INTRODUCTION

Prolapse of the rectum is still a matter of interest for discussion and research. The term "prolapse of the rectum" implies a circumferential descent of the bowel through the anus; it is usually a condition of the extremes of age *(Keighley, 1985).*

There are two types of rectal prolapse; the mucosal type in which only the mucous membrane of the rectum protrudes outside the anus and the complete type, which consists of all layers of the rectal wall *(Williams, 1992).*

The condition in children is usually said to be of mucosal type, but sometimes is unquestionably of the complete type. The suggestion of the prolapse as a hernia is based upon the presence of a defect in one or more factors of the supporting structures of the anorectum *(Moschcowitz, 1912).*

Another suggestion is that the prolapse is a form of bowel intussusception and is not due to a weakness of the pelvic floor *(keighley, 1985).*

Internal intussusception represents the precursor of complete prolapse. It represents an early stage of the disease occurring internally before it becomes visible so that the diagnosis is sometimes frequently missed. It may be associated with functional problems of the rectum including difficulty with evacuation, constipation and faecal incontinence *(Broden et al., 1980; Yoshioka et al., 1989).*

Mucosal prolapse of the rectum in children is essentially a self-limiting disease and usually responds satisfactorily to simple non-operative treatment.

An ideal single operation that can be applied to all cases does not exist. The many operations described for rectal prolapse attempt to correct one or more of the anatomical changes present, thereby improving anorectal function and controlling prolapse *(Williams, 1992)*.

AIM OF THE WORK

The aim of this work is to study and evaluate rectal prolapse in children as regards anatomy, physiology, pathogenesis, clinical presentation, diagnosis and to shed spotlights on the different techniques of management.

ANATOMY OF RECTUM AND ANAL CANAL

Embryology

The endodermal gut tube is created by embryonic folding during the third week of gestation. The gastrointestinal tract develops from the foregut, midgut, and hindgut. The hindgut matures into the distal transverse colon, descending colon, sigmoid colon, and rectum. The hindgut extends into the tail of the embryo, and it develops a ventral diverticulum, the allantois. The junction of the allantois and the hindgut becomes the cloacal region. The tailgut, or postallantoic gut, remains small and eventually disappears at week 6 of gestation (Fig. 1).

The cloaca is well defined by the fourth week and appears triangular from the side. The cloaca's corners include the hindgut, tailgut, and allantois. The cloacal membrane forms at week 5 and is a closing plate between the body and tail stalk of the embryo. The closing plate is composed of endodermal and ectodermal layers in contact with each other. The urorectal septum is a wedge of mesoderm that lies ventral to the hindgut and dorsal to the allantois. The septum, or Tourneaux fold,

moves caudally and reaches the cloacal membrane at week 7 *(Nadav et al., 2004).*

