INTRODUCTION

The main goal of treating rectal cancer is to relieve the patient symptoms or potential symptoms caused by the local tumor while curing his disease. A second goal is to minimize morbidity and maximize quality of life. Despite these efforts, both local and distant recurrences occur, which can be devastating for patients and often results in death. In order to reduce the chance of local recurrence, a wide local excision in the form of abdomino-perineal resection (APR) is often performed which removes the rectum and the lymph node bearing tissues as well as the anal sphincter and has been considered the standard treatment for low rectal cancers ***(Breen and Bleday, 1997).***

The (APR), although successful in most patients, has significant morbidity. A postoperative morbidity rate of 61% in the form of urinary complications, perineal wound complications and sexual dysfunction ***(Piliphsen et al., 1984 and Pollard et al., 1994).*** There is also significant change in body image compared with sphincter saving procedures ***(Williams and Johnson, 1993).***

Using the gold standard of (APR) as a measure of cancer control, sphincter saving procedures appear to provide similar rates of survival and local recurrence ***(Breen and Bleday, 1997).***

Sphincter saving procedures in the form of local excision (Trans anal and Transcoccygeal and Trans sphincteric routes) ***(Hiemann et al., 1992)*** and Trans Abdominal low anterior resection ***(Paty et al., 1994).*** Abdomino-endo anal pull through resection ***(Cautait et al., 1985)*** have proven to be acceptable forms of therapy for distal rectal cancers, but the issue of the function of the spared anal sphincter after surgery with or without adjuvant therapy and how this relates to the quality of life, needs to be evaluated ***(Stahl et al., 1993).***

AIM OF THE WORK

The aim of this work is to provide a current appraisal of the available sphincter saving procedures and their efficacy together with patient selection criteria in the treatment of distal rectal cancers.

NORMAL AND ABNORMAL DEVELOPMENT OF ANORECTUM

The exact mechanism of the formation of the anorectum in early embryonic life has remained controversial and hypothetical ***(Freeman, 1994)***.

The major events in the development of the anus and rectum take place between the fourth fetal week and the sixth fetal month, times corresponding to a crown-rump length of 4 to 200mm embryonic stages ***(Raffensperger, 1990)***.

Three main phases of development are recognized:

1. Formation of the cloaca.
2. Division of the cloaca into the urogenital sinus and rectum.
3. Development of the anal canal.

(Cook, 1990).

The cloaca is formed between the 2mm and the 4mm embryonic stages. In the early embryo, endoderm and ectoderm are in contact without interplaced mesodermal cells between the caudal end of the primitive streak and the body stalk. The allantois grows out of the caudal end of the gut ventrally into the body stalk and as the dorsal portion of the embryo grows, the allantoic duct and the cloacal membrane are displaced ventrally. There is some caudal expansion of the hindgut to form the tailgut ***(Cook, 1990)***.

By the 4 mm embryonic stage, the cloaca and cloacal membrane are present. The membrane lies transversely and separates the internal from the external cloaca ***(Templeton and O'Neill, 1986)***.

Wu and his team (1990), emphasized that the cloacal membrane plays a decisive role in the genesis of anorectal malformation.

The primitive hindgut is the anlage of the terminal ileum, colon, and cloaca. The anterior portion of the cloaca gives rise to the lower genitourinary system, whereas the posterior portion gives rise to the lower gastrointestinal system ***(Salman, 1996)***.

The upper rectum and sigmoid colon are derived from the hindgut, which in the 4 mm embryo joins the allantois and the mesonephric ducts to form the cloaca ***(Raffensperger, 1990)***.

The cloaca is thus a terminal expansion of the hindgut into which enter the allantois, the gut and the tailgut (Fig.1), and also by the end of the 3 mm embryonic stage, the wolffian or mesospheric ducts ***(Cook, 1990)***.

Between the 4 mm and 16 mm embryonic stages, the internal cloaca is divided in a coronal plane by the urorectal septum, which starts cranially and ends caudally. This downgrowth of the urorectal septum (Tourneux's fold) is paralleled by lateral ingrowths (Rathke's plicae) and results in two chambers (Fig.2), one receiving the allantois and wolffian ducts and the other receiving the rectum ***(Stephens, 1983)***.

