

CLINICAL STUDY

Modified Martius graft – a renaissance of surgical procedure

DOBROVODSKY Andrej^{1,2}, PECHAN Juraj^{1,5}, DUFFEK Marian^{3,4}, SKUTA Radovan², HUSTAK Rastislav²

Faculty Hospital Trnava, Slovakia. andrej.dobrovodsky@fntt.sk

ABSTRACT

AIM: The rectovaginal fistula (RVF) is relatively uncommon and by clinical manifestations grave illness. The surgery treatment of RVF is extremely demanding and represents the subject of frustration for many surgeons. Miscellaneous etiology of RVF and various heights of fistula in a rectovaginal septum are crucial for the choice of surgical procedure. Despite targeted treatment, more than one-half of rectovaginal fistulas recurs.

We evaluated the frequency of recurrences after surgical treatment by modified Martius graft and its influence on continence and quality of life. The necessity of concomitant colostomy when performing modified Martius graft was the secondary aim.

METHOD: We collected and analyzed 8 years of data from our patient database. There were admitted 21 female patients with diagnosis RVF to the Surgery department of Faculty Hospital Trnava. Unfortunately, only 5 patients, concerning the etiology of disease and clinical state, were indicated for surgery by modified Martius graft. All RVFs were low and a defect in the rectovaginal septum wouldn't exceed 1.5 cm in diameter.

RESULTS: Due to the small sample and non-confirmation of normality in all variables, nonparametric comparison tests were chosen for paired samples differences. We used the Wilcoxon sign-rank test and counted the effect sizes expressed the success of the treatment. Each female patient with low RVF included in this study has healed. The mean value of a complete healing of RVF in our cohort was 12 weeks. We had discovered one recurrence after surgery, that was successfully repaired by contralateral modified Martius graft. The significant decrease of Wexner fecal incontinence score in the observed group ($p < 0.05$, $r = 0.639$) and slightly elevated Cleveland Clinic Constipation Scoring System ($p < 0.05$, $r = -0.577$) were confirmed. The protective colostomy was performed just once. Only two sections of the SF-36 Health Survey – the physical functioning and the bodily pain, were without significant changes. The rest of the watching sections of SF-36 have changed significantly.

CONCLUSION: Treatment of low rectovaginal fistulas (LRVF) by modified Martius graft is followed by a low percentage of recurrences. It should be the first-line therapy in the algorithm of surgical treatment of LRVF, without the necessity of protective colostomy (Tab. 2, Fig. 3, Ref. 27). Text in PDF www.elis.sk

KEY WORDS: rectovaginal septum, rectovaginal fistula, fecal incontinence, bowel habit, interposition flap.

Introduction

A rectovaginal fistula is defined as an abnormal epithelial cell communication between the rectum and the vagina. Although the etiology of RVFs and perirectal fistulas mostly differs from each other, they are together enrolled in the same group of perirectal fistulas. RVFs comprise only 5 % of all perirectal fistulas (1). Childbirth trauma is the cause of RVF in 88 % (2). However, RVFs are quite infrequent after childbirth with episiotomy. Other etiologi-

cal factors are gynecological procedures, surgery of pelvic floor, and proctological procedures (3) especially those, where meshes and staplers are used. Inflammatory bowel disease, various local inflammations, and abscesses, neoplastic or metastatic infiltration of rectovaginal septum, pelvic radiotherapy, and decubitus of rectovaginal septum due to a forgotten diaphragm might be the cause of RVF too.

There are distinguished simplex and complex rectovaginal or anovaginal fistulas. As far as the height of RVF is concerned, there is low, middle, and high fistula and the determinative element is a relation of a fistula to the back vaginal wall. There exist none generally accepted classification of RVFs. De facto, there are only low and high RVF in the clinical practice. Some authors describe anovaginal fistulas (4), which have at least one fistula opening in the anal canal and a second in the vaginal introitus. RVFs in the middle vagina are very rare thanks to the anatomical structure of the vagina. It is very important to distinguish complicated fistula with or without abscess in clinical practice. A clinical image may

¹Faculty of Medicine, Slovak Medical University in Bratislava, Slovakia, ²Faculty Hospital Trnava, Slovakia, ³Central Military Hospital Ružomberok – Faculty Hospital, Slovakia, ⁴Comenius University Jessenius Faculty of Medicine in Martin, Slovakia, and ⁵National Oncology Institute, Bratislava, Slovakia

Address for correspondence: A. DOBROVODSKY, MD, Faculty Hospital Trnava, A. Zarnova 11, SK-917 02 Trnava, Slovakia.
Phone: +421.33.5938858

change, depending on running reparative and healing processes. An obvious surgeon's mistake is not to wait for an adequate time for mature fistula tract (5). The surgery soon after determination of diagnosis, in the time of running pelvic sepsis, can lead to a recurrence of RVF.

