



# *Essentials of* CLINICAL PROCTOLOGY

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*Third Edition*

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## Preface

IN 1946 I PUBLISHED a book entitled "Essentials of Clinical Proctology." This volume, the outgrowth of lectures on diseases of the anus, rectum and colon given to medical and postgraduate students, covered, in outline form, only the essentials of the entire subject of proctology, from simplified embryology and anatomy to preoperative and postoperative proctologic care. Instead of giving many prescriptions and technics for the treatment of each condition—which would have been confusing and time-consuming to a busy physician—I included only the prescriptions, medicinals, office treatment, home treatment and operative technics which I had found most satisfactory over a period of twenty years. Each chapter also included practical diagnostic aids, accompanied by simple teaching schematic drawings. The book was acclaimed as a rapid and convenient reference of all essential, practical and usable proctologic material.

However, constant progress and changes, not only in proctology but in all fields of medicine, make periodic re-evaluation necessary, and this newly revised third edition is just such a re-evaluation. The same principles that were followed in the original book, however, have again been adhered to.

A complete chapter on the injection treatment of hemorrhoids has been added that gives the exact simple injection technic, injection solution and rules for "what not to do." Also added is a chapter on pediatric proctology, steps and illustrations in the performance of a sigmoidoscopic examination, a complete chapter on ulcerative colitis, giving the diagnosis and most recent treatment for each type; a new chapter on hydradenitis suppurativa; and a completely revised chapter on pruritus ani, with new drugs and schematic drawings for all steps in the "clover-leaf" operation for the intractable condition. There is also a revised chapter on the treatment of postoperative complications; a complete chapter on amebiasis and its relationship to pruritus ani; a new simple histo-pathologic classification of polyps and their treatment; and a chapter on coccygodynia and proctalgia fugax, showing the relationship and treatment of both of these frequently undiagnosed, painful rectal conditions. The reader will find sections on making anorectal operations less painful; the "critical angle" and its relationship to fistula operations and anorectal incontinence; and the fissure pentad (the five conditions

usually associated with an anal fissure). This edition contains the most complete dissertation in the medical literature on the pecten band, pectenosis and pectenotomy, the last two being a condition and a treatment necessary to understand if proctologic diseases are to be properly diagnosed and treated. A brief resume of useful diagnostic and therapeutic procedures for the treatment of carcinoma of the rectum and colon has been included, and, last but not least, a schematic drawing of the authors' treatment drawer with a list of all office medicinals found valuable by the writers over a period of thirty years.

I wish to give credit and thanks to my associate and partner, Dr. Louis Malow, who, through his collaboration, contributed so materially to the tremendous task of making this third revised edition possible. I also wish to express gratitude to Mrs. E. McKeown and Mrs. G. K. Jones of the University of Illinois Medical Art Department, who prepared new illustrations, including two color plates on ulcerative colitis and amebic colitis, and to Miss Ruth Kiewe, our secretary, who spent innumerable hours typing and retyping new material for this book. Finally, thanks are extended to our publisher, Grune & Stratton, who have again aided us in the editing and printing of this third edition.

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*Chicago, Illinois*  
*January 1957*

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## Chapter 1

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# EMBRYOLOGY AND APPLIED ANATOMY OF THE ANORECTUM

### EMBRYOLOGY

THE rectum and anus are derived from three distinct embryonic structures: the hindgut, the pouch developed from the hindgut, called the postallantoic gut, and the proctodeum.

The caudal expansion of the hindgut is the cloaca. The rectum proper is derived from the cloaca. The cloaca gives off the allantois, which later forms the genito-urinary system, and the postallantoic gut, which forms the balance of the rectum and anus. The postallantoic gut grows downward and outward to meet the proctodeum, which begins to dimple in toward the postallantoic gut. In this process, the anterior or cloacal opening leading to the allantois gradually closes, dividing the rectum from the genito-urinary tract and the remainder of the pelvic viscera.

The postallantoic gut (termination of the hindgut) continues to grow outward to meet the proctodeum, and in about the fourth intra-uterine month their union forms a septum known as the anal membrane. This membrane ruptures, forming communication between the bowel and the exterior. Where this membrane ruptures there results a very important anatomical landmark known as the pectinate line (from the Latin *pectinatus*, combed, meaning like the teeth of a comb) (figs. 1 to 4). Should this membrane not rupture, one of the types of imperforate anus results (chap. 2).