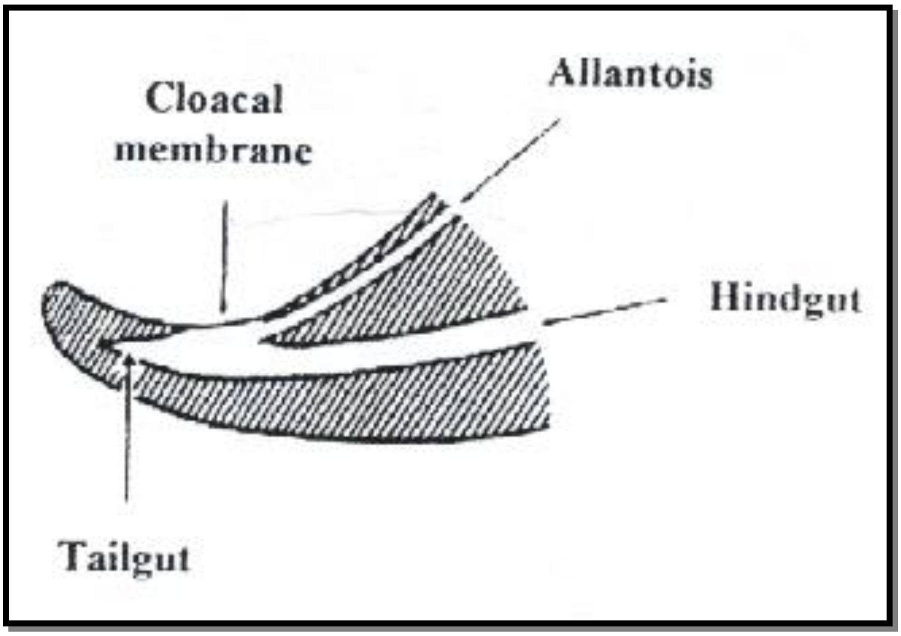

Figure 1 : The cloaca complete ***(Cook, 1990)***

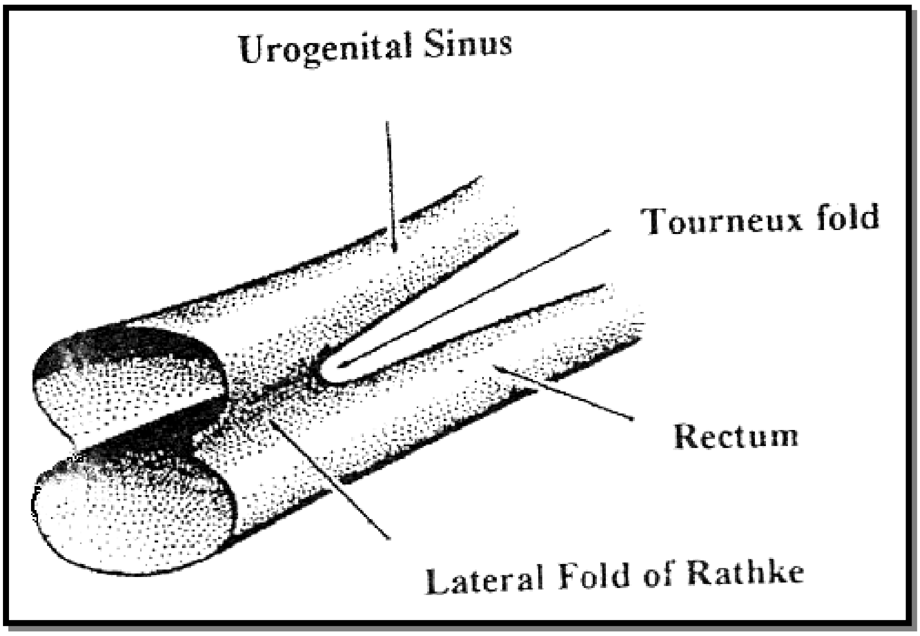

Figure 2: Representation of the Combined effect of the development of the lateral plicae of Rathke and Tourneux fold ***(Cook, 1990)***.

