Pediatric Rectal Prolapse

An Essay

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of the Master Degree in General Surgery

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Dedication

I dedicate this work to

My father, mother,

All members of my family

and all who help me

List of contents

List of Figures

INTRODUCTION

Rectal prolapse is considered when part or all of the rectum protrudes through the anal orifice. It is partial when the rectal mucosa only protrudes and complete when all layers protrude ***(Shah et al., ٢٠٠٦)***.

Although it is frequently encountered in the frail elderly, yet it also occurs in children. The condition is most troublesome in the premature infants with significant associated comorbidities ***(Lee et al., ٢٠٠٦)***.

In infants and children prolapse of the rectum through the anus may involve only a small ring of mucosa or more commonly all layers of the rectum. It is usually seen at the age of ١ to ٣ years with males and females having equal incidence. The most common form of rectal prolapse is idiopathic. Children with conditions that tend to promote tenesmus, such as rectal polyps, worms, proctitis, ulcerative colitis, and cystic fibrosis also may have mild rectal prolapse. It is common in patients with conditions associated with deficiencies in either pelvic musculature or innervation as meningeomyelocele and exstrophy of the bladder ***(Rintala* and Pakarinen, ٢٠٠٦)**.

Rectal prolapse is prone to various complications as superficial infection and ulceration of the exposed mucosa, as well as intermittent bleeding with subsequent anemia. Moreover, in long standing cases proctitis may develop in

addition to weakness of the external sphincter that may compromise the continence mechanism ***(Koivusalo et al., ٢٠٠٦)***.

It is a self-limiting condition in infancy. Most cases respond to conservative management; however, surgery is occasionally required in cases that are intractable to conservative treatment ***(Antao et al., ٢٠٠٥)***.

Surgical intervention ranges from simple procedure as sclerotherapy or Thiersch wire to complex one as perineal or transabdominal bowel resection ***(Lee et al., ٢٠٠٦).***

AIM OF THE WORK

This essay aims to study the pathogenesis of rectal prolapse and to evaluate different treatment options in children and infants with highlights on new modalities of treatment.

ANATOMY OF THE RECTUM

The rectum is the terminal portion of the gastrointestinal tract. It is a linear organ in lower mammals; its name is derived from the Latin word rectus, which means straight. However, in humans, the rectum is curved and follows the shape of the sacrum and coccyx through the levator ani down and back to the anal canal. 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 ***(Nelson et al., ٢٠٠١).***

Anatomists typically consider the beginning of the rectum to be at the level of the third sacral vertebra. Other definitions include the following: ١٥ 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 ***(Nelson et al., ٢٠٠١).***

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 ***(Sinnatamby, ١٩٩٩)***.

The rectal lumen:

When the rectum is empty the mucosa forms a number of longitudinal folds in its lower part which become effaced during distension. In addition the rectum commonly has three (although the number can vary) permenant semilunar transverse or horizontal folds most marked in rectal distension known as valves of Houston ***(Neil, ٢٠٠٥).***

Two forms of horizontal fold have been recognized. One consists of the mucosa, a circular muscle layer and part of the longitudinal muscle, and is marked externally by an indentation. The other is devoid of longitudinal muscle and has no external marking ***(Neil, ٢٠٠٥).***

The most superior fold at the beginning of the rectum may be either on the left or right and occasionally encircles the rectal lumen. The middle fold is largest and most constant. It lies immediately above the rectal ampulla, projecting from the anterior and right wall just below the level of the anterior peritoneal reflection. The circular muscle is more marked in this fold than in the others. The most inferior and variable fold is found on the left c.٢.٥cm below the middle fold. Sometimes a fourth fold is found on the left c.٢.٥cm above the middle fold ***(Neil, ٢٠٠٥).***

Relations of the rectum:

The *anterior* boundary of the rectum 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 ***(Kaiser and Ortega, ٢٠٠٢)***.

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 ***(Kaiser and Ortega, ٢٠٠٢)***.

The *posterior* relations of the rectum include the sacrum, coccyx, levator ani muscles, the median sacral vessels, and the sacral nerve plexus roots ***(Kaiser and Ortega, ٢٠٠٢)***.

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 ١٢ to ١٥ cm from the anal verge. The anterior peritoneal reflection, or rectovesical pouch, is approximately ٨ cm from the anal verge in men. In women, the rectouterine pouch of Douglas is approximately ٦ cm from the anal verge ***(Heald and Moran, ١٩٩٨).***

Fascial relationships:

Inferior to the peritoneal reflection, the rectum is devoid of 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 ***(Heald and Moran, ١٩٩٨)***.

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 ***(Neil, ٢٠٠٥)***.

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 ***(Neil, ٢٠٠٥)***.

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 ***(Neil, ٢٠٠٥)***.

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 supero nterior portion of the ligament contains the middle rectal artery. The inferoposterior portion of the ligament contains the pelvic splanchnic nerves ***(Sato and Sato, ١٩٩١)***.

