

ANATOMICAL CONSIDERATIONS IN THE RECTAL PROLAPSE OF INFANTS

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IN a former paper contributed to this journal I have drawn attention to certain functional characteristics of the perirectal tissue. In this I confirmed statements already made by my former colleagues, to whose work references are there given.⁷ In the dissection of the pelvis of the full-term foetus and the infant, certain additional facts have come to light which possess their own significance in the consideration of cases of rectal prolapse.

The investigation of cases of so-called rectal prolapse resolves the condition into three types, which are described by clinicians as commencing in varying situations:

1. At the anal margin.
2. At a certain distance above the anal margin and protruding.
3. At a higher level (pelvic colon) and not protruding.⁹

The second and third of these types clearly belong to the class of intussusceptions, differing from the ordinary clinical condition known as intussusception only in that the entering portion of bowel commences its progress through the intussusciens low down in the distal colon; it may be in the rectum itself. The anatomical features of the distal colon show there to be two situations favorable for the development of an intussusception. These are the pelvirectal junction and the subdivision of the rectum at the great valve of Houston. For at each of these positions there is a more or less marked infolding of the bowel wall, and both correspond to the junction of a higher comparatively mobile portion of the bowel with a lower, more fixed portion.

The nature of the fixation differs in the two instances. At the junction of pelvic colon with rectum there is the sudden loss of the mesocolon. The change from the presence to the absence of the mesentery cannot, however, be a very potent factor in inducing intussusception. Indeed, from the looseness of the subperitoneal tissue in this area one might well doubt whether it would have any importance at all.

In the case of the lower situation, namely, the location of the great valve of Houston, the problem is a different one, and one for which a more plausible solution is indicated. The muscular diaphragm of the pelvis, constituted in large part by the two levatores ani, is generally held to be the main support of the rectum. As I showed in the previous article, this is only partially true. Lack of tone in the pelvic diaphragm

will certainly allow the rectum to become prolapsed to a limited extent. But the muscles indicated are not the only or indeed the main support of the rectum. The organ is upheld by the attachment to it of the perineural and perivascular tissue known as the rectal stalks¹ or *les ailerons*.⁶ These form the lateral portions of the fascia propria,⁴ part of which does not become thinner as it passes upward, as Waldeyer suggested,¹⁰ but is attached to the sacrum at the level of the third sacral vertebra or thereabouts.⁷ The rectal stalks comprise the tissue surrounding the middle hæmorrhoidal vessels and visceral pelvic nerves, of which branches from the third and fourth sacral trunks pass to the rectum. They are attached to the lateral walls of the perineal chamber^{8, 11} or ampulla of the organ. Hence this portion of the rectum is more fixed than the pelvic chamber to which no portion of the stalks is attached.

It is not, however, intended in this paper that attention be directed to intussusceptive forms of rectal prolapse, but rather to that type which commences at the actual anal margin, and which is thus a true prolapse or procidentia of the rectum.

Inasmuch as the manner of support of the rectum is concerned in cases of rectal prolapse, and in view of the occurrence of this condition in infants and young children, it may be of service to put on record the results of investigation on the infant pelvis.

On consultation of the literature for the accepted or suggested etiology of prolapse, some of the causes given recommend themselves with greater force than others to one's judgment. Overloaded rectum and straining at stool naturally have their place in the etiology of the condition, in association with other causative factors, such as lack of muscular tone in the pelvic diaphragm and diminution of the fat in the ischio-rectal fossæ occurring in rickets and wasting diseases. As is well known, the sacrum of the infant is straighter than that of the adult, and consequently the rectum is more vertically placed. It is conceivable that all these factors, acting in harmony, will tend to produce rectal prolapse in young children. On the other hand, prolapse of a very persistent and troublesome nature does occasionally occur in children who, apart from the condition indicated, show no departure from normal health. Of other suggested causes, the so-called laxity of the submucosa, which is said to permit movement of the mucous membrane on the muscularis, cannot account for more than a mere pouting of the mucous membrane, for the laxity cannot be more than the blood-vessels which pass through the submucosa will allow. Laxity of the connections of the rectum with the sacrum is also given as a cause of prolapse in infants. But as will shortly be shown, there is no greater laxity in these attachments than there is in the adult.

