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Rectovaginal radiation fistula repair using an obturator fasciocutaneous thigh flap

Raphael C. Lee[a,*] and Jacob Rotmensch[b]

[a] Section of Plastic Surgery, Department of Surgery, The University of Chicago, Chicago, IL 60637, USA
[b] Section of Gynecologic Oncology, Department of Obstetrics and Gynecology, The University of Chicago, Chicago, IL 60637, USA

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Abstract

Background. Rectovaginal fistulae are a known complication of pelvic radiotherapy utilizing locally applied isotope implants. Most often, either permanent colostomy or reconstruction with a well-vascularized flap is necessary. Traditional techniques for fistula repair utilize bulky muscle flaps, disfiguring pudendal artery flaps or may require laparotomy.

Case. We describe the management of a 26-year-old woman with a large radiation-induced rectovaginal fistula. A fasciocutaneous medial thigh flap based on terminal branches of the obturator artery and vein was used without colostomy and resulted in pain-free sexual function and minimal vulva disfigurement.

Conclusion. A medial thigh fasciocutaneous flap without muscle can be transferred into the vagina on the obturator vessels and may become the preferred method for managing large rectovaginal fistulas.

Keywords: Radiation; Rectovaginal fistulae; Obturator artery; Fasciocutaneous flap; Medial thigh

Introduction

Rectovaginal fistulae are a recognized complication of local brachytherapy for posterior vaginal wall and cervical cancers [1–7]. The morbidity of rectovaginal fistula is very substantial, and from a psychosocial perspective, can make a normal lifestyle impossible. Spontaneous healing is unlikely despite diversion of the colon for an extended time period. This results from the loss of cytoproliferative capacity of cells in the radiation field and the abnormal vascular perfusion pattern in the fibrotic tissue surrounding these fistulas.

Radiation-induced fistulae are also notoriously difficult to repair. Surgical intervention involves primary closure of the rectal and vaginal walls with interposition of well-vascularized, nonirradiated tissue. Both partial resection of the rectum followed by rectosigmoidostomy and subtotal resection of the vagina followed by flap reconstruction are standard options for surgical management. General management guidelines also include diverting colostomy to facilitate healing under conditions of reduced bacterial contamination [8–12].

There are multiple surgical strategies described to transfer healthy nonirradiated tissue into the vagina. These methods involve use of skin flaps, muscle flaps, musculocutaneous flaps and intestinal flaps [13–25]. Donor areas for skin and muscle flaps are usually the thigh or abdomen. Both gracilus musculocutaneous, obturator and pudendal skin flaps can be used to transfer medical thigh soft tissue [13–21]. The posterior thigh flap based on the inferior gluteal artery can be used to transfer posterior thigh skin. The rectus abdominus musculocutaneous flap based on the inferior epigastric artery is most commonly used for transferring abdominal skin into the pelvic floor [23–25]. This method is particularly useful following pelvic exenteration procedures where a large volume of tissue is need for reconstruction. To bring rich blood supply to a neovagina, jejunal and omental flaps from the peritoneal cavity have been described [25–27].

Flaps from the perineum based on the superficial perineal branch of the pudendal artery and others have also been

* Corresponding author. Section of Plastic Surgery, Department of Surgery, The University of Chicago, 5812 South Ellis Avenue, Chicago, IL 60637. Fax: +1-773-702-1634.
E-mail address: rlee@surgery.bsd.uchicago.edu (R.C. Lee).

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used to provide the well-vascularized tissue in the vaginal wall. Muscle and musculocutaneous flaps have also been described for management of rectovaginal fistula [17–19]. Skin flaps are preferred for repair of defects in the vagina rather than replacement of the entire vagina because muscle or musculocutaneous flaps tend to be very bulky are most suitable when there is a large pelvic defect such as following hysterectomy.

Ideally, the reconstruction of the posterior vaginal wall after resection of a radiation-induced rectovaginal fistula will utilize thin pliable and sensate tissues. Flaps based on the pudendal artery have recently become the primary method to accomplish this goal [16–20]. However, vulva pain, disfigurement and risk of transfer of micrometastases from the perineal nodal basin back into the defect are reported concerns [17–19]. Lymphatic nodes draining the vulva and vagina exist in close association with the pudendal vasculature.

The purpose of this paper is to describe a new method we developed used to transfer upper medial thigh skin as a fasciocutaneous flap to replace the posterior vaginal wall and provide reliable vascular coverage of the repaired rectum.