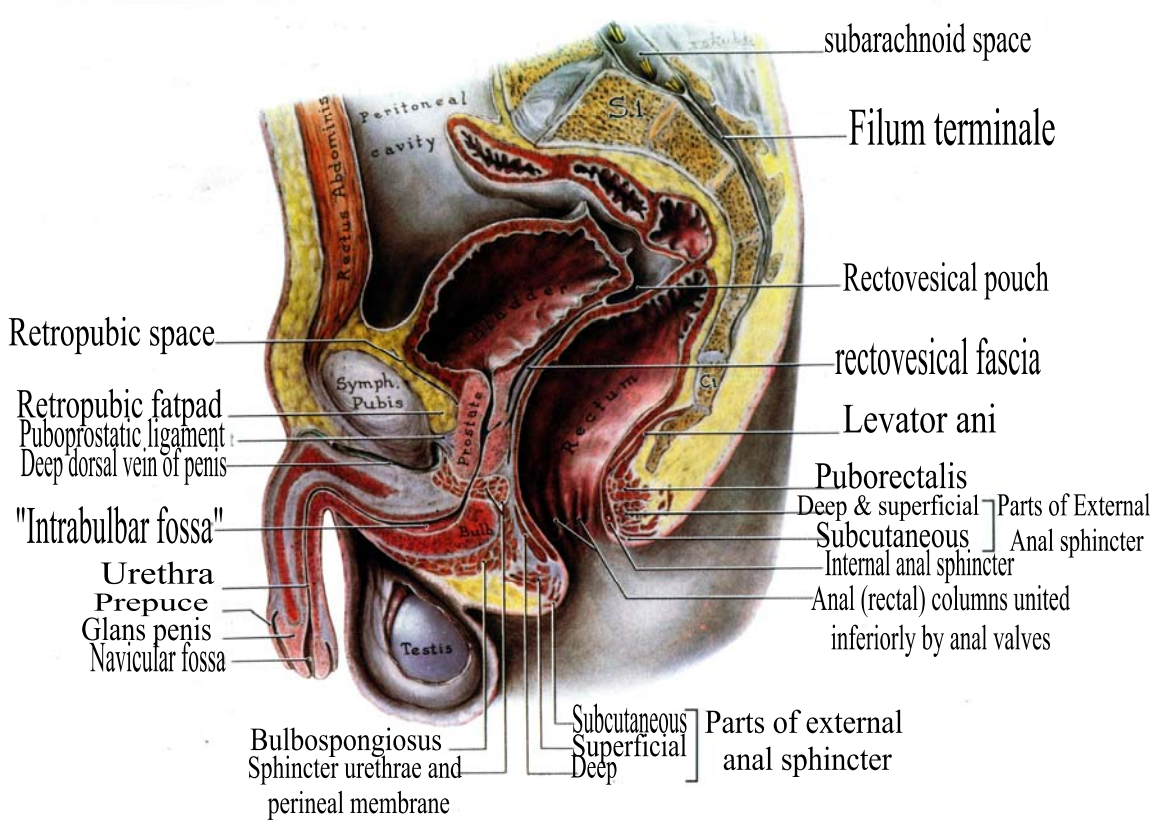

Fig. (١-١): Male pelvis, median section showing the rectum and anal canal ***(Agur and Lee, ١٩٩١).***

Supports of the rectum:

The rectum is kept in place although it is continuously under pressure during the act of defecation. The normal position of the rectum in relation to the sacrum is of a great surgical importance since the rectum follows the curve of the sacrum. The factors that help to keep the rectum in place can be summarized as follow ***(Borden and Snellman, ١٩٦٨):***

a) Extrarectal supporting factors:

(١) Peritoneal attachment: the peritoneum covers the upper two thirds of the anterior surface then it is reflected anteriorly to form the recto-vesical or recto-vaginal pouch. In females with complete rectal prolapse the recto-vaginal pouch is abnormally deep. The peritoneum also covers the upper third where it forms a short broad mesorectum and covers the lateral ligaments ***(Borden and Snellman, ١٩٦٨).***

(٢) The fasciae related to the rectum may be loose areolar connective tissue as in the recto-vesical fascia or condensed connective tissue as Waldeyer's fascia between the rectum and the sacrum, and Denoviller's fascia or lateral ligaments of the rectum connecting it to the sides of the pelvis ***(Borden and Snellman, ١٩٦٨)).***

b) Intrarectal supporting factors:

These are much more important aids that help in keeping

the rectum in situ and include the internal ridges of Houston's valves, integrity of the rectal wall, and the relation between the intra-rectal pressures with the anal valvular mechanism. The arrangement of this pressure on the rectal wall and the axis of its direction are other factors ***(Borden and Snellman, ١٩٦٨).***

Histological features:

The rectum comprises four separate layers:

- The mucosal layer is composed of three divisions; the *first* division consists of columnar epithelium comprising straight tubules that lie parallel to one another and do not branch; the glands of Lieburkuhn. The tubule surface is lined with simple columnar cells. The sides of the tubules are composed primarily of goblet cells, which secrete mucous. Neuroendocrine or amine precursor uptake and decarboxylation cells are located at the base of the tubules. The lamina densa of the basement membrane separates the epithelial layer from the connective tissue. The *second* division of the mucosa is the lamina propria, which contains the connective tissue stroma, including capillaries, inflammatory cells, and lymphoid follicles. The *third* division is the muscularis mucosa, which is composed of smooth muscle ***(Wexner and Jorge, ٢٠٠٥).***

- The submucosa is the next layer of the rectum and is composed of connective tissue, including vessels, lymphatics, and Meissner's plexus. This layer provides strength for anastomosis ***(Wexner and Jorge, ٢٠٠٥).***