

Use of Martius flap in the complex female urethral surgery

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Introduction Objectives were to evaluate safety and patient reported perception of the Martius fibro-adipose flap for complex female urethra reconstruction.

Material and methods Patients operated with a Martius flap were contacted again via telephone to rate their self-perception on cosmetic appearance, pain or numbness of the flap harvest site.

Results 37 women (mean age of 46.8 yrs.) were operated with Martius flaps. Complications were limited to bleeding from the flap bed in 19% (7/37); hematomas – 5.4% (2/37); and lymphorrhea from the labial incision in 13.5% (5/37) and labial wound infection in 5.4% of cases (2/37). For self-perception 65% of patients (24/37) were phone interviewed (mean follow up – 54.2 months). Only 17% of women (4/24) complained to cosmetic problems. Two patients (8%) complained to a periodical mild pain. And 12.5% (3/24) of the women had decreased sensation or numbness at the labia.

Conclusions Martius flap is safe and it is not causing significant complications during female urethral reconstruction. However, an informed consent for decreased sensation and numbness at the flap harvesting area should be obtained.

Key Words: female urethra ◊ surgical flaps ◊ urinary fistula ◊ radiation ◊ self-perception

INTRODUCTION

The surgical procedures on female urethra are rare occurrences that usually result from urethrovaginal fistula, urethral diverticulas or urethral damage during anti-incontinence procedures. In the developing world, the vast majority of urethrovaginal fistulae result from obstructed labor [1]. Due to advances in obstetric care, urologists in the developed world encounter urethrovaginal fistulae rarely, and many of the fistulas seen are secondary to vaginal surgery. In the developed world, the more common causes of urethral injury include trauma, iatrogenic injury at urethral diverticulectomy, bladder neck suspension, endoscopic surgery and gynecologic surgery, such as vaginal hysterectomy or anterior vaginal repair. Urethral erosion can result from synthetic materials used in these procedures or from anti-incontinence surgery [2, 3], or it may be due to long-term indwelling catheters in neurologically impaired or comatose patients [4, 5]. The risk of development of genitourinary fistulas after radical surgery and radiotherapy

is significantly decreased nowadays [6]. These fistulas may involve urethovesical junction and the mid-urethra. The management of these cases remains a challenge for dedicated specialists because of the fibrosis and vascular deficiency [7]. Female urethral traumas are rare conditions. The incidence of urethral injury with pelvic fractures ranges from 0 to 6% and is predominantly caused by high-speed motor vehicle accidents [8]. Some authors unite urethrovaginal fistulae with urethral loss and other urethral conditions. There is a traumatic absence of the proximal urethra occurring within context of various labor injuries in Africa. We believe that these are separate conditions with different clinical manifestations.

Surgical treatment procedures include direct primary anatomical repair and interpositional tissue restorations. In each case, the interposed tissue serves to create an additional layer in the repair, to fill dead space, and to bring in new blood supply to the area. In 1928, Heinrich Martius presented an interpositional tissue flap from the bulbocavernosus muscle

accompanied with fibroadipose tissue from labia majora pudenda [9]. This flap receives a blood supply from both external and internal pudendal arteries. It has been widely accepted and adopted for the repair of urethrovaginal, vesicovaginal and rectovaginal fistulae [10, 11], for damaged urethra reconstruction, vaginal or rectal stenosis, and post radiation rectal or vaginal fistulae, with high success rate. We conducted a cohort study for the evaluation of functional and anatomical outcomes of vaginal urethral reconstruction with the Martius procedure.

MATERIAL AND METHODS

Since 2001, 37 women underwent vaginal reconstructions with utilization of the Martius flap in our clinic. These patients were suffering from urethrovaginal fistulae in some cases associated with radiation, urethral diverticulas and urethral damage after anti-incontinence procedures, mainly synthetic tape protrusion into urethral lumen. The type of surgery patients underwent was selected based on the protocols that were accepted in our hospital at the time at which the patients were treated. We took a detailed history and performed an in-depth