Case synopsis

DE presented to the University of Chicago with a cloacogenic adenocarcinoma of the rectovaginal septum in 1994. The carcinoma was treated using high-dose-rate brachytherapy (HDR-ICR). The rectal point (RP) was defined according to the criteria recommended in the ICRU Report 38. The time-dose factor (TDF) and the biologically effective dose (BED) were calculated as components of the cumulative reference rectal dose using the RP dose in brachytherapy. The tumor regressed leaving a 3-cm-diameter, rectovaginal fistula located 4 cm from the posterior fourchette as shown in Fig. 1. The resulting transvaginal fecal incontinence severely compromised the patient's ability to return to a normal lifestyle. Therefore, the decision was made to undertake reconstructive surgery.

In late November, 2000, DE underwent preoperative bowel preparation with GoLytely (polyethylene glycol solution p.o.). In addition, she received enemas until clear. She was then given a general anesthetic perioperative antibiotic and a rectal and vaginal prep with Betadine solution. A Kerlex® roll soaked in a methylene blue solution was gently packed into the rectum to prevent wound contamination during repair and stain the granulation tissue of the fistula track to ensure that all of the granulation tissue was identified for excision. To reduce blood staining of the operative field, the soft tissues surrounding the fistula were infiltrated with Lactated Ringers solution containing 0.05% Marcaine® and 1:100,000 v/v dilution of epinephrine. Once vasoconstriction was achieved, the rectovaginal fistula tract was exposed transvagninally and sharply excised with electrocautery. Then the space between the rectum and vagina was opened to separate the rectal wall from the vaginal wall. The rectum was freed from lateral connective tissue attachments to the pelvic inlet enough to approximate the edges of the rectal wound without tension. The rectum was repaired in layers using 4.0 Maxon® sutures for mucosal layer and 3.0 Maxon® sutures in the muscularis layer and then again for adventitial layer. The repair was carried out in a transverse orientation to prevent narrowing of rectum.

Once the rectum was repaired, the vaginal wall was inspected for radiation fibrosis and hypervascularity. Radiation-damaged vaginal mucosa was resected. To allow for transfer of vascularized tissue from the proximal right thigh, the distal third of the right lateral vaginal wall was resected.

Then, a proximal medial thigh skin paddle, which was large enough to repair the vaginal defect, was designed to repair the recto/vaginal fistula and lateral wall of the vagina was outlined proximal medial thigh posterior to the adductor longus over the gracilis muscle (Fig. 2). The skin surrounding the flap was infiltrated with Marcaine® containing epinephrine. Once vasoconstriction was obtained, the skin paddle of the flap was incised. Dissection of the fascial pedicle began at the anterior apex of the flap. The most prominent point of the adductor longus muscle beneath the anterior apex of the skin paddled. The flap dissection was taken down to the adductor longus muscle. The fascia overlying the adductor longus was incised along the posterior edge of the adductor longus prominence from the skin paddle to the pubic ramus. At the distal margin of the skin flap, the incision was extended from the adductor longus fascia incision posteriorly across the fascia of the gracilus muscle to the septum between the gracilus and semimembranosus muscles. The fascia over the most anterior border of the semimembranosus muscle was incised along the border to the pubic ramus. To include the obturator vessels in the flap, the flap pedicle dissection included the fascia of the adductor magnus muscle. This dissection began proximal to the medial circumflex artery and vein as it courses between the adductor longus and gracilus muscles and extended proximally toward the origin of the adductor magnus until it reached 1–2 in. distal to the adductor magnus insertion (Fig. 3).

Posterior to the gracilus muscle, the adductor magnus muscle fascia was also elevated with the flap pedicle. To leave the gracilus muscle in situ, the fascia of the gracilus muscle was incised along the deep surface of the gracilus muscle and dissected away from the muscle so that it was included in the two components of the flap's pedicle. The two pedicles were anterior and posterior to the gracilus muscle.

Proximal to the proximal edge of the flap, a thin skin bridge was elevated just below the superficial fascia of the proximal thigh as shown in Fig. 4. This dissection was carried deep beneath the deep perineal fascia beneath the right labia majora and labia minora and entered the vagina through the

Fig. 1. Large rectovaginal radiation fistula is identified by the methylene blue staining. A probe is shown that has been passed transanally through the fistula into the vagina.

right (inaudible) wall. A defect measuring approximately 3 × 4 in. was made into the vagina to allow for tension-free transfer of the obturator island flap into the vagina as shown in Fig. 5. The radiated scar tissue of the vagina was removed with the creation of the vaginal wall. The flap was transferred into the defect and covering the repair of the anterior rectal wall at the point of the fistula. The vascularity of the flap was checked by examining flap skin edge bleeding. The flap was inserted into the vagina over the drain and wounds were closed with interrupted 4.0 Maxon® sutures. The steps of this procedure are outlined in Fig. 6.

Fig. 2. Location, size and orientation of the skin paddle of medial thigh flap placed relative to the adductor longus muscle is shown. Only the central portion of the skin paddle is used. However, the paddle design allows for linear closure of the defect.

Fig. 3. The obturator fasciocutaneous flap is shown elevated on dual pedicles, one anterior and one posterior to the gracilus muscle.

