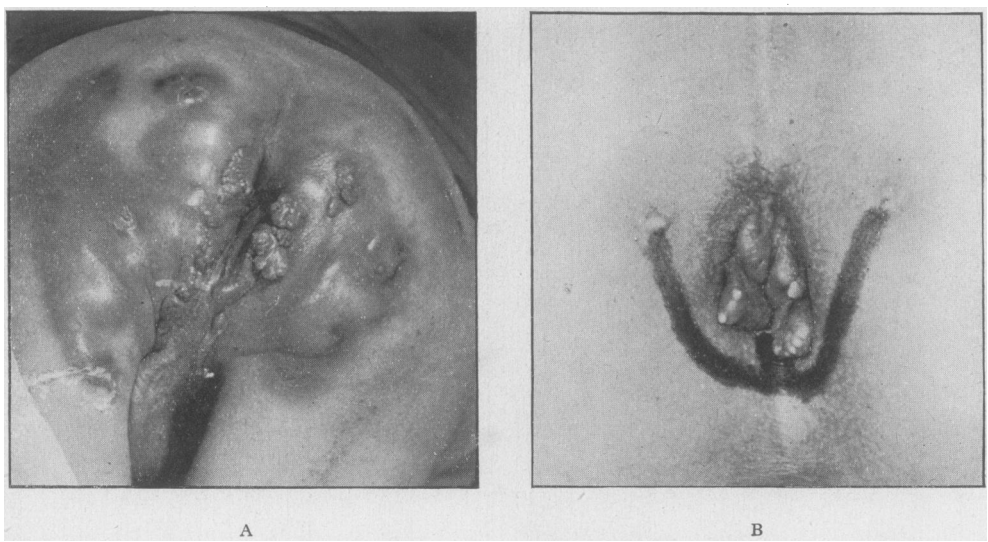

FIG. 17.— A—Multiple subcutaneous fistulæ following outward spread of infection from the perianal space. B—Low anal fistula. Direct spread of infection around the perianal space.

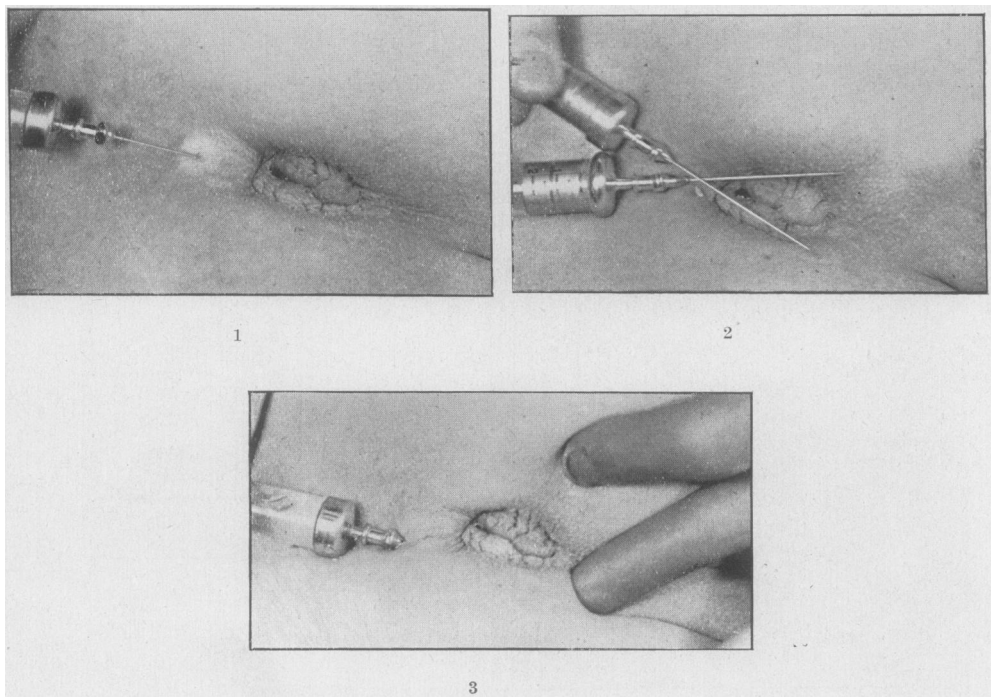

FIG. 18.—Perianal injection. 1. Intradermal wheal. 2. Direction of needle on both sides of anus. 3. Showing depth and direction of needle. The point is palpated with the finger.