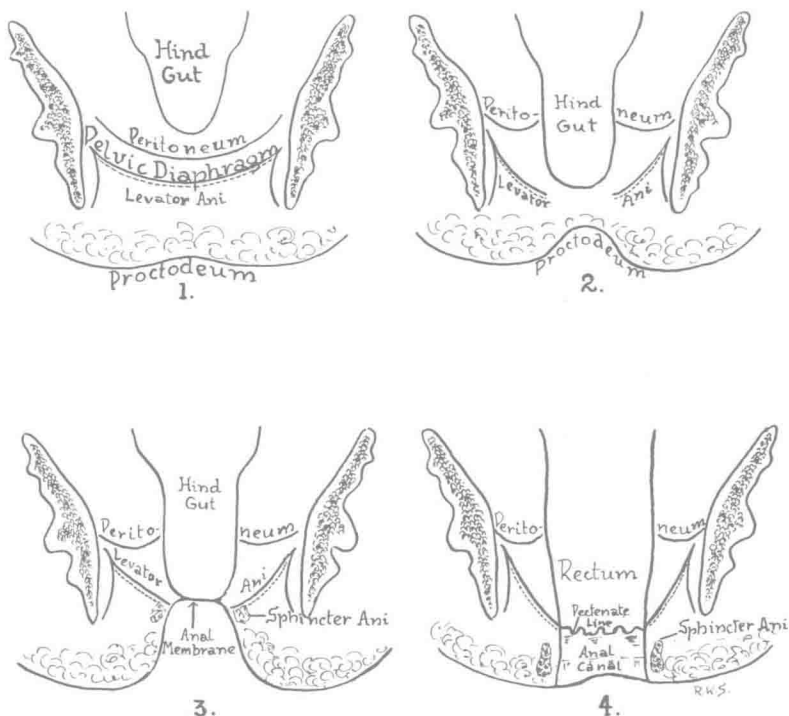
### APPLIED ANATOMY

To make the anatomy of the anorectal region more interesting and applicable to diagnosis and treatment, the writers have attempted to explain the clinical and surgical significance of many of the anatomical structures in this area (see Frontispiece).

As stated above, the hindgut grows outward to meet the proctodeum, which invaginates inward. It is where they meet, and where the anal membrane finally ruptures, that we find the pectinate line. The blood



supply, the nerve supply, and the lymphatic supply, as well as the histological structure of the epithelium, are different above and below this line. A clear understanding of these differences will aid one materially in the diagnosis and treatment of proctologic conditions.



#### SCHEMATIC LONGITUDINAL SECTION OF THE ANORECTUM

FIGS. 1-4. EMBRYOLOGICAL FORMATION OF ANORECTUM (after Pennington)

Fig. 1. Formation of rectum and anus.

Fig. 2. Hindgut piercing the pelvic diaphragm and the proctodeum.

Fig. 3. Communication between hindgut and proctodeum forming the anal membrane.

Fig. 4. Communication between hindgut and proctodeum completed and formation of the pectinate line.

**Pectinate Line.**—The pectinate line is found about one to one and one-half inches above the anal opening, and it divides the postallantoic gut (entoderm) from the proctodeum (ectoderm). It is the dividing line for several important anatomical systems, namely, the vascular system, the nervous system, and the lymphatic system. Above the pec-

minate line are found the superior hemorrhoidal vessels, while below are the inferior hemorrhoidals. Above the pectinate line the structures are supplied by the autonomic system, while below by the cerebrospinal nerves. Above the pectinate line the lymph drainage is to the deep rectal, pelvic, and abdominal glands; below, the lymph drainage is mostly to the inguinal glands. Above the pectinate line the epithelium is columnar, and below it is transitional and squamous.

*Anal Valves and Crypts.*—Arising from the pectinate line are a number of irregular semilunar folds which are known as the anal valves. These form a number of small pockets known as the crypts of Morgagni. These crypts are the common cause of anal pain as well as the origin of abscesses and fistulas.