Diagnosis of RVF is usually based on a thorough history of examined patient (6). The patient suffers from spontaneous flatus, mucus, and/or fecal leakage, eventually recurrent vaginitis. It's necessary to think about the clinical symptoms of Crohn's disease. That's why a colonoscopy examination is recommended for each patient with RVF. The computed tomography or magnetic resonance of the pelvis is indicated if debatable results of examinations and ambiguous history are taken. The gynecological examination excludes or confirms the presence of gynecological neoplasia. A thorough clinical examination with an evaluation of anal sphincter function is crucial before planning a surgical procedure. The endorectal ultrasound and anorectal manometry help us to check the functional status of the anal sphincter.

The clinical division of RVFs and their etiology determine the treatment modality and a suitable choice of surgical procedure. The trans-abdominal approach is indicated in the case of high RVF. The rectal resection with the omental flap interposition is usually performed. Colovaginal fistula due to severe diverticulitis is a typical example. Endorectal, transvaginal, trans-perineal or combine surgical procedures are indicated in the case of anovaginal or low rectovaginal fistulas. The endorectal advancement flap is the most frequent procedure used to treat RVFs with a success rate with big differences. If anal sphincter reconstruction is added, the result of an operation is better (7, 8). Surgical procedures based on principles of plastic surgery are the separate chapter of treatment RVFs. There is the interposition of the flap between the rectum and vagina, for example, gracilis muscle or adipose tissue of the vagina. However, the treatment of primary disease leading to the origin of RVF, for example, Crohn's disease, is essential. Treatment with biologics can lead in half of the cases of Crohn's RVFs to its permanent healing (9). There are quite good results with stem cells application in Crohn's RVFs too (10). Likewise, the injection of stromal vascular fraction derived from adipose tissue to surroundings of local flap covering fistula opening is a promising treatment modality of the radiation-induced RVF (11).

Heinrich Martius in 1928 had described the way, how to treat vesicovaginal fistula with the help of an interposition flap from adipose tissue of the vagina and bulbocavernosus muscle. The flap was implanted to perivesical space and front vaginal wall (12). It was several times modified. Elkins et al. proved an excellent blood supply of fatty tissue of the vagina and good firmness and consistency thanks to the arrangement of its connective tissue (13). That is why, the transposition of adipose tissue of the vagina with nutrition vessels to the rectovaginal septum, without bulbocavernosus muscle, was the last modification of this procedure. It's called a modified Martius graft.

The procedure is not difficult. It is necessary to find with a doppler ultrasound the terminal branches of the internal pudendal artery posteriorly and mark their localization on the skin. The procedure starts with a vertical skin incision of the labium majus



Fig. 1. Tunnel between dissected rectovaginal septum and freed adipose tissue flap.

medially from bulbocavernosus and ischiocavernosus muscles. Described fatty tissue is well bordered and more solid in consistency than surrounding tissue. Its preparation is quite easy thanks to the fibrous capsule. The cut-off anterior branch of the external pudendal artery is crucial for a perfect mobilization of the flap. The posterior pedicle must not be cut off. The length of the flap after mobilization is from 8 to 15 cm. It easily covers the opening in the rectovaginal septum without tension. The preparation of the rectovaginal septum and transection of RVF is the next step. The former must be performed at least 1 cm above the opening of RVF to ensure sufficient overlap of the defect in the rectum and vagina. The preparation of a tunnel between the rectovaginal septum and freed dorsal pedicle continues (Fig. 1). This tunnel must not be narrow, not to compress the nutrition artery. After fistulectomy and suturing the defect, fatty tissue of the flap is fixed at the place of the previous RVF. The long-term resorbable suture material is used. The procedure ends with suturing the perineal and labial skin incision and wound drainage (14).

Methods

Female patients with rectovaginal fistula sent to the proctological outpatient clinic of Faculty Hospital Trnava were enrolled in this study. The data had been collected for 8 years, from January 1, 2012 to December 31, 2019. Only 5 female patients from an overall number of 21 with rectovaginal fistula fulfilled the inclusion criteria and underwent a modified Martius graft procedure. One patient was operated twice. A low rectovaginal fistula was confirmed in each case. All the patients were in good physical condition and nutrition state before planning the procedure. They had been informed about all the details of the upcoming surgical procedure and subsequently signed an informed consent. All the candidates underwent a proctological examination with an anoscope, proctoscope, and anorectal ultrasound. The latter mentioned

Tab. 1. Descriptive statistics and normality testing (Shapiro Wilk) of the 1st and 2nd variables measurements.

