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Gynecologic Oncology 97 (2005) 596–601

Gynecologic Oncology

www.elsevier.com/locate/ygyno

Rectus abdominis myocutaneous and myoperitoneal flaps for neovaginal reconstruction after radical pelvic surgery: Comparison of flap-related morbidity☆

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Received 24 November 2004
Available online 16 March 2005

Abstract

Purpose. To compare flap-specific complications of rectus abdominis myocutaneous (RAM) and myoperitoneal (RAMP) flap neovagina reconstructions performed concurrently with radical pelvic procedures.

Materials and methods. Retrospective single institution chart review of all patients with RAM or RAMP flap neovaginal reconstructions performed on a Gynecologic Oncology service, 1988–2003. Analysis for associations with flap-specific morbidity was performed.

Results. Neovaginal reconstructions comprised 32 RAM and 7 RAMP flaps. Twenty-two (69%) RAM patients underwent total pelvic exenteration compared to 1 (14%) RAMP patient ($P < 0.013$). Overall, 33 (85%) of the patient population had previously been treated with radiation. Flap-specific complications developed in 12 (32%) RAM versus 4 (57%) of the RAMP patients ($P > 0.1$). Donor site complications and incisional hernias were increased in RAMP patients (both $P < 0.03$), with trends for increasing risk of vaginal stricture/stenosis and superficial wound separations (both $P < 0.1$). Complete vaginal stenosis developed in only 1 (3%) RAM versus 3 (43%) RAMP patients. Furthermore, 3 RAMP patients developed complete stenosis when the vaginal defect was circumferential and involved >65% of the vagina while this did not occur in 22 similar RAM patients ($P < 0.0005$). Only patients with partial longitudinal defects maintained vaginal patency after RAMP flap. Fifteen (58%) of 26 patients surviving >12 months reported coitus, with no significant difference between the groups.

Conclusions. When there is circumferential loss of the upper 2/3 of the vagina. RAMP flaps are not suitable for neovaginal reconstruction after radical pelvic surgery because of an increased risk of vaginal stenosis compared to RAM flaps. Patients with partial longitudinal vaginal defects, however, may have successful neovaginal reconstruction with RAMP flaps.

Keywords: Vagina; Flap; Coitus

Introduction

The richly anastomotic blood supply of the rectus abdominis muscle and the overlying skin of the anterior abdominal wall combined with a wide arc of rotation around vascular pedicles make it a versatile muscle for use in reconstructive surgery. Cranially oriented rectus abdominis myocutaneous (RAM) flaps receiving vascular supply from the inferior mammary vessels were initially developed for breast reconstruction [1]. Subsequently, distal RAM flaps with the blood supply derived from the deep inferior epigastric vessels have been used in a variety of pelvic reconstructions during radical pelvic surgery, with low risk of flap loss or vaginal stenosis when concurrent neovaginal reconstruction is performed [1–7].

Konerding et al. [8] performed meticulous anatomic studies of the vascular territory supplied by the inferior epigastric artery to the inner aspect of the anterior abdominal wall in human cadavers. They demonstrated that

☆ Presented at the 50th Annual Meeting of the Society of Pelvic Surgeons, Miami, Florida November, 2004.

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0090-8258/$ - see front matter © 2005 Elsevier Inc. All rights reserved.
doi:10.1016/j.ygyno.2005.01.032

the blood supply to the anterior abdominal wall skin was mirrored by an extensive anastomotic territory supplying the medial 10–15 cm of adjacent transversalis muscle, fascia, and underlying peritoneum. Anastomoses were demonstrated between deep inferior epigastric branches to branches of the superior epigastric artery superiorly and to several thoracic intercostal arteries laterally. Hockel first reported the successful use of rectus myoperitoneal (RAMP) flaps for vulvovaginal reconstruction in two patients [9]. Since his report, only a few other cases of vaginal reconstructions in patients with gynecologic malignancies have been reported using this technique [10,11]. Rietjens et al. [11] compared outcomes in 5 patients treated with RAMP flap neovaginal reconstructions during radical pelvic surgery to 5 patients who received conventional RAM flaps. They reported that the risk of vaginal stenosis was much higher in the patients repaired with the RAMP flap. We report our experience, comparing flap-specific complications of RAM and RAMP flap neovaginal reconstruction performed concurrently with radical pelvic resections.