*Hilton's Line.*—The lineal interval between the external and internal sphincter muscles is known as Hilton's white line. This is often referred to as the mucocutaneous junction, because below this line the anal canal is lined by squamous epithelium, indistinguishable from ordinary skin, while the area between Hilton's line and the pectinate line is lined by transitional or modified anal skin.

*Pecten.*—Between Hilton's line and the pectinate line is an area known as the pecten or pecten area of Stroud (fig. 5) which varies in width from one-third to one-half inch and is lined by transitional epithelium, differing from the columnar cells above and the squamous epithelium below. The pecten is therefore neither skin nor mucous membrane and is usually referred to as modified anal skin.

*Columns of Morgagni.*—Above the pectinate line are longitudinal folds of the anorectal mucosa known as the columns of Morgagni, which are lined by columnar cells.

*Vascular System.*—Four blood vessels supply the anorectum; superior, middle, inferior hemorrhoidal, and occasionally a branch from the middle sacral. Above the pectinate line are found the superior hemorrhoidal vessels which penetrate the muscular coat, enter the submucous tissue, and supply three definite areas with main branches and as many as five secondary areas with secondary branches. These primary venous branches, when varicosed, produce the three primary hemorrhoids located above the pectinate line in the right anterior, right posterior, and left lateral quadrants, which are the areas removed during hemorrhoidectomy. Secondary hemorrhoids may develop in between these definite

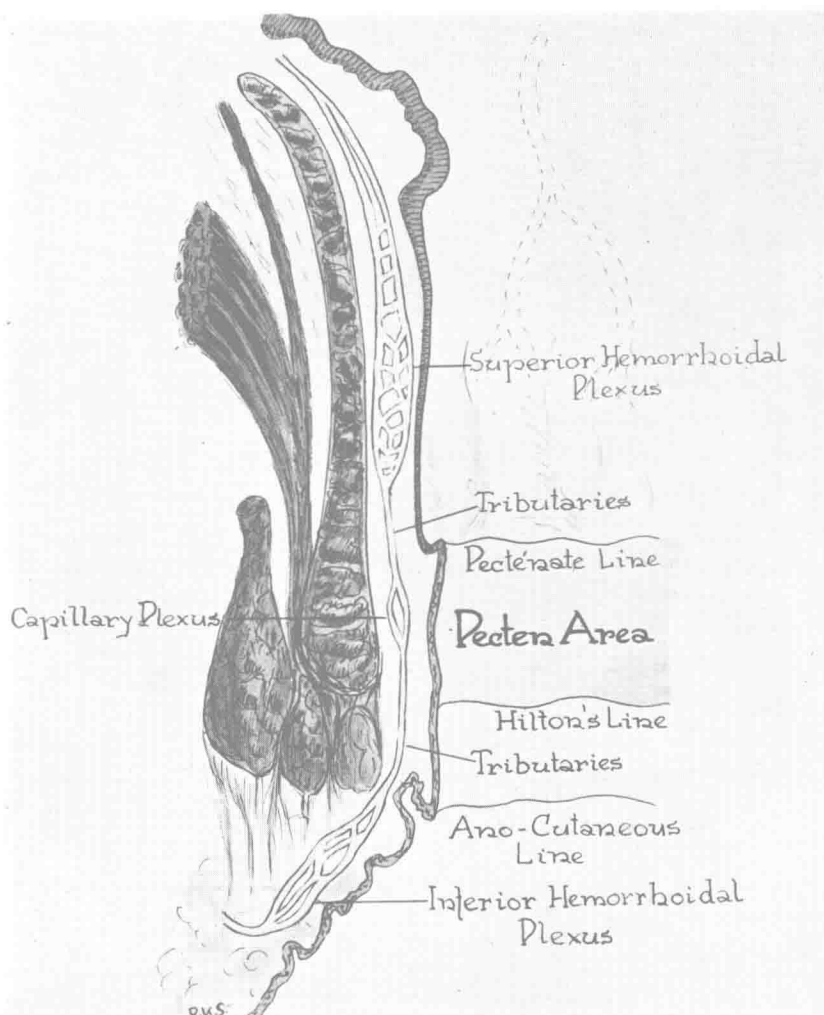


FIG. 5. LONGITUDINAL SCHEMATIC SECTION OF THE ANORECTUM SHOWING THE ANATOMICAL LANDMARK, THE PECTEN AREA

The pecten area lies between the pectinate line and Hilton's line. This is the area where pathological pecten bands develop.