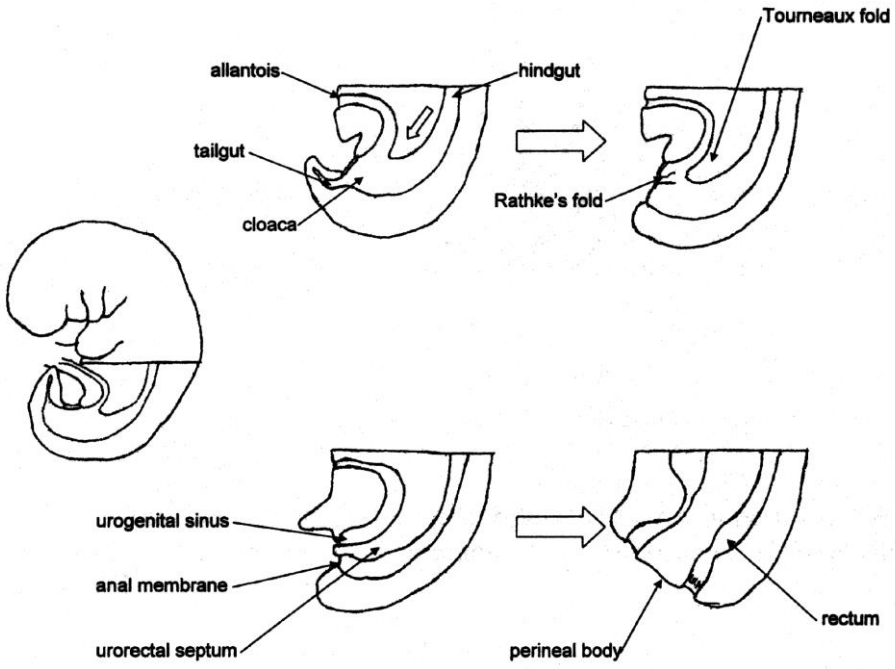

Figure (1): Embryologic development-cloaca ***(Netter, 1997).***

The urorectal septum is composed of two mesodermal septal systems. First, the Tourneaux fold appears at week 4 and begins as an inferiorly growing wedge between the allantois and the hindgut. Then, a pair of lateral Rathke folds arises as mesodermal bars on either side of the cloacal cavity near the cloacal

membrane. They grow medially and fuse with the Tourneaux fold to complete the urorectal septum *(Larsen WJ, 2001).* This process divides the cloaca into the ventral urogenital sinus and the dorsal rectum. The rectum has two enlargements: the cephalad enlargement will form the rectal ampulla, whereas the caudal enlargement will form the anal canal.

The septum's union with the cloacal membrane forms the perineal body and deep perineum. The cloacal membrane is now divided into a ventral urogenital membrane and a dorsal anal membrane. The anal membrane forms the proctodeum, or anal dimple, which ruptures during the eighth week. In adults, the dentate, or pectinate, line correlates to the level of the anal membrane. The embryonic musculature forms around the entire cloacal region. A pair of anal tubercles forms bilaterally at the most dorsal portion of the cloacal region. These tubercles fuse dorsally at week 7 and ventrally at the perineal body during the tenth week. This musculature forms the striated external anal sphincter. In comparison, the smooth internal anal sphincter forms as a caudal extension of the circular muscle of the rectum *(Skandalakis et al., 1994).*

In adults, the anal canal runs from the levator ani to the anal verge. The anal canal is composed of two parts, which have different linings, innervation, vasculature, and lymphatics. The superior two thirds of the anal canal is derived from the cloaca and has an endodermal lining that ends at the dentate line. Below the dentate line, the inferior one third of the canal forms from the anal pit whose lining is of ectodermal origin (Fig. 2).

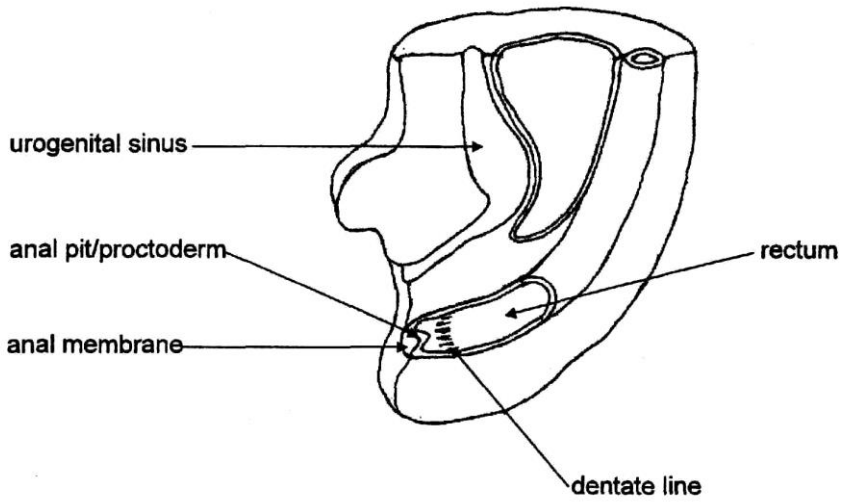

Figure (2): Embryologic origin of the anal canal ***(Netter, 1997).***

Anatomy

The proportions of the newborn child differ markedly from the form of the adult. Some of its organs and structures are well developed and even of full adult size while others have yet to develop.