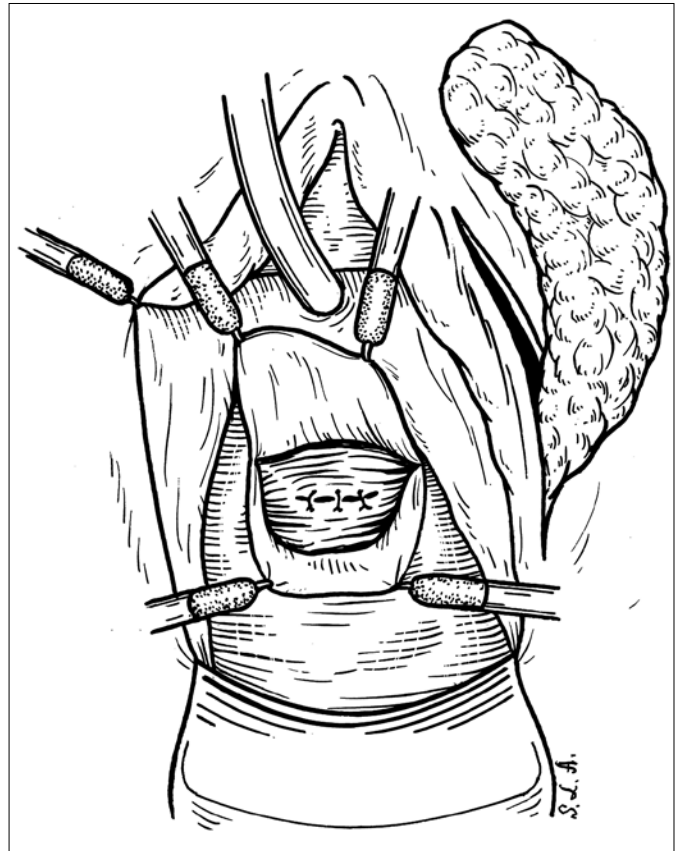


Figure 2. Well vascularized fibroadipose flap is exposed.

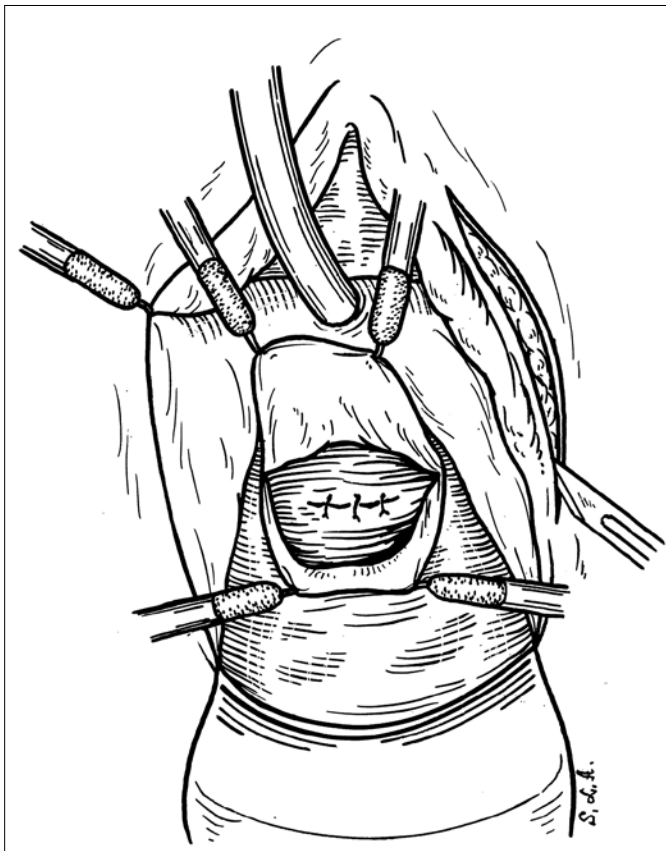


Figure 1. Longitudinal incision on the labia majora is done.

physical exam prior to surgery that included: vaginal exam, urethrocytoscopy and ultrasound. Informed consents were obtained prior to the surgery. All procedures were performed by surgeons who were experienced in vaginal surgery. The patients underwent routine clinical examination within one month of the surgery. Starting in June 2011, we retrospectively reviewed medical records of the identified patients after approval of the Institutional Ethics Committee before the study. Obtained data was stored and analyzed with a Microsoft Excel software package. Patients were contacted again via telephone, and when available, they were asked to rate their self-perception on cosmetic appearance, pain and numbness of the flap harvest site.