locations according to the secondary branches which supply this area (see fig. 6). Below the level of the pecten area lies a venous ring which is drained by the inferior hemorrhoidal plexus. When hemorrhoids develop in this area they appear in three definite forms: the chronic forms are the anal verge symptomless bluish varicosities, known as the external

varicose hemorrhoids, and the integumentary hemorrhoids (skin tags); the acute form is known as the thrombotic pile, or hematoma ani. The internal hemorrhoidal area (above the pectinate line) is drained by the portal system and the external hemorrhoidal area (below the pecten) by the inferior vena cava (fig. 7), so that metastases from a carcinoma

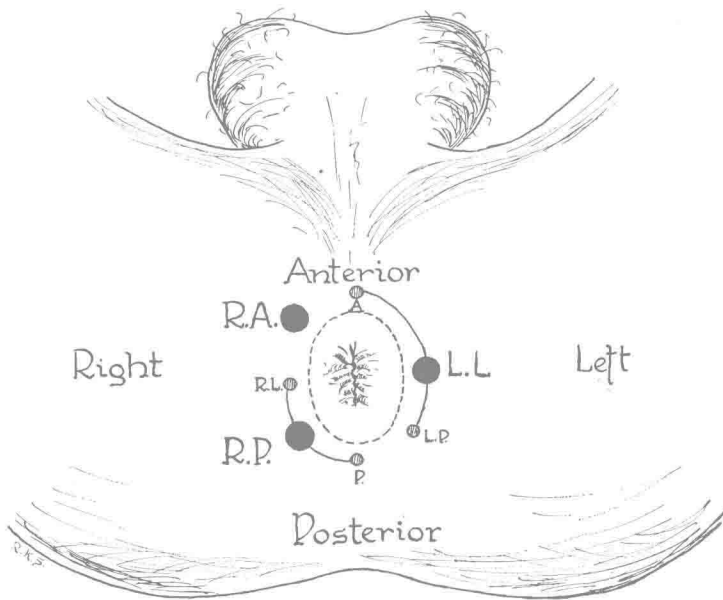


FIG. 6. LOCATION OF HEMORRHOIDS

Schematic cross section of rectum just above pectinate line showing position of main hemorrhoidal vessels and their branches. The solid black dots indicate the main branches R.A., R.P., and L.L., while the shaded dots indicate the location of their branches. Varicosities of the main branches form the three primary hemorrhoids R.A., R.P., and L.L., while secondary hemorrhoids in the Anterior, Posterior, R.L. and L.P. quadrants may develop from the primaries. The R.A. hemorrhoidal vessel has no branches and develops no secondary hemorrhoid.

above the pecten is to the liver while below the pecten it may enter the general circulation and appear anywhere.

*Nervous System.*—Above the pectinate line, the anorectum is supplied by the autonomic nervous system, and the sensation of pain is absent, which explains why carcinoma of the rectum develops to a considerable size without producing pain. It also explains why internal hemorrhoids

