

PERINEAL AND POSTERIOR VAGINAL WALL RECONSTRUCTION WITH SUPERIOR AND INFERIOR GLUTEAL ARTERY PERFORATOR FLAPS

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Perineal and posterior vaginal wall reconstruction following abdominoperineal and local cancer resection entails replacement of volume between the perineum and sacrum and restoration of a functional vagina. Ideal local reconstructive options include those which avoid functional muscle sacrifice, do not interfere with colostomy formation, and avoid the use of irