

## Anatomical Study of Rectal Fascia and Connective Tissue Structures Surrounding the Rectum

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The aim of the study is anatomical investigation of rectal fascia and its relation to perirectal connective tissue structures and spaces. Materials were from adult cadavers and human fetuses. They were dissected and examined histologically. The results show that rectal adventitia and rectal fascia are situated circularly around the extraperitoneal part of the rectum. Rectal fascia is bordered behind by retrorectal space, laterally is connected with pararectal pelvic space by lateral ligament and in front is part of recto-urogenital septum. There are collagen and single elastic fibres in the rectal fascia on histological sections. The rectum with rectal adventitia and fascia compose an integrated morphological compartment.

*Key words:* rectal fascia, rectal adventitia, pelvic fascias.

### Introduction

Rectal fascia has the cardinal role among perirectal structures according to rectal cancer management. The first known description of rectal fascia has been given by Rumanian surgeon and anatomist T. Ionescu in 1890. He described “la gaine fibreuse du rectum” (fibrous envelope of the rectum), which circularly surround the extraperitoneal part of the rectum [2]. The review of contemporary publications shows that there are differences in description of rectal fascia. Because of that the aim of the study is macroscopic and histological investigation of rectal fascia and perirectal connective tissue structures and spaces.

### Materials and Methods

We dissected precisely six embalmed with formaldehyde adult cadavers (three male and three female) without pelvic pathology. For histological investigations we used specimens from four fresh adult cadavers (two males and two females) without pelvic pathology. Samples after fixation were included in paraffin and cut at 4 µm. Sections were stained with Haematoxylin & Eosin, Azan, Van Gieson, Orcein and immunostaining with S-100 proteins (to present the nerve fibres). The same histologi-

cal methods were applied for specimens obtained from two (one male and one female) human fetuses with age 17 -19 weeks. On this fetal age the pelvic fascial structures are already developed and this gave us opportunity to investigate the precise topography and relations of perirectal fascias, ligaments and spaces [3].

## Results

The rectal adventitia is situated round the muscular wall of the extraperitoneal part of the rectum between rectosigmoid and anorectal junctions (Fig. 1). It is composed of fat and loose connective tissue, branches of superior rectal artery, tributaries of superior rectal vein, perirectal lymph nodes and nerve fibres. The adventitia is the most developed dorsally, decreased laterally and is the thinnest anteriorly.

The rectal fascia is a thin sheet of connective tissue, intimately connected with underlying adventitia and has the same contour as the rectal adventitia. Its cranial beginning is situated just behind superior rectal artery. Rectal fascia is continuing and ending in subperitoneal connective tissue in peritoneal rectal walls. It is connected with longitudinal muscle layer of the anal canal. It is composed of collagen fibres intermingled with elastic fibres and fat tissue.

The retrorectal space is situated behind rectal fascia. There is loose connective tissue in it. The outer border of this space is inner layer of urogenital fascia (Fig. 2). Rectosacral fascia is a quadrangular sheet composed of collagen fibres, some elastic fibres and smooth muscles. It starts from the periosteum of fourth sacral vertebra and pass towards the rectal fascia in caudal and ventral direction (Fig. 3).

Rectal fascia is connected with pararectal pelvic space by lateral ligaments of the rectum, were autonomic nerves from inferior hypogastric plexus (rectal branches), small vessels and some collagen fibres are present.

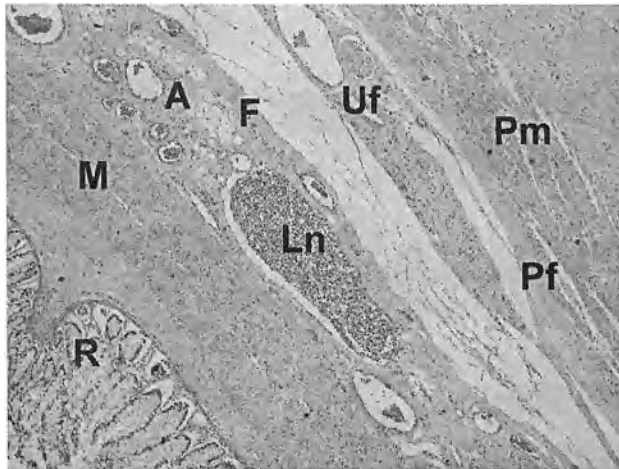


Fig. 1. Presenting of perirectal structures on histological section from human fetus (R — rectal mucosa, M — tunica muscularis, A — rectal adventitia, F — rectal fascia, Ln — perirectal lymph node, Uf — urogenital fascia, Pf — parietal fascia, Pm — p.piriformis). H&E staining,  $\times 60$