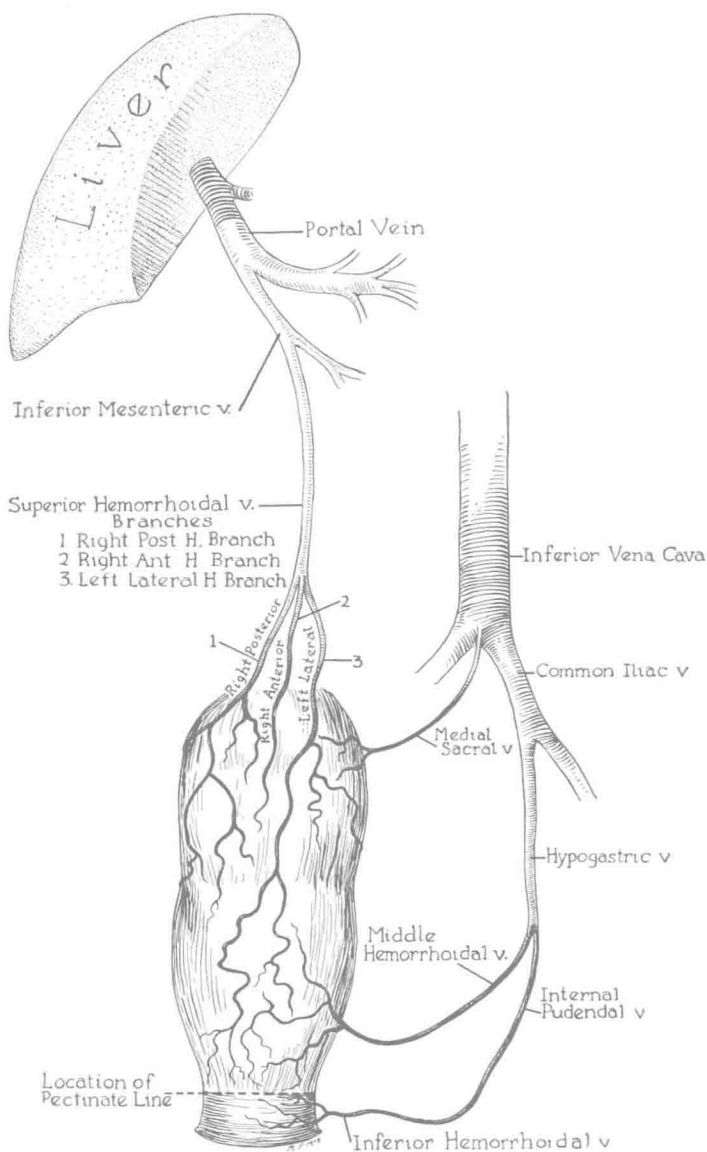


FIG. 7. THE VENOUS SUPPLY TO THE ANOECTUM

Schematic drawing, showing the origin and insertion of the venous blood supply to the anorectum. Note the three primary branches of the superior hemorrhoidal vein 1, 2, and 3. The right anterior branch is a single branch without any offshoots, while the right posterior and left lateral branches give off several offshoots.

cause bleeding but no pain. It is only when hemorrhoids prolapse and invade the sensory area below the pectinate line that pain is experienced. Below the pectinate line all pathological lesions such as cryptitis, papillitis, fissure in ano, abscess, thrombotic pile, and carcinoma are associated with pain.

The nerve supply to the anal canal is from the sacral and coccygeal plexuses. The hemorrhoidal branch of the internal pudic supplies the lateral walls; the perineal branch of the pudic supplies the anterior quadrant and is known as the anterior sphincterian nerve; the fifth and sixth sacral and coccygeal branches form the lesser sphincterian nerve, or the nerve of Morestin. These nerves and their location are important to keep in mind in giving local anesthesia (fig. 8). The sensory nerves of the anal region are intimately connected with the nerve supply of the neck of the bladder, urethra, vagina, and inner side of the knee and hip joint and are capable of producing disturbances in these parts when

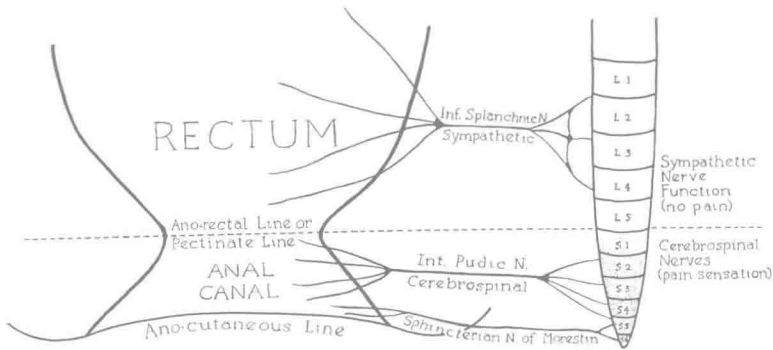


FIG. 8. NERVE SUPPLY TO ANORECTUM

Note that the sensory nerve area ends at the pectinate line. No pain sensation is felt above the pectinate line except reflex pain from the coccyx, prostate, or female organs. This explains the lack of pain in polyps, early carcinoma, and internal hemorrhoids.

the anal canal is affected. An illustration of this is the difficulty of urination associated with anorectal abscess or anorectal operations.