The division of the cloaca forms the portion of the rectum extending from the upper part of the anal canal to the peritoneal reflection . The Torneaux's septum stops its down growth at the level of the verumontanum or mullerian tubercle. This point is of great significance because it is here where most rectourethral Fistulae occur in the male. Below this point, the urorectal septum consists of an ingrowth of mesenchyme from a lateral direction that fuses in the midline. This is called Rathke'sfold ***(Raffensperger, 1990)***.

Failure of the urorectal septum to develop probably results in a rectourinary fistula in the male and rectocloacal or rectovaginal fistula in the female ***(Bill and Johnson, 1958)***.

Also, between the 4 mm and 16 mm embryonic stages, mesoderm builds up on the surface of the perineum, resulting in the formation of the genital tubercle on the ventral aspect, genital folds on either side, and anal tubercles posteriorly (Fig.3).

The depression produced thereby is the external cloaca. When the urorectal septum reaches the cloacal membrane at the 16 mm embryonic stage, the membrane begins to atrophy. When this atrophy is complete, the future urogenital tract and future rectum both issue into the external cloaca ***(Stephens and Smith, 1971)***.

By the 50 mm embryonic stage of normal gestation, the structures of the rectum, anus, urinary and the genital tracts are laid down in their distinctive form in considerable detail (Fig. 3) ***(Cook, 1990)***.

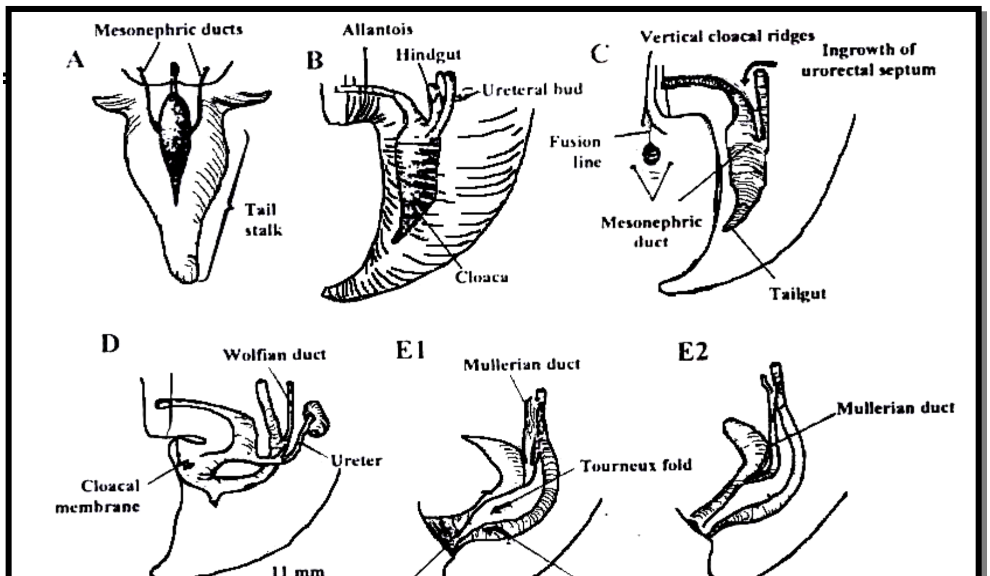

Figure 3: Normal anorectal embryology , illustrating the separation of the cloaca into the urogenital system and the rectum . the anus forms on the perineum from the anal tubercles ***(Raffensperger, 1990)***.

During growth of the embryo from 16 mm to 50 mm embryonic stages, the uroanal septum grows caudally into the external cloaca. It dose so by growth of the perineal mound, which is an extension of the urorectal septum, and by inward migration of the inner genital folds on either side. These folds grow medially until they fuse with the perineal mound to from the perineum separating the urinary and anal canals ***(Stephens, 1983)***.

De Vries and Friedland (1974), however, in their study, demonstrated that there was no external cloaca at the time the anal membrane broke down, and found that even before this, the anal tubercles had formed a prominent fold dorsal and lateral to the cloaca, while an evagination of the dorsal wall of the cloaca became the bulbus analis portion of the anorectal wall which is thus formed from endoderm.