	M	Median	SD	Min	Max	Shapiro-Wilk's normality test
Physical functioning 1	82.5	85	11.3	70	100	.212
Physical functioning 2	87.5	90	10.8	70	100	.659
Role limitations due to physical health 1	4.2	0	10.2	0	25	.000
Role limitations due to physical health 2	62.5	50	30.6	25	100	.101
Role limitations due to emotional health 1	5.6	0	13.6	0	33.3	.000
Role limitations due to emotional health 2	77.8	83.4	27.2	33.3	100	.091
Energy/fatigue 1	60.0	60	7.1	50	70	.960
Energy/fatigue 2	79.2	80	13.9	55	95	.525
Emotional well-being 1	44.0	40	16.8	24	68	.566
Emotional well-being 2	86.0	88	14.0	60	100	.189
Social functioning 1	8.3	0	15.1	0	37.5	.003
Social functioning 2	62.5	62.5	19.4	37.5	87.5	.456
Pain 1	70.0	77.5	11.6	55	77.5	.001
Pain 2	81.3	77.5	16.9	55	100	.212
General health 1	54.2	55	18.0	35	75	.185
General health 2	76.7	80	18.3	45	100	.583
Health change 1	37.5	50	30.6	0	75	.101
Health change 2	83.3	100	25.8	50	100	.001
WS 1	16.0	16	1.3	14	18	.101
WS 2	4.8	2.5	5.6	1	16	.007
CCCS 1	4.5	4.5	1.9	2	7	.961
CCCS 2	5.2	5.5	1.8	3	7	.158

Tab. 2. Results of the paired samples difference testing (Wilcoxon signed-rank test).

	Ranks	N	Mean Rank	p	r*
Physical functioning 2-1	Negative Ranks	1	2	p > 0.05	
	Positive Ranks	4	3.25		
	Ties	1			
Role limitations due to physical health 2-1	Negative Ranks	0	0	p < 0.05	-0.643
	Positive Ranks	6	3.5		
	Ties	0			
Role limitations due to emotional health 2-1	Negative Ranks	0	0	p < 0.05	-0.644
	Positive Ranks	6	3.5		
	Ties	0			
Energy/fatigue 2-1	Negative Ranks	0	0	p < 0.05	-0.643
	Positive Ranks	6	3.5		
	Ties	0			
Emotional well-being 2-1	Negative Ranks	0	0	p < 0.05	-0.635
	Positive Ranks	6	3.5		
	Ties	0			
Social functioning 2-1	Negative Ranks	0	0	p < 0.05	-0.637
	Positive Ranks	6	3.5		
	Ties	0			
Pain 2-1	Negative Ranks	0	0	p > 0.05	
	Positive Ranks	3	2		
	Ties	3			
General health 2-1	Negative Ranks	0	0	p < 0.05	-0.637
	Positive Ranks	6	3.5		
	Ties	0			
Health change 2-1	Negative Ranks	1	1	p < 0.05	-0.591
	Positive Ranks	5	4		
	Ties	0			
WS 2-1	Negative Ranks	6	3.5	p < 0.05	0.639
	Positive Ranks	0	0		
	Ties	0			

* r – effect size for Wilcoxon signed-rank test

were performed by BK3000 ultrasound with a high-resolution rectal circular probe 20R3. The height of the fistula and a diameter of a defect in the rectovaginal septum was determined. Only the patients with low RVF and defects in RVS up to 1.5 cm in diameter were enrolled in the study.

All the participants in this study had completed SF-36 questionnaires before the admission to the hospital and 6–8 weeks after the surgery. We managed, with the help of questionnaire SF-36, to analyze all its sections: physical functioning, physical role functioning, emotional role functioning, vitality, mental health, social role functioning, bodily pain, general health, and change in health. Wexner's score (WS) of fecal incontinence was determined and vigorous constipation was excluded by the Cleveland Clinic Constipation Scoring System (CCCS).

All the surgical procedures were performed in general anesthesia and all the participants received 3 doses of antibiotic prophylaxis (metronidazole, cefazoline). Concomitant protective colostomy or ileostomy was not performed. In the case, that participant had a colostomy done before the procedure, we left it as a protective colostomy. The first control examination was two weeks after the surgery to check the healing of the wounds. The next examination was planned 6 to 8 weeks after the procedure. The participants were asked to fulfill the SF-36 questionnaire again and restage Wexner's score of fecal incontinence and CCCs.