The surgical technique described by Martius [9] starts with a lateral incision on the labia majora pudenda. The side from which the flap is taken depends on fistula location. When choosing the side, the shortest distance to the covering area has to be considered because of less tension, a better blood supply of the flap, and better recovery with less recurrence. When a longitudinal incision on the labia majora is done, a well vascularized labial fat is exposed (Figures 1 and 2). The mobilization of the

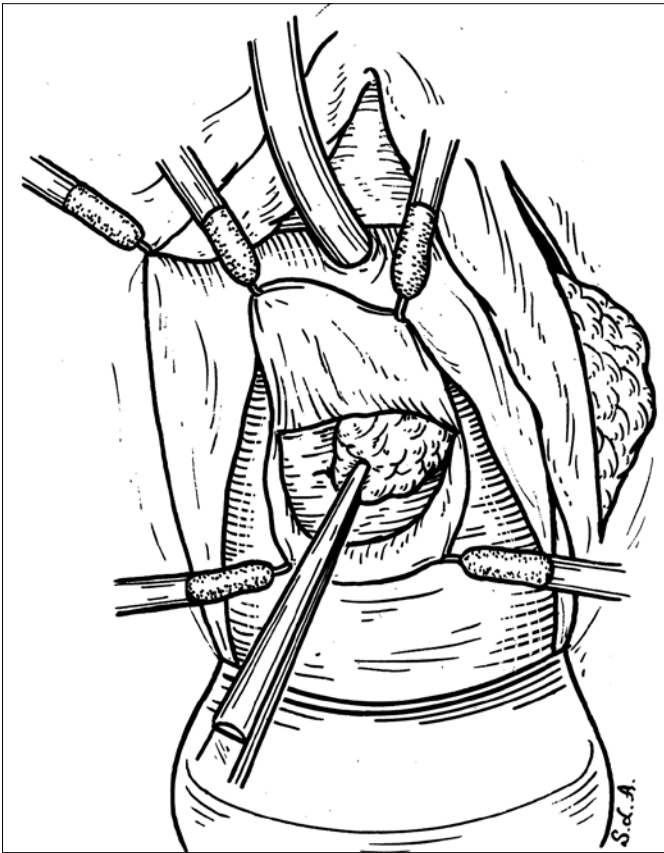


Figure 3. The flap is tunneled by a curve clamp under the vaginal wall, from labia to vaginal incision.

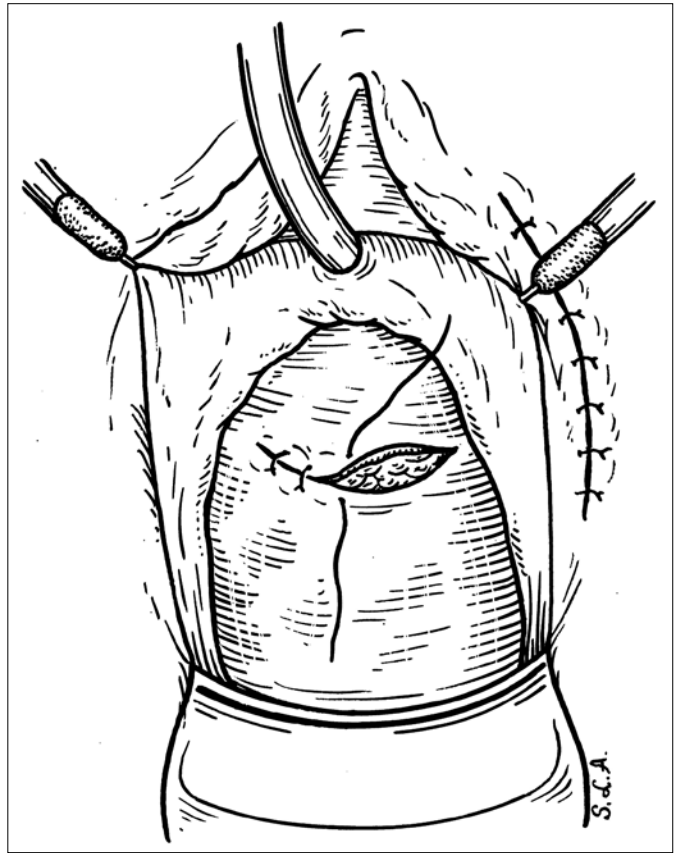


Figure 4. The incisions over the labia majora pudenda and vagina are sutured.

graft should be done taking into consideration the external and internal pudendal blood supply [12]. These features make the Martius flap a flexible tool for fistula management. After mobilization, the flap is tunneled by a curve clamp under the vaginal wall, from labia to vaginal incision (Figure 3). We use absorbable sutures for fixing the flap over the fistula repair site. Normally, the labial flap has excellent mobility and significant bulk effect. This bulk effect is often quite necessary, but should be considered before flap harvesting. Excessive bulking may provoke problems with the anterior vaginal wall closure. This is why the vaginal wall should be mobilized enough in order to cover the flap without tension. The incision over the labia majora pudenda is sutured (Figure 4). Routinely, we do not use any drain in the harvest site, but a Penrose drain might be an option to prevent hematoma accumulation if bleeding is present. The final step of the procedure is vaginal wall closure.