Cook, (1990) and Kluth et al. (1995), stressed the importance of the early formation of the analge of the future anal orifice for the normal development. They also assumed that a shift of the rectum (caudal migration) or a shift of the caudal cloaca to the tailgroove is necessary to establish the anorectal canal.

The anal orifice itself arises as a separate entity by the ring like fusion of the right and left anal tubercles. By the 19 mm embryonic stage, potency of the anal canal is usually established. From then until the 50 mm embryonic stage, further elongation of the urethra and anal canal occurs, but external differentiation of male and female genital structures is not yet apparent. This differentiation becomes clear by the 56 mm embryonic stage ***(Bill and Johnson, 1958)***.

During the tenth week, the anal tubercles, a pair of ectodermal swellings around the proctodeal pit, fuse dorsally to form a horseshoe-shaped structure and anteriorly to create the perineal body. The cloacal sphincter is separated by the perineal body into urogenital and anal portions [external anal sphincter (EAS)]**.** The internal anal sphincter (IAS) is formed later (sixth to twelfth week) from enlarging fibers of the circular layer of the rectum ***(Nivatvongs et al., 1992)*****.**

The sphincters apparently migrate during their development; the external sphincter grows cephalad, and the internal sphincter moves caudally. Concomitantly, the longitudinal muscle descends into the intersphincteric plane ***(Levi et al., 1991)*****.**

SURGICAL ANATOMY OF THE RECTUM AND ANAL CANAL

Surgical Anatomy of Rectum:

The rectum is not otherwise well demarcated from sigmoid colon and changes in structure in passing from the one to the other are gradual ***(O'rahilly, 1986)***.

The transion between the rectum and the sigmoid colon is a gradual one. At this junctional region the sigmoid mesocolon ends and the rectum has no mesentery. The taeniae of the sigmoid colon gradually broaden to form wide anterior and posterior muscular bands which meet laterally to give the rectum a complete outer layer of longitudinal muscle, so the rectum has no sacculations, there are also no epiploicae in the rectum ***(Sinnatamby, 1999)***.

Varying in length with age, and body habitues, the rectum is described by anatomists as beginning at the S3 vertebral body but surgeons described it as beginning at the promontory (***Pemberton, 1991)***.

Also, anatomically, the rectum reaches below to the dentate line, the level which corresponds with the embryological proctodeal membrane. Surgically the distal limit of the rectum is at muscular ring, an easily identifined level ***(Hughes et al., 1983)***.

The rectum descends caudally following the curve of the sacrum first downwards and then forwards for a distance of 13 to 15cm end at the anorectal ring. This ring is formed by pelvic floor muscle (puborectalis`muscle in particular) and external anal sphincter (EAS) and internal ring by turning abruptly downwards and backward to terminate at the anal verge ***(Pemberton, 1991)***.

The rectum has three lateral curves. The upper and lower curves are convex to the right whereas the middle curve is convex to the left. On the intraluminal aspect of these curves are the valves of Houston. These infoldings incorporate all layers of the rectal wall except the longitudinal muscle layer. The middle valve is the most consistent and usually marks the level of the anterior peritoneal refection (**Pemberton, 1991**). This valve is known as Kohlrausch's plica. The upper left and lower left valve are present in 80-90% of the cases. There may be an additional valve on the right side, both above and below these three chief ones. The function if any, of the rectal valves is not clear (Fig. 4) ***(Hughes et al., 1983)***.