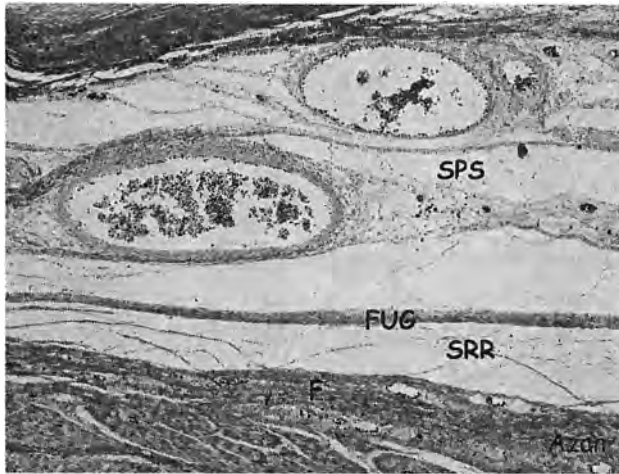


Fig. 2. Fascias and spaces behind the rectum on human fetus. (F — rectal fascia, SRR — retrorectal space, FUG —urogenital fascia, SRS —presacral space with venous plexus). Azan staining,  $\times 100$

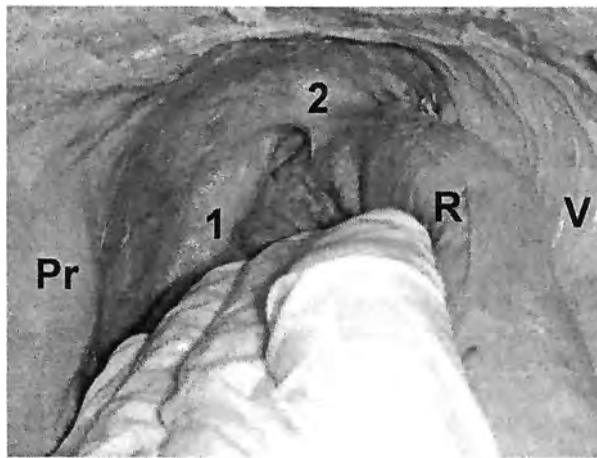


Fig. 3. Presenting of rectosacral fascia (1) and lateral ligament (2) on anatomical specimen from embalmed adult male cadaver (Pr — promontorium, R — rectum, V— urinary bladder)

Rectal fascia is a part of the recto-urogenital septum in front of the rectal wall. It is separated from peritoneoperineal fascia by prerectal space, filled with loose connective tissue. Peritoneoperineal fascia is structured by collagen and elastic fibres with longitudinal smooth muscle bundles and many nerves (Fig. 4).

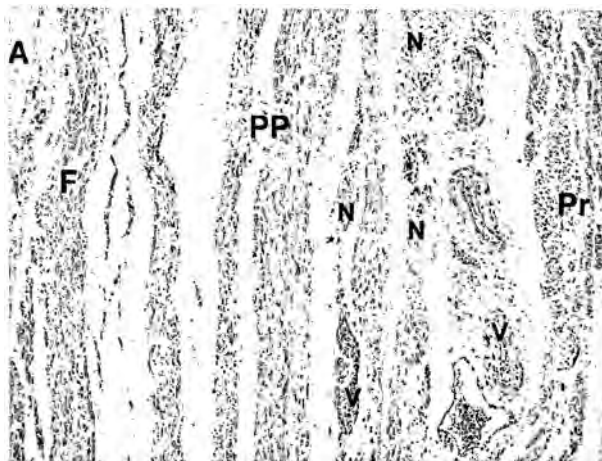


Fig. 4. Presentation of rectoprostatic septum in section from adult male cadaver (A — rectal adventitia, F — rectal fascia, PP — prostatoperitoneal fascia, Pr — prostate, N — nerve fibres, V — periprostatic blood vessels). H&E staining,  $\times 60$

## Discussion

Our description of rectal adventitia and fascia is similar to this of H. Fritsch [3], and I. Bissett and coauthors [1]. On the other hand, we do not agree with R. Heald and B. Moran [4] who believe that rectal fascia is situated only behind the rectum. About urogenital fascia we agree principally with the descriptions of V. Muntean [7]. We share the view of T. Takahashi et al. [10] about lateral ligament's topography and structure, but we cannot accept the statement of O. Jones et al. [5] that lateral ligament do not exist really and is "artifact, produced during surgical technique". Our description of rectal and peritoneoperineal fascia in recto-urogenital septum coincide with this of I. Lindsey and coauthors [6]. However, we did not find two anatomical separate layers of peritoneoperineal fascia, as M. Nano et al. [8] presented. We believe that "posterior layer" of the peritoneoperineal fascia is in fact the rectal fascia; the statement is maintained by A. Ophoven and S. Roth [9] as well.

In conclusion we can state that rectum with rectal adventitia and rectal fascia composes an integrated morphological compartment, separate from other pelvic connective tissue.

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