Background: In recent years, great attention has been paid to the reciprocal influence between malignant tumor and tumor-associated stromal elements. However, it has also been shown that the changes are noticeable in distant mucosa. Connective tissue of rectal mucosa in the remote surrounding of the malignant tumor shows structural disorganization and the aim of our study was to quantify those changes using image analysis.

Materials and methods: Morphometric study of rectal mucosa was performed in samples taken 10 cm and 20 cm away from the malignant tumor during endoscopic examination of 13 patients of both sexes. The samples of rectal mucosa were obtained from 5 healthy controls during active screening for asymptomatic cancer. Tissue sections were routinely stained with Gomori’s silver impregnation technique. Microphotographs were acquired with a digital camera Olympus C3030-Z connected to a light microscope Opton Photomicroscope III. Measurements of the spacing between reticular fibers were performed using plugin BoneJ within open-source software Fiji. Results were statistically analyzed with Mann-Whitney U test.

Results: At the distance of 10 cm away from the tumor lesion a significant increase in diameter of the spaces between the reticular fibers was observed (5.41±2.34μm), in comparison with both healthy controls (3.77±2.34μm) and tissue samples taken 20 cm away from the tumor (3.75±1.14μm).

Conclusion: Tumor induces structural changes of connective tissue in the remote, uninvolved lamina propria of rectal mucosa 10 cm away from the malignant lesion.

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Fig. 1: Rectal mucosa of a healthy person. Reticular fibers of lamina propria are closely appositioned and orderly organized. Gomori's silver impregnation; x630

Fig. 2: Rectal mucosa taken 10 cm away from the malignant tumor. Reticular fibers of lamina propria show irregular organization. Spaces between the fibers are enlarged. Gomori's silver impregnation; x630

Fig. 3: Rectal mucosa of a healthy person. Graphical output from BoneJ. Spaces between closely appositioned and orderly organized reticular fibers, as presented by red rectangle in Fig. 1, measured with plugin Thickness. Yellow regions have larger diameter than blue regions.

Fig. 4: Rectal mucosa taken 10 cm away from the malignant tumor. Graphical output from BoneJ. Enlarged spaces between reticular fibers, as presented by red rectangle in Fig. 2, measured with plugin Thickness. Yellow regions have larger diameter than blue regions.