A sagittal section of the pelvis at birth shows that the position of the rectum relative to that of the bladder (and of the uterus in the female) differs from the adult relation in that the latter organs are placed at a higher level in association with the small capacity of the pelvis. In other

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words, the rectum at birth is already in a position of mechanical disadvantage, inasmuch as it occupies a lower site than the other organs which, in later life, also descend entirely into the true pelvis. Since the plicæ transversales, or valves of Houston, are present in embryonic life, the exact position of the rectum relative to the vertebral column may be ascertained. In the dissection of a series of pelves of new-born infants I find that the third or great valve of Houston lies opposite the fifth piece of the sacrum on the average, the variation being from the level of the fourth sacral to that of the first coccygeal vertebra. Hence at birth the third plica transversalis has already reached its adult position. This is the most constant portion of the rectum, and was therefore chosen as the indication of the true level of the organ compared with the vertebral bodies. Since I drew attention to this point,⁸ it has been brought out again by F. P. Johnson in a paper which gives additional information on the development of the rectum² beyond that which lay within the scope of my observations.

This site is, as one would expect, retained during childhood.⁵ Hence one may say that while the rectum in the infant occupies the same position relative to the vertebræ as in the adult, yet it is in a position of greater mechanical disadvantage from the higher position occupied by the bladder and uterus, as well as from the straight character of the sacrum, which cannot relieve the organ from pressure of overlying viscera as can the more curved sacrum of the adult.

Next one may consider the question of laxity of the attachments of the rectum to the sacrum in the infant.

The fascia propria of Waldeyer, apart from any continuation upwards into the fascia of the pelvic mesocolon,¹⁰ has a definite attachment (rectosacral aponeurosis) to the hollow of the sacrum between the third sacral foramina,⁴ forming a capsule for the rectum.³ The lateral parts of the rectosacral aponeurosis comprising the fibromuscular tissue around the middle hæmorrhoidal vessels and visceral pelvic nerves has, in view of its relation to the last named, some fixation to the sacrum in the region of the second, third and fourth foramina (rectal stalks). It is to be remembered that only the third and fourth sacral nerves actually send branches to the perineal chamber of the rectum, but there is no anatomical subdivision of the fascia surrounding the several nerves. These nerves, vessels, and surrounding fascia correspond to the substance of the mesenteries by which other parts of the alimentary canal are supported. In a number of cases I made dissections of the rectal stalks in new-born infants and found that the stalk, simply isolated and as yet undissected, measures about half the length of the contained vessels and nerves if they are freed from vascular and perineural fibromuscular tissue. I found that these proportions obtained also in the adult specimens used as controls. For example, in a new-born female child the sacrum of which measured 42 mm. in length, the isolated but undissected

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rectal stalk measured 12 mm., while the dissected stalk consisting of nerves only was 22 mm. long. The corresponding measurements in a male infant, the sacrum of which measured 40 mm., were the following: Undissected stalk, 12 mm.; nerves only 25 mm. This comparative length of nerves and vessels allows some possibility of movement of the rectum as a whole, but so long as they remain uninjured, the movement of the organ is necessarily limited. In no case did I find the dissected rectal stalks long enough to allow the great valve of Houston to descend so far as the anus. In the female infant above mentioned, the distance from the great valve to the mucocutaneous anal junction was 36 mm.; in the male, 37 mm. With a maximum length of rectal stalk of 22 and 25 mm., respectively, it is plainly seen that prolapse must be limited. The same approximate proportion is found in the adult.

In a male subject of thirty-five years of age, in which the dissected rectal stalks measured 60 mm., the sacrum was 115 mm. in length and the distance from the great valve of Houston to the mucocutaneous anal junction 75 mm. The length of the dissected rectal stalk is approximately one-half that of the sacrum. In a female twenty-five years old it was 55 mm. in length, the sacrum being 110 mm. long. The undissected rectal stalks in the adult male cited each measured 30 mm.; in the adult female, 20 mm.

As a result of the investigation, I find that in the adult the increase in possible length of the rectal stalk corresponds roughly with the amount to which the rectum can be drawn out of a perineal wound when the levatores ani, but not the stalks, have been completely severed. In the infant the length of the rectal stalks and their increase in length on dissection correspond proportionately to the condition found in the adult. There is, therefore, no greater laxity of the rectosacral attachments in the infant than in the adult. In both there is sufficient play in the rectal stalks to allow a certain limited prolapse in the presence of other accessory causative factors and without damage to the nerves and vessels themselves. In such instances, the prolapse must obviously be temporary, and it would appear unnecessary to resort to operative measures for its treatment.

SUMMARY

1. As estimated by the position of the great valve of Houston, the rectum at birth presents practically the same relation to the vertebral column as in the adult.
2. Similarly the rectal stalks are of the same proportionate length in the infant as in the adult. Hence in the former there is no greater laxity than in the latter.
3. The only anatomical characters which can be of special importance in infantile prolapse are the comparatively straight sacrum and consequently more vertical rectum.

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