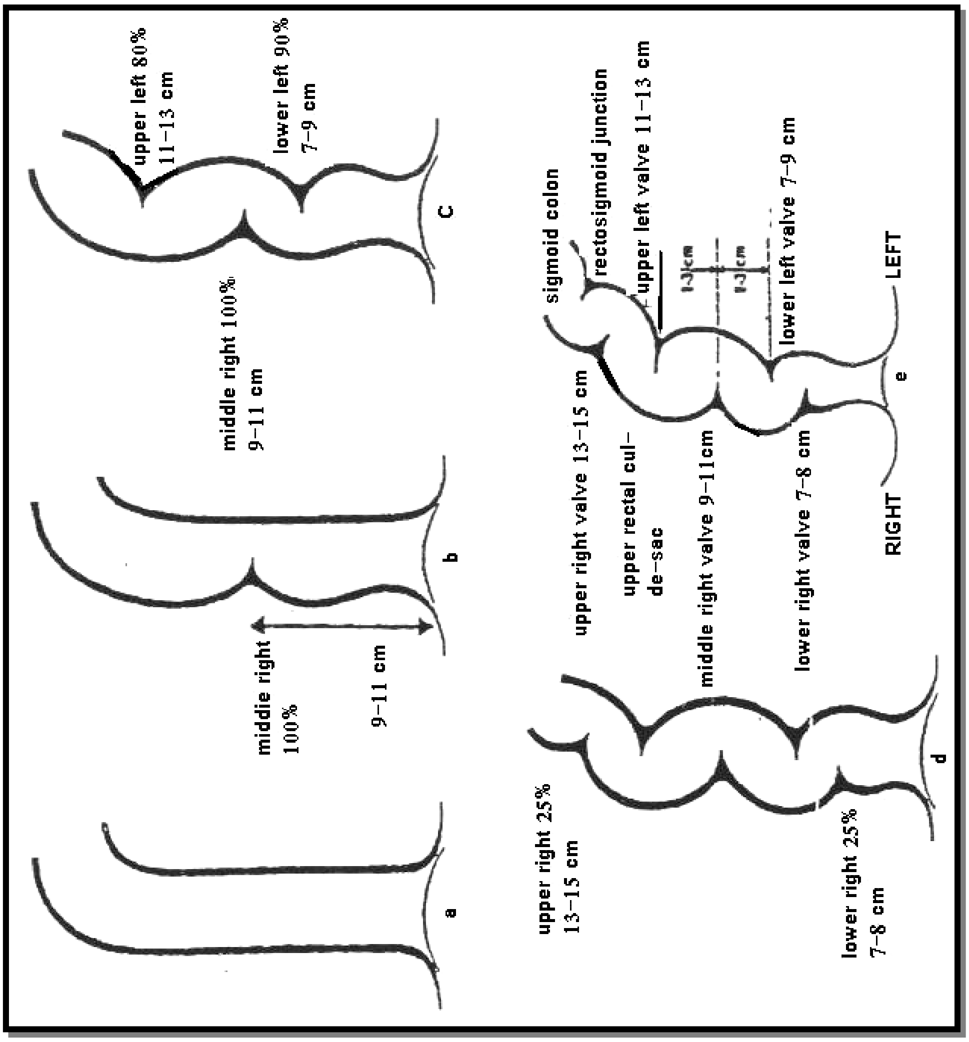

Figure 4 : Distribution of valves in rectum a) A straight tube is never found b) The middle right valve is always present c) The upper left and lower left are frequently present d) The upper right and lower right are occasionally present e) The general arrangement ***(Hughes et al., 1983)***.

They are encountered by the sigmoidoscope at 4-7 cm, 8-10 cm, and 10-12 cm from the anal verge ***(Skandalakis et al., 1995)***. When the curves are straightened by rectal mobilization lengthens by about 5 cm ***(Pemberton, 1991)***.

Relation of the peritoneum to the rectum:

Peritoneum covers the upper third of the rectum at the front and sides, and the middle third only at the front, the lower third is below the level of the peritoneum which is reflected forwards on to the upper part of the bladder (in the male) or upper vagina (in the female) to form the recto vesical pouch or rectouterine pouch of douglas. These pouches form the lowest parts of the perintoneal cavity and being 7.5 and 5.5 cm from the anal margins in male and female respectively are within reach of the finger tip on rectal examination ***(Sinnatamby, 1999)***.

The extraperintoneal relationships from the rationale for the sacrococcygeal approach to the rectum. The close relation of the rectum to the lumbosacral plexus explains the sciatic and perineal distribution of pain noted at times as an early symptom of carcinoma of the rectum ***(McVay, 1984)***.