RESULTS

The mean age of the patients was 46.8 years (range from 28 to 68 years, SD 10.3). Sixteen women under-

went vaginal surgery with Martius flap due to radiation induced genitourinary fistula. Among these patients, 5 women had their first attempt at fistula closure. The other 12 cases (75%) were secondary or tertiary procedures. Two patients had a history of Martius flap harvesting, and 2 women were treated with omentum flaps during previous procedures. Ten women were operated for urethrovaginal fistulas that were caused by pelvic injuries and previous vaginal surgeries, such as marsupialisation of urethral diverticula and anterior colporrhaphies. These data are presented in the Table 1.

Six women among our patients have been operated on due to urethral damage after anti-incontinence procedures. Urethral damage with the protrusion of a mid-urethral synthetic sling was found in 2 women. This is becoming a more common problem with a difficult solution. Bladder outlet obstruction after anti-incontinence procedures is often treated with removal of the sling. In four cases sling division and urethrolisis performed because of intergrowth of the sling into the urethra which resulted in urethral damage.

We used a Martius flap in five patients during diverticula removal.

Table 1. Objective outcomes after vaginal reconstruction with Martius flap

	Non-primary cases (secondary tertiary, etc)	The history of previous urethral surgeries with the use of the flaps	Successful fistula/urethral defects closure	Urinary incontinence after fistula/urethral defects closure
Pelvic fractures (2)	2/2	1/2	1/2	1/1
Pelvic gunshot trauma (1)	1/1	1/1	1/1	1/1
Marsupialisation of urethral diverticulas (6)	0/6	N/A	6/6	1/6
Anterior colporrhaphy (1)	0/1	N/A	1/1	0/1
Radiation induced fistula (16)	12/16	4/12	12/16	4/12
Protrusion of mid-urethral synthetic tape into the urethra (2)	0/2	N/A	2/2	0/2
Urethrolisis with removal of mid-urethral synthetic tape or vaginal mesh (4)	1/4	0/4	3/4	0/4
Excision of urethral diverticula (5)	0/5	N/A	5/5	0/5

Perioperative and postoperative complications related to the harvesting of the Martius flap are reported in the Table 2. Moderate intra-operative bleeding from the flap bed was noted in 19% of the cases. These bleedings were usually well controlled with cautery and we also used Penrose drainage to help avoid hematoma formation in specific cases. Early postoperative complications were limited to wound infection, hematoma and lymphorrhea from the labial incision. We used compressive dressing to help reduce lymphorrhea in particular cases.

The patients' self perception was evaluated via telephone communication. At the time of study, 24 patients from 37 were available for phone interview. Mean follow-up from the surgery was 54.2 months. When the cosmetic appearance of the labial incision was discussed, 4 women considered it as a problem while others believed that it was identical to other side or there were only minimal changes when compared to the contralateral. Despite a current view, 2 patients from 24 complained about a periodical

Table 2. Perioperative and postoperative complications related to the harvesting of the Martius flap (Grade II by Clavien Classification of Surgical Complication)

Complications	Bleeding >100 cc	Wound infection	Hematoma	Lymphorrhea
Number	7/37	2/37	2/37	5/37
%	18.9%	5.4%	5.4%	13.5%

pain in the operated labia, which did not require pain relievers. Some of the women reported permanently decreased sensation or numbness at the harvest site.

DISCUSSION

Interpositional tissue should be considered whenever the closure lines or the vaginal tissues are of questionable quality or if subsequent sling placement is being considered. Rotated vascularized pedicle flaps are an important adjunct to surgical techniques used in the repair of female urethra. They increase success by enhancing granulation tissue formation, increasing neovascularity to the area, and obliterating dead space. They also provide a barrier layer between the urethral and bladder suture line and the vaginal suture line. When tissues are insufficient, a Martius flap should be considered to secure the closure, which necessitates careful mobilization of vaginal mucosa. At the same time we should not to expect that the flap will provide an additional support to the urethral wall in order to provide a urinary continence.