Drains were placed through the skin of the mons pubis and tunneled beneath the labia majora was transferred into the wound beneath the flap, adjacent to the lateral margins of the rectal wall repair as shown in Fig. 7. Drains were copiously irrigated to remove all blood and to insure that the drains were functioning adequately. Marcaine® (0.5%) was infiltrated in the deep perineal fascia around the pudendal nerves and in the fascia of the medial thigh muscle to reduce postoperative pain. The proximal–medial right thigh skin was elevated and transferred superiorly to close the donor defect from the transfer of the obturator flap. A large #10 French Jackson-Pratt drain was placed in the medial thigh defect as well.

Postoperative care

A compressive occlusive dressing on the medial thigh was placed to coat dead space and reduce seroma forma-

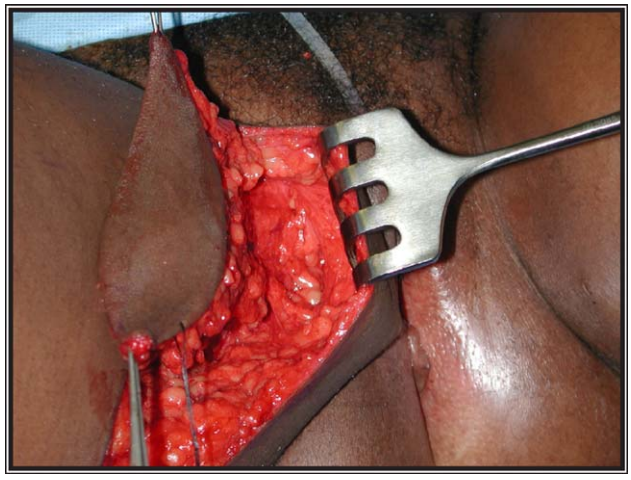

Fig. 4. Tunnel dissected through superficial perineal fascia lateral to labia majora then deep beneath vulva structures.

Fig. 5. Obturator flap transferred into vagina through a portal in lateral wall of the vagina created by resecting part of the vaginal wall.

tion for 48 h. Drains were kept under 80 Torr continuous subatmospheric pressure until the serous drainage was less than 30 cc per 34-h period. The patient was supported on intravenous nutrition for 2 days before allowing oral intake of liquid. Sitting for more than 15 min was not permitted for 5 days. Ambulation was started on postoperative day 2. The patient's diet was slowly advanced from clear liquids to full liquids to solids over a 2-week period of time.

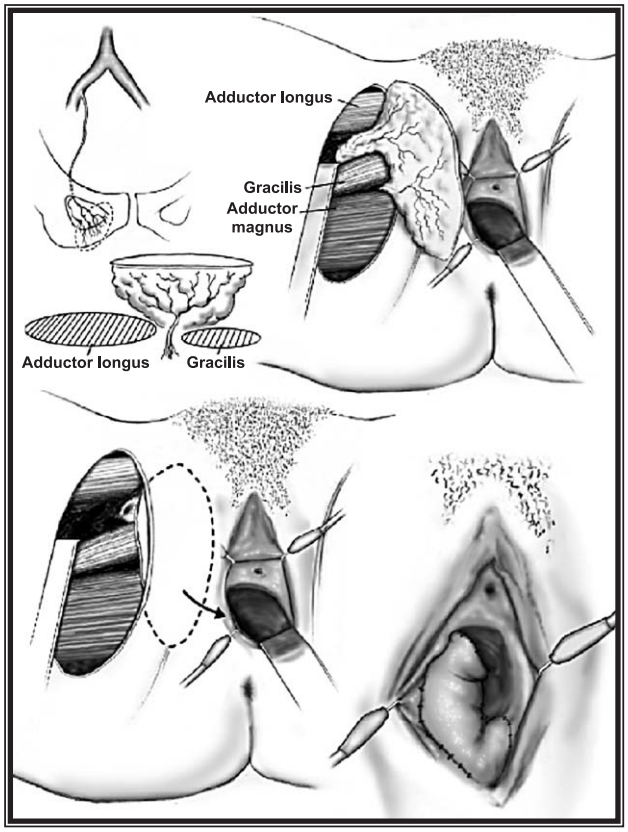

Fig. 6. Artist illustration of flap design, vascular supply and transfer into vaginal defect.

Fig. 7. Immediate postoperative photograph illustrating placement of closed suction drains and bladder catheter.

In the 2 years since the procedure was performed, the patient has not returned to normal sexual activity primarily because of fear of fistula recurrence. She underwent two minor procedures to remove buried sutures that became exposed and contaminated. In the same procedure, a biopsy of a suspicious vaginal wall lesion was performed. No evidence of cancer was found. In the late Summer 2002, the patient began vaginal dilations to permit initiation of sexual activity. No recurrence of fecal incontinence has occurred and the fistula remains closed. Fig. 8 shows the minimal vulva deformity and donor site appearance 1 year postoperatively.