In the newborn the sacrum is straight, the ilia are flat and don't develop their normal concavity until the child grows older. The rectosigmoid and rectum form a straight line rather than the curved configuration present in an older child. The valves of Houston are absent or poorly developed. Fusion of the rectal wall to the aponeurosis of Denonvilliers is incomplete and the lateral ligaments of the rectum are poorly developed in children *(Last's, 1999).*

Rectum:

The rectum is a linear organ in lower mammals; its name is derived from the Latin word *rectus,* which means straight. In humans, however, the rectum is curved and follows the shape of the sacrum and coccyx through the levator ani down and back to the anal canal. The rectum is the terminal portion of the gastrointestinal tract, and it differs from the colon in that it lacks sacculations or epiploic appendages. It resides in the osseous pelvis in

conjunction with the urogenital organs. The rectum functions as a fecal reservoir capable of expelling its contents. There are multiple definitions regarding the upper border of the rectum. Anatomists typically consider the beginning of the rectum to be at the level of the third sacral vertebra. Other definitions include the following: 15 cm from the anal verge, the position of the peritoneal reflection, and the level of the sacral promontory. The most useful landmark functionally and surgically is the confluence of the taenia coli at the rectosigmoid junction. Because this point cannot be visualized endoscopically, the National Cancer Institute defined the rectum as the last 12 cm from the anal verge when measured using a rigid proctosigmoidoscope. This definition provides better uniformity between clinical trials *(Nelson H et al., 2001)*.

Endoscopically, there are three lateral endoluminal curves, known as the valves of Houston. The superior and inferior folds are seen on the right, whereas the middle fold is visualized on the left. The middle fold correlates with the anterior peritoneal reflection and is the most consistently located valve. The folds provide a good location for biopsies because they do not contain all the layers of the rectum, which decreases the risk of

rectal perforation. There are also longitudinal folds within the rectum that disappear with insufflation (Fig. 3).

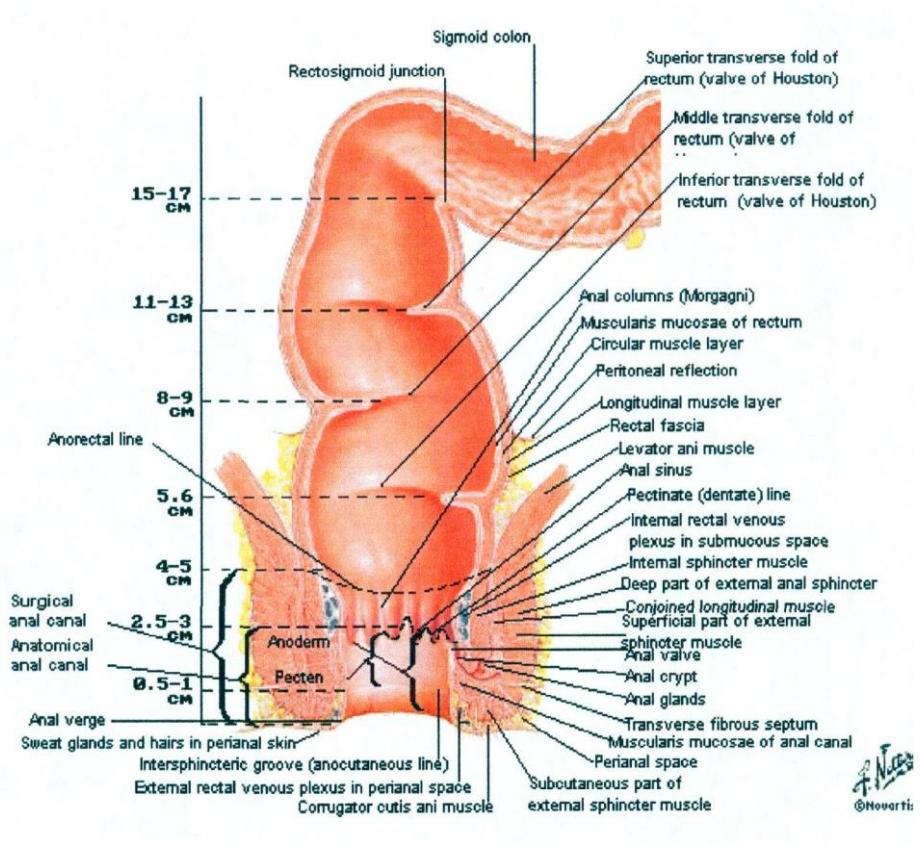

Figure (3): Coronal view of the rectum ***(Netter, 1997).***

Peritoneal relationships:

The rectum gradually exits the peritoneal cavity on its way through the pelvis. The superior third has an anterior and a lateral peritoneal covering. The middle third has only an anterior covering, whereas the inferior third is completely extraperitoneal. The posterior peritoneal reflection occurs between 12 to 15cm from the anal verge. The anterior peritoneal reflection, or rectovesical pouch, is approximately 8 cm from the anal verge in men. In women, the rectouterine pouch of Douglas is approximately 6 cm from the anal verge. The rectum's anterior boundary for men includes the prostate, seminal vesicles, vasa deferentia, ureters, urinary bladder, small bowel and sigmoid colon. For women, the anterior boundary comprises the posterior wall of the vagina, uterus, fallopian tubes, ovaries, small bowel, and sigmoid colon. Above the peritoneal reflection, neighboring lateral structures include the adnexa, small bowel, and sigmoid colon. Below the reflection, lateral structures include the ureters and internal iliac arteries. The posterior relations of the rectum include the sacrum, coccyx, levator ani muscles, the median sacral vessels, and the sacral nerve plexus roots.

Fascial relationships:

Inferior to the peritoneal reflection, the rectum is devoid of a serosa; however, it does have a thin, investing, visceral pelvic fascia known as the fascia propria of the rectum. The mesorectum surrounds the rectum and lies within the fascia propria. The fascia propria is the "holy plane" for the total mesorectal excision of the rectum *(Heald et al., 1998).*

The levator ani is surrounded by a parietal fascia, which at the rectal hiatus, ascends to join the fascia propria of the rectum. The descending component interposes itself between the two muscular coats of the rectum to join the conjoined longitudinal muscle. Posteriorly, the presacral fascia, which is part of the parietal pelvic fascia, covers the sacrum, coccyx, and median sacral vessels. Posterior to the presacral fascia is the sacral venous plexus. If this plane is entered, the sacral venous plexus bleeds extensively.

The rectosacral, or Waldeyer's, fascia extends from the fourth sacral vertebra to the posterior rectal wall. Waldeyer's fascia contains lateral and median sacral vessels with sacral splanchnic nerve branches from the sacral sympathetic ganglia. During mobilization of the rectum, Waldeyer's fascia should be divided sharply.

Below the rectosacral fascia is the supralevator or infrarectal space.

Anterior to the investing fascia of the rectum there is a thin layer of connective tissue known as Denonvilliers' fascia. This fascia extends from the anterior peritoneal reflection to the urogenital diaphragm. This layer separates the rectum from the prostate and seminal vesicles in men and the posterior wall of the vagina in women. The lateral ligament or stalk is a dense connective tissue below the lateral peritoneal reflection and above the levator ani. The lateral ligament connects the rectum to the parietal pelvic fascia. The superoanterior portion of the ligament contains the middle rectal artery. The inferoposterior portion of the ligament contains the pelvic splanchnic nerves (Fig. 4 A, B).