*Lymphatic System.*—The pecten is also the dividing line of the lymphatic system. Above the pecten the lymphatics drain to the perirectal, sacral, iliac, and aortic glands; below the pecten, drainage is to the

inguinal glands. This explains the inguinal metastasis in carcinoma of the anal opening and the inguinal adenitis in venereal ulcers of the anal verge.

*Anal Canal and Rectum.*—The anal canal, according to the American school, extends from the anal opening to the pectinate line, a distance of about an inch to an inch and a quarter. The rectum extends from the anorectal line to the rectosigmoidal juncture at about the level of the third sacral vertebra and is about five to seven inches in length. The anal canal points upward and anteriorly, while the rectum follows the hollow of the sacrum, pointing upward and backward. This is important to keep in mind when passing a proctoscope. Immediately after the anal canal is passed the scope should be pointed backward to avoid striking against the prostate or uterus. The rectum below the peritoneum is composed of mucosa, submucosa, muscularis, and fascia propria; above the peritoneal reflection the outer layer is serosa. The muscular coat is composed of an inner circular and an outer longitudinal layer. The thickening of the circular muscles of the lower rectum down to Hilton's line forms the internal sphincter, and the taenia coli of the colon fuse at the rectum and surround the entire tube. The external sphincter, unlike the internal sphincter, is supplied by the cerebrospinal nerves. It is under the control of the will. Hilton's line is the dividing line between the two sphincters. Crescentic folds which stand out from the rectal wall are three in number, encircle from one-third to two-thirds of its circumference, and are known as the valves of Houston (fig. 9). Their exact function is as yet not definitely understood. In front of the rectum lie the prostate, seminal vesicles, vas deferens, urethra, and prostate, in the male; in the female, the vagina, uterus, and adnexa. There is no peritoneum on the posterior surface of the rectum. The lateral portions of the upper rectum are covered by peritoneum to a slight extent and the upper third of the rectum is covered by peritoneum on its anterior aspect. In the male the distance from the perineal skin to the reflection of the peritoneum is from two and one-half to three inches. In the female the cul-de-sac comes down even lower and may be as little as one and one-half inches away. This is important to keep in mind in procidentia recti, where the peritoneum in the female may be included in the prolapse and excision of this mass may result in peritonitis and death. Also in passing bougies, sigmoidoscopes, etc., or in coagulating tumors on the

anterior wall of the rectum, the peritoneal cavity may be entered and result in a fatality.

*Muscles of the Anorectal Region.*—The new conception of the external sphincter according to Milligan and Morgan is that it is composed of three parts, namely: (1) sphincter ani externus subcutaneous; (2)