Analysis

Statistical descriptive and inference procedures were used to achieve the research objectives. As part of variables exploration, the normality of the measurements of the first and second variables was examined. Due to the small sample and non-confirmation of normality in all the variables (Tab. 1), nonparametric comparison tests were chosen for paired samples differences. The calculations were processed in IBM SPSS 22.0 and the effect size (for the Wilcoxon sign-rank test) was generated by formula according to Olejnik (15).

Results

A total of 5 female patients with a low RVF have met the criteria for inclusion in

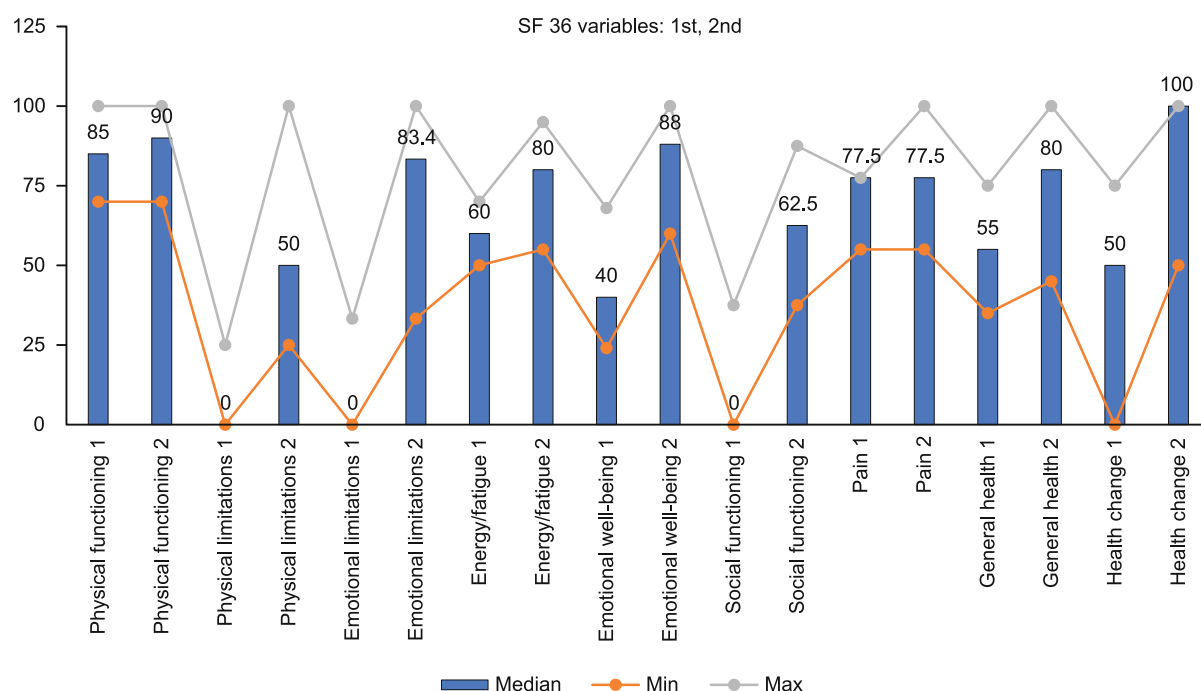


Fig. 2. Illustration of SF 36 variables in 1st and 2nd measurements.

our study. However, because of one recurrence 6 procedures of modified Martius graft were evaluated. All the patients were cooperative, underwent all suggested investigations, returned all SF-36 questionnaires and score columns. Blood samples were taken, and a history of excluded sarcopenia was confirmed. The participants were in a good physical and nutrition state. All 5 patients with low RVF have healed. The mean value of RVF complete healing was 12 weeks. We defined the complete healing in our cohort as the healing of all the wounds and defects of the vagina, perineum, rectum, and without any communication between the vagina and rectum. As it was mentioned, we have detected one recurrence of RVF, that was successfully repaired by a contralateral modified Martius graft. That is why the success rate in our cohort was quite high (83.3 %).

The protective colostomy has been performed just once (16.6 %). The patient with colostomy was not a typical case indicated for modified Martius graft. She underwent numerous unsuccessful abdominal and endorectal surgical procedures. The etiology of RVF was rectal injury due to a foreign body. That is why the previously done protective colostomy had been left before the modified Martius graft was performed. We found the protective colostomy almost useless in the surgical treatment of uncomplicated low rectovaginal fistulas by modified Martius graft.

We have properly analyzed the influence of the disease on the physical and psychical status by the Short Form Health Survey (SF-36), degree of the anal incontinence, and bowel habit.