Materials and methods

We reviewed the charts and records of all women undergoing radical pelvic surgery in the Division of Gynecologic Oncology at Duke University Medical Center from 1978 through 2003, on an IRB-approved study. Patients undergoing other complex or myocutaneous flaps for neovaginal reconstructions, those who received rectus abdominis flaps for groin or vulvar reconstructions, patients who did not undergo concurrent neovaginal reconstructions, or those who did not have a radical resection of at least a portion of the vagina and adjacent tissues were excluded from analysis. Thirty-nine patients undergoing pelvic exenteration, radical vulvovaginectomy or radical vaginectomy procedures combined with partial or complete neovaginal reconstruction with concurrent RAM or RAMP flaps neovaginal reconstructions were identified for this analysis, with rectus flaps first performed on our service in 1988 for neovaginal reconstruction.

Surgical technique

All radical pelvic procedures were performed by faculty members of the Division of Gynecologic Oncology, with the assistance of fellows and residents. The majority of myocutaneous flaps and all myoperitoneal flaps were both developed and employed by members of the Division of Gynecologic Oncology. However, in four (11%) patients, RAM flaps were developed by members of the Division of Plastic Surgery and employed for pelvic reconstruction by the Gynecologic Oncology team.

Both vertical (VRAM) and oblique or transverse (TRAM) unilateral rectus abdominis flaps were used, based on surgeon preference and anatomical considerations, using previously described techniques [2–7]. None of the patients were evaluated preoperatively with selective angiography. All flaps were developed above the level of the arcuate line with preservation of the posterior rectus fascia. A full thickness ellipse of skin and adipose tissue measuring 10–12 cm vertically by 5–8 cm horizontally was used for VRAM flaps, while TRAM flaps ranged from 12 to 15 cm horizontally by 7–10 cm vertically. Initially, the anterior rectus fascia was incised in a slightly smaller ellipse that mirrored the skin island, leaving a 6–10 cm by 4–6 cm fascial defect. As we have gained experience with the flap, the skin island has been mobilized off of the anterior fascia, leaving a fascial defect of only approximately 4 × 4 cm. The rectus muscle was divided adjacent to the cranial border of the flap and elevated off of the posterior sheath after loosely suturing the skin to the fascia of the flap to prevent shearing of the perforating vessels during flap manipulation.

After mobilization of the myocutaneous island, the rectus muscle was dissected free from the anterior and posterior sheath to its insertion onto the symphysis, controlling perforating vessels with electrocautery or ligatures. The inferior epigastric vessels were identified along the posterolateral surface of the muscle and this pedicle was preserved where it crossed the lateral border of the muscle at approximately the level of the arcuate line. If necessary, the vascular pedicle was mobilized to allow rotation of the flap into the pelvis. The distal rectus muscle was not divided below the level of the vascular pedicle. For circumferential vaginal defects the skin island was folded and tubularized with absorbable sutures: VRAM flaps were usually intubated so that the proximal and distal tips of the island formed the introitus or closed in a spiral fashion [5], while TRAM flaps were usually folded so that the lateral tip was approximated to the medial border and the cranial border of the skin island formed the introitus. The RAM flap was rotated into the pelvis medially below the arcuate line such that the vascular pedicle was not on tension. The open end of the neovagina was sutured to the introitus or vaginal remnant and rectus muscle secured to the levator plate with loose interrupted absorbable sutures. For partial longitudinal vaginal defects, the flap was employed as a patch and skin edges sutured to vaginal mucosa with absorbable sutures.

For patients undergoing RAMP flap reconstructions, we constructed a composite flap similar to the technique described by Hockel [9]. The rectus muscle was mobilized from the anterior rectus fascia to above the level of the umbilicus and the muscle was divided cranially. The underlying posterior rectus fascia and peritoneum were divided and mobilized laterally. Depending on the amount of vaginal loss, adjacent peritoneum and fascia were mobilized along with the medial portion of the adjacent transverses abdominis muscle as a transverse paddle, measuring up to 10 × 10 cm. The rectus muscle inferior to the myoperitoneal paddle was mobilized from its sheath to the symphysis pubis, dividing lateral intercostal vascular attachments and preserving the deep inferior epigastric