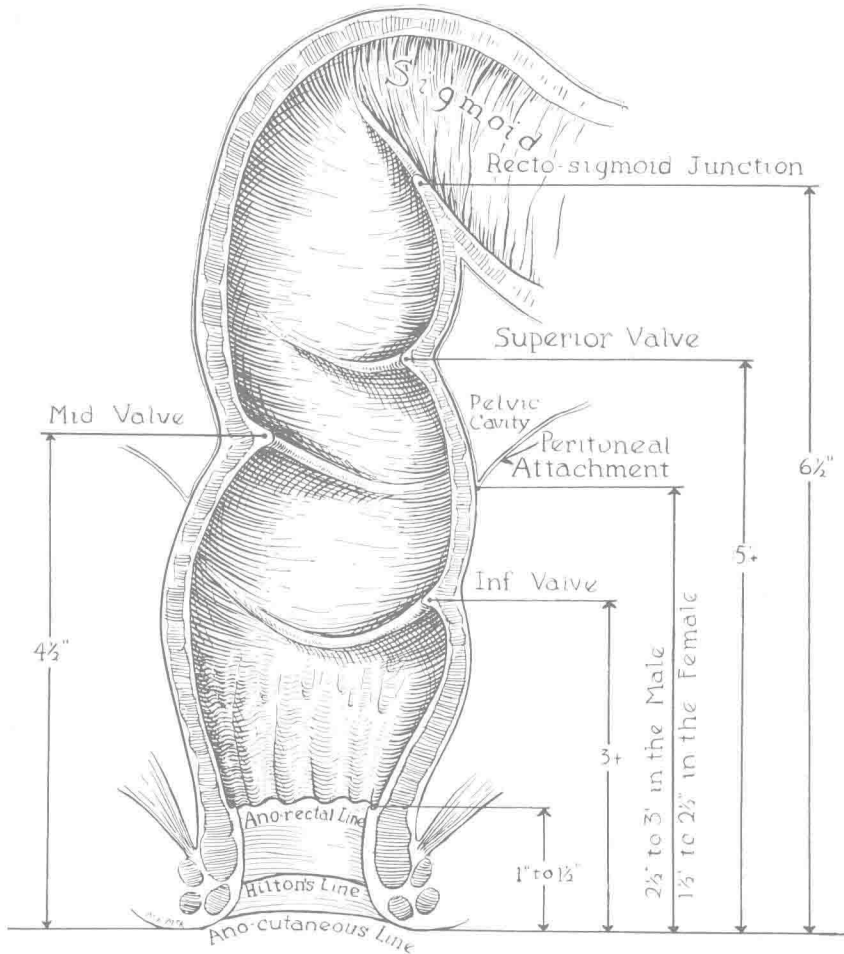


FIG. 9. ANO-RECTO-SIGMOID

Longitudinal section of the anus, rectum, and sigmoid, showing the various approximate distances of the anocutaneous line to the pectinate line; the three rectal valves; the distance to the peritoneal reflection and to the rectosigmoid junction.



sphincter ani externus superficialis; and (3) sphincter ani externus profundus. The first and third portions are annular muscles not attached to the coccyx; the second portion is elliptical in shape and is attached to the coccyx (see fig. 10). In some cases there are only two separate portions, the two deeper layers being then inseparable. The first portion, the sphincter ani externus, is easily seen and felt beneath the skin of the anus and lies in the same plane as the internal sphincter. This is the portion of the sphincter which has heretofore been taken for the entire external sphincter and is the portion most commonly cut in fistula operations. This is important to understand and will easily explain why it does not matter at what angle this portion of the sphincter is cut. Rarely

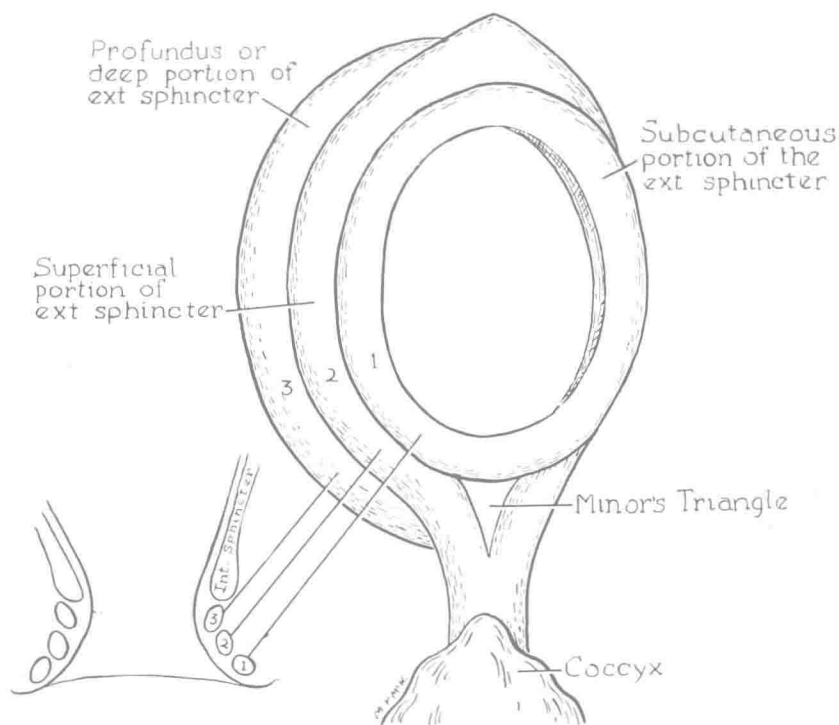


FIG. 10. EXTERNAL SPHINCTER

Schematic drawing showing the three doughnut-shaped portions of the sphincter muscle attached to each other. Note that the second portion (Superficial External Sphincter) attaches to the coccyx, forming a space known as Minor's Triangle.