In Table 2, the results of Wilcoxon's signed-rank test are shown. We interpret significant paired differences ($p < 0.05$) in all the domains and scales of SF 36 except for Physical functioning

and Pain based on the increase in values between the measurements (Fig. 2). Further, in WS, a significant decrease ($p < 0.05$), and in CCCS a significant increase ($p < 0.05$) in the values between two measurements were found (Fig. 3). According to the results of Wilcoxon's test, the cases count of positive, negative, and ties changes could be reported. It can be interpreted, that decrease in WS means mainly a successfully performed surgery and a significantly reduced fecal leakage due to the healing of pathological communication in the rectovaginal septum. The increase in CCCS is probably due to postoperative thickening of the rectovaginal septum by interposed fatty tissue. Changed bowel

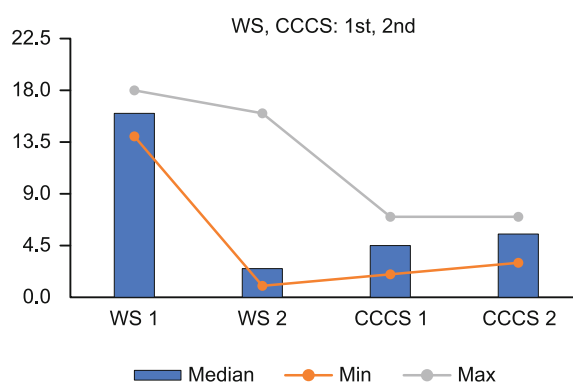


Fig. 3. Illustration of variables WS and CCCS in 1st and 2nd measurements.

habits and the fear of possible anal incontinence should be considered too.

Unfortunately, our results are influenced by a small number of participants in the cohort. The reason is, that the incidence of rectovaginal fistulas is generally low, and the patients of our cohort had to meet quite strict inclusion criteria.

Discussion

The RVF is quite a rare complication of various diseases, the most often because of rectovaginal septum birth trauma (16). Surgery can resolve this frustrating disease. Unfortunately, the success rate after initial surgery for RVF is only 60–88.65 % (16, 17). It improves with each next surgical procedure. The endorectal advancement flap (EAF) is the most common first-line operative treatment. Its success rate is variable and the healing of RVF comes only at about 65 % (18). If the treatment by EAF or other treatment options failed and the transabdominal approach was contraindicated, flap with interposed tissue would be an excellent next treatment modality (19). It's for example gracilis muscle transposition or Martius flap. There are some postoperative problems after bulbocavernosus or gracilis muscle transposition e.g., dyspareunia and proctalgia (20). Especially dyspareunia is the most frequent complication resulting from the scarred tissue of the vagina (21). Its rate is up to 25 % of all the postoperative cases (22).

That is why a modified Martius graft is preferred, as only fatty tissue of labia majora is used for repairing rectovaginal septum defects.

It is necessary sometimes to create a stoma, especially in case of recurrence. It is not rare and uncommon concerning the low success of RVF operative treatment. Individual approach to the patient with RVF is substantial. We must consider the age, nutrition state, comorbidity, the vitality of dissected tissue, previous surgery, the height of fistula, its etiology and rectovaginal microbiota (23, 24). But available data shows, that creating stoma before planned surgery of low RVF with interposed flap isn't necessary (25).

Another special chapter of fistulas is radiation induced RVFs, caused by radiotherapy of an advanced cervical or rectal cancer. The primary closure of them is quite rare because of the suppression of connective tissue. Colostomy and the closure of vital tissues of the rectovaginal septum are conditions for their appropriate healing (26). It could be a combined colostomy and interposition flap as the modified Martius graft with advantage. However, there are described preliminarily good results after the stromal vascular fraction injection to surroundings of radiation-induced RVF (11).

There is a growing incidence of RVF after rectal resection too. The rectal resection and suture of the vagina is the usual next step of treating this type of fistula. Rarely, trans anal endoscopic surgery (TES) (27) is used to repair it. But sometimes it is impossible and abdominoperineal resection (APR) must be performed. The light at the end of the tunnel is the usage of an interposition flap to heal such RVFs and thus prevent permanent consequences of APR.

An interposition flap and specially modified Martius graft is a promising treatment modality of low RVFs, with a low recurrence rate and usually without the need for a protective stoma. Generally, unsuccessful treatment of RVF is often connected with a persisting inflammation, presence of hematoma, deformed scar, or suturing defect of fistula under tension. Reduction of recurrences could be achieved by removing of the latter mentioned factors.

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