Various modifications of Martius' original procedure have been published. In the modifications described by Elkins, DeLancy and McGuire, only the fibroadipose tissue was isolated [13]. The flap did not contain bulbocavernosus muscle. The authors showed the risk of hemorrhage with the classic Martius graft technique because it requires a deep plane of dissection to isolate the bulbocavernosus muscle. The fibroadipose tissue isolated in their dissection possessed sufficient blood supply and strength for success. Additionally, they noted that the dual blood supply to this tissue and the bulbocavernosus muscle (dorsally via internal pudendal artery and ventrally via external pudendal artery) enables the surgeon the choice of using a flap with a superior or inferior base.

A mild dyspareunia over the graft site is a potential complication, which may be difficult to avoid and treat. Petrou studied patients' self perception after harvesting the Martius flaps [14]. Of the 8 patients, only one woman (13%) complained of dyspareunia,

3 (38%) had intermittent discomfort in the harvest area one year after the operation and 5 (62%) perceived permanently decreased sensation or numbness at the harvest site. According to the authors, the Martius flap is not associated with a significant amount of perceived cosmetic disfigurement. At the same time, it has relatively little effect on sexual relations, postoperative discomfort is minimal, but there may be associated numbness or decreased sensation at the harvest site.

Petrou reported 62% of permanently decreased sensation or numbness at the harvest site [14]. The author suggests that it may have been related to suprameatal transvaginal urethrolisis, which was performed in all of the patients concomitantly with the Martius flap procedure in that study. Our data showed that decrease of sensation at the harvested areas may appear in one patient from ten in long term follow up. This is in accordance with other observations [15]. During the past several years, many reports of complications associated with synthetic slings and meshes have been published in the literature. In 2011, the joint committee of the ICS-IUGA published a standardized terminology and classification for complications related to synthetic and biological materials in the female pelvic floor surgery [16]. This classification is designed to comprehensively cover complications in both insertion and healing. The most frequent complications include vaginal erosion, mesh shrinkage, infections, pain and urinary tract disorders. There have also been reports of rare complications, such as urethral necrosis resulting from mid-urethral synthetic slings [17]. Additionally, removal of the meshes or mid-urethral slings is always associated with potential risk of iatrogenic urethral or bladder wall damage and development of complex fistulas. We believe that the Martius flap remains a valuable tool in armamentarium of the vaginal surgeons in these particular cases as well.

The use of Martius flap supposes to improve the cure rate of genitourinary fistulas and decrease fistula recurrence rate. There is a limited possibility to design a head-to-head study to prove that hypothesis. In our previous study, we summarized our experience of the 210 cases of radiation induced fistula closure.

Based on it, we revealed that the primary cure rate did not exceed 48%. In another retrospective study of 12 women with urethral damage, 3 of 4 patients who were repaired primarily without graft had recurrences, compared with only 1 of 8 whose closures were reinforced with a Martius labial fat pad [11]. In our study, among the 16 patients with urethral damage associated with radiation therapy, we found that 75% patients (12/17) had no recurrence in the long term followup. At the same time, 4 patients from these 12 were suffering urinary incontinence with mixed symptoms.

Limitations of this study

Heterogenous patients managed with different techniques were the main limitation of the present study. Also, because of the relative rarity of reconstructive surgery on the female urethra, no large case-control series trials was available as a comparison for our study.

Urethral damage with protrusion of mid-urethral synthetic sling is becoming a more common problem. Bladder outlet obstruction after anti-incontinence procedures is often treated with the removal of the sling. Both may have intergrowth of the sling into urethra with dense adhesions, which may result in further damage to the urethra during removal.

Urethral diverticula invariably communicate with the urethral lumen. The definitive excision of a diverticula is to perform a full excision with a full opening of the urethra, but this does carry with it a chance of morbidity, even in experienced hands.

CONCLUSIONS

Martius flap is safe and it is not causing significant complications during vaginal reconstruction. Patient reported perception reports showed that the procedure has only minimal impact on the patient body appearance. At the same time, an informed consent for possible neurological disorders, such as decreased sensation and numbness at the flap harvesting area should be obtained. The heterogeneity of the patients included managed with different techniques is the main limitation of the present study.

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