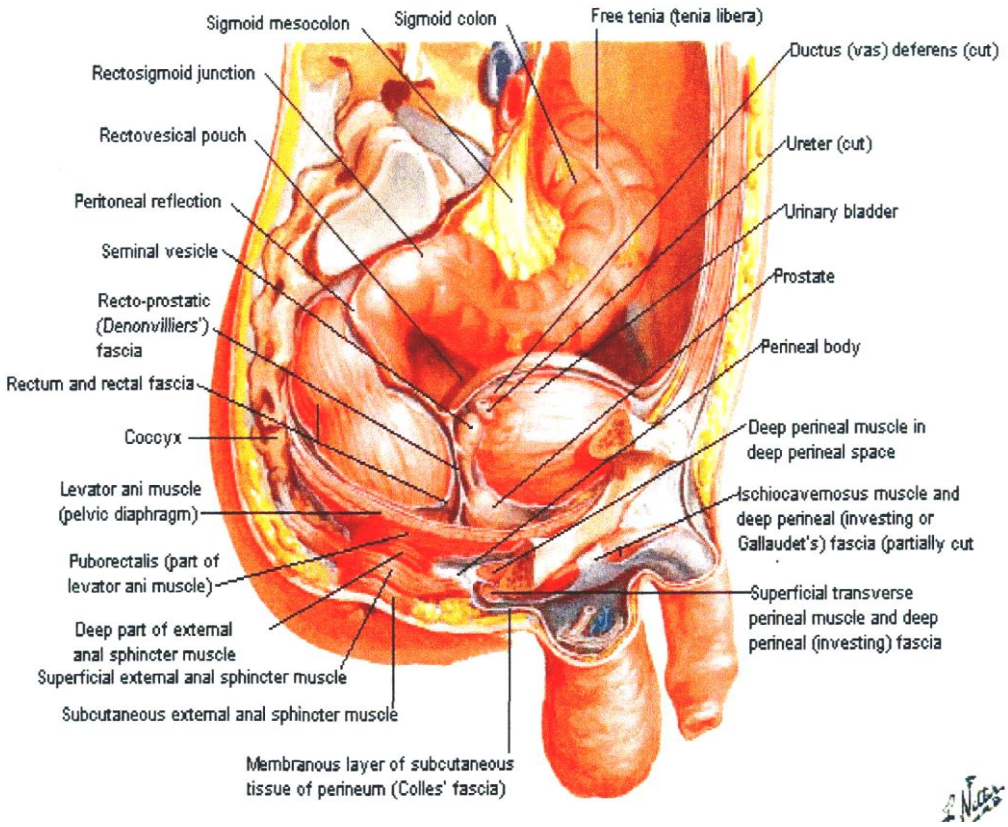

Figure (4A): Rectum of male in situ ***(Netter, 1997).***

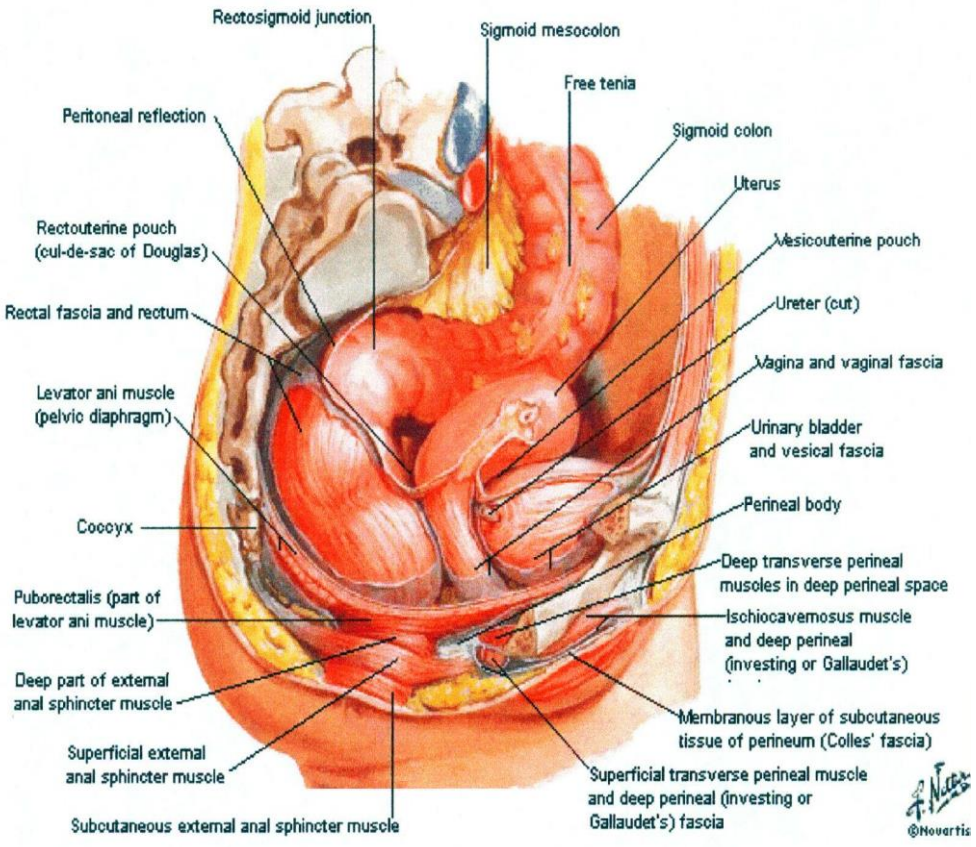

Figure (4 B): Rectum of female in situ ***(Netter, 1997).***