Magnetic Resonance Imaging (MRI) with retrograde intra-lumen contrast enhancement of the rectum in diagnostics of rectovaginal fistulas after combination therapy of rectal cancer. Experience of application

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Abstract. Experiment of use of MRI in diagnostics of rectovaginal fistulas after combination therapy of rectal cancer is shown on clinical examples. We used retrograde contrasting of a rectum with 150ml ultrasonic gel to make MRI more informative in case of low diagnostic efficiency of ultrasound, colonoscopy and gynecological examination.

1. Introduction
Rectal cancer accounts for 2-10% of all cancer cases and for 25-30% of all gastrointestinal tumors. Surgery remains the treatment of choice for rectal cancer. The combination rectal cancer therapy includes radiation/chemoradiation therapy which increases the risk of surgical complications [1]. Failure of entero-entero anastomosis sutures after resection of the rectum is an important concern. The rate of this complication reaches 12.6-18.6% [2, 3, 4]. Rectovaginal fistulas after resection of the rectum occur in 3–5.2% of cases [5, 6] and need to be corrected surgically. Rectal and gynecological examinations are not always informative. Ultrasound studies in circumstances of postoperative and postradiation changes are not always effective for a detailed evaluation of anastomosis. Videocolonoscopy identifies anastomosis defects almost in 100% of cases; however, it fails to evaluate surrounding tissues. MRI is a method of choice in diagnosis of pathologies in the pelvis [7,8]. In case of rectal cancer, MRI is a method of choice in diagnosis of pathologies in the pelvis [7,8]. In case of rectal cancer, MRI is a method of choice in diagnosis of pathologies in the pelvis [7,8]. After the completion of the therapy, MRI is used for diagnostics of recurrences and evaluation of postoperative changes [11,12,13,14]. Despite its high resolution, MRI sometimes fails to detect small defects of the wall in the postoperative and postradiation period. Only a few studies analyze the effectiveness of MRI for postoperative complications [15,16]. At the present time, there is no effective method for the diagnostics of rectovaginal fistulas and surrounding tissues.

We have summarized our experience of using MRI with retrograde contrast enhancement for diagnostics of rectovaginal fistulas.
2. Methods

a. MRI acquisition
MRI was performed with MAGNETOM ESSENZA scanner (SIEMENS, Germany), with field strength of 1.5 T, using a body matrix coil in T2-weighted sequence. Both axial and sagittal projections were used, with a section thickness of 3 mm (TR-4900 ms, TE-87 ms). The examination was performed after a standard bowel preparation. MRI was conducted prior to and after retrograde filling of the rectum. In all cases, the doze administered through the rectum was well tolerated by patients.

2.2 Modification of MRI techniques
We filled the rectum with 100-120 ml of a radiopaque to make MRI more informative. We used a special ultrasound gel as a radiopaque to be filled in the rectum.

3. Clinical example

b. Clinical example 1
Patient M., female, 50 years of age, received the combination therapy of rectal cancer (stage IIA, with pT3N0M0) in our clinic. The neoadjuvant radiation therapy (total dose 40 Gy) and the anterior resection of rectum were performed. After the surgery, a rectovaginal fistula developed. Gynecological and ultrasound examinations failed to detect the fistula. MRI failed to detect the fistula until contrast enhancement of the rectum with the ultrasound gel was used (Figure 1).

![Figure 1](image1.png)

Figure 1. Sagittal T2-weighted MRI images without contrast enhancement of the rectum with the ultrasound gel. No fistula is identified.

Contrast enhancement of the rectum with 120 ml of the ultrasound gel allowed us to visualize the rectum and the vagina filled with the radiopaque and to identify the fistula on the anterior wall of the rectum. (Figure 2).

![Figure 2](image2.png)

Figure 2. Axial T2-weighted MRI images with contrast enhancement of the rectum with the ultrasound gel. A fistula, as well as the rectum and the vagina filled with the gel, are identified.
The plastic reconstruction of the rectovaginal fistula was performed. At the expiration of 2 months after the surgery, MRI without contrast enhancement of the rectum did not identify a fistula (Fig. 3a, 3b). Contrast enhancement of the rectum with the gel did not show a fistula either. The gel did not penetrate into the vagina. (Figure 3).

![Figure 3. Axial T2-weighted MRI images with contrast enhancement of the rectum with the ultrasound gel. No fistula is identified.](image)

c.

**Clinical example 2**

Patient G., female, 63 years of age, received the therapy of rectal cancer (stage IIA, with pT3N0M0) in our clinic. The neoadjuvant radiation therapy (total dose 40 Gy) and the anterior resection of rectum were performed. After the surgery, a rectovaginal fistula was identified. The fistula was not detected by gynecological examination. Video colonoscopy identified a 2-3 mm opening on the anterior wall of the rectum. When air was supplied, the patient noted some air coming out from her vagina. The plastic reconstruction of the rectovaginal fistula was performed. At the expiration of 3 months after the surgery, gynecological examination did not detect a fistula. Video colonoscopy identified a 1-2 mm opening on the anterior wall of the rectum.

MRI without contrast enhancement of the rectum did not visualize a fistula, but detected some signs of inflammation in the region of anastomosis (Figure 4). MRI with contrast enhancement of the rectum (120 ml of the gel) identified a rectovaginal fistula and showed a penetration of the gel into the vaginal lumen. (Figure 5).

![Figure 4. Axial T2-weighted MRI images without and with contrast enhancement of the rectum with the ultrasound gel. No fistula is identified.](image)

Taking into account the changes shown by MRI, the anti-inflammatory therapy was prescribed to the patient. Plastic reconstruction of the fistula is planned.
4. Discussion
The presented case studies demonstrate that MRI with contrast enhancement of the rectum is informative for diagnostics of rectovaginal fistulas after combination therapy of rectal cancer. This method is informative when gynecological and ultrasound examinations fail. Fiber-optic colonoscopy of rectovaginal fistulas is effective, but it fails to evaluate the surrounding tissues and the rectal wall. The advantages of MRI with contrast enhancement of the rectal lumen include simplicity and a good tolerability. This method makes it possible to identify rectovaginal fistulas and to evaluate the rectal wall and the vaginal wall, which is useful for planning a surgical treatment of fistulas.

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