Discussion

We present this case to illustrate that management of vaginal cancers requires both eradication of disease and reconstruction of the vagina. In this instance, it was also necessary to repair a severely debilitating rectovaginal

Fig. 8. View of perineum 1 year after surgery. The vaginal wall was intact and the external vulva was relatively normal in appearance.

fistula. The method of vaginal fistula repair involved modification of the previously described vaginal reconstruction methods so that a small segment of healthy well-perfused medial thigh skin could be transferred in the vagina defect without obstructing the vagina. This new method has several important advantages, which are discussed later.

A recent report from our center attempted to correlate patient, treatment and dosimetric factors with the risk of late rectal injury sequelae in patients treated with radiation therapy (RT) for cervical carcinoma [7]. In that study cohort, treatment consisted of external beam pelvic RT (EBRT) followed by intracavitary RT (ICRT) consisting of one or two insertions. Conventional total rectal doses were obtained by adding together the EBRT and ICRT rectal doses. Logistic regression analysis demonstrated a low risk (<10%) of late rectal sequelae below conventional and biological rectal doses of 75 Gy and 135 BED, respectively. A defined threshold percentage above which rectal sequelae were more common was identified over the range of doses evaluated. This threshold was 87% at a total rectal dose of 60 Gy and decreased to 60% at 80 Gy. Diabetes, Point A and EBRT doses are the most significant factors associated with the risk of late rectal sequelae in patients treated with RT for cervical carcinoma. The volume of rectum irradiated is an important and independent parameter in the development of late rectal sequelae.

Surgical intervention is very often required for treatment of radiation-induced rectovaginal fistulae. The rate of closure by healing is low regardless of whether the fecal stream is diverted. Loss of proliferative potential by the irradiated rectal and vaginal wall tissues is to be expected. Primary repair or local flaps are unlikely to succeed for the same reason, radiation injury. Successful repair of a rectovaginal fistula is predicated upon a transfer of nonirradiated vascularized tissue into the vaginal septum to allow for separation of the rectum and vagina as well as delivery of proliferation-competent cells into the area to allow for tissue repair. Some fistulae secondary to neoplasia, radiation, anastomotic leaks or inflammatory bowel disease require diversion of the fecal stream either as an adjunct to repair or as definitive treatment.

Each method of reconstruction has certain advantages and complication risks. Use of abdominal viscera for repair has certain inherent risks including bowel obstruction or anastomotic leakage. Anterior abdominal wall tissue transfer may result in ventral hernia or shifts in trunk muscle imbalances. Transfer of posterior thigh skin or medial thigh skin on the pudendal artery can result in chronic pain.

Here, we describe a new technique for transfer of sensory innervated medial thigh skin to the vaginal wall. The obturator artery receives blood from the internal oblique and the deep inferior epigastric artery [28]. The use of the obturator artery to transfer medial thigh tissue into the pelvis for vulva and vaginal reconstruction has been described by Soper et al. [21]. In their technique, the proximal portion of the gracilis muscle was transferred with the flap, which adds bulk and higher risk of compression of the obturator vessels. In addition, the attachment of the proximal gracilis tendon to the pubic ramus must seriously limit mobility of the flap. They have reported a high flap failure rate.

Our method differs from the technique described by Soper et al. in that we transfer the medical thigh skin as a septocutaneous flap leaving the gracilus muscle intact. The result is that the flap pedicle is thin enough to pass readily beneath the lateral perineal skin. The flap can be rotated 90° to fit the vaginal geometry and defect. In addition, it leaves a very inconspicuous donor site. We have subsequently used this approach in more than 40 patients with few complications [29,30]. To the best of our knowledge, this obturator fasciocutaneous flap has not been previously described. We find this flap reconstruction technique to be safe, reliable and capable of providing both functionally and cosmetically acceptable repair.

By using a well-vascularized and compliant flap to replace the posterior vaginal wall and cover the rectal fistula repair, it was possible repair the fistula without a diverting colostomy. A vigorous bowel prep was carried out preoperatively and the patient was allowed only a liquid diet for 3 days postoperatively. Postoperative management included not sitting for more than a few minutes at a time for 7 days to avoid compression of the vascular pedicle. In addition, stool softeners we used to avoid straining during bowel movement.

Successful reconstruction of the irradiated vagina represents a tremendous surgical challenge. The optimal method would permit transfer of soft, pliable, sensate tissues into the vagina in a single stage and avoid incisions that cross the vulva. Among the several different techniques to transfer viable cutaneous tissue into the vagina, we find that this obturator artery fasciocutaneous flap to provide superior results in the patient than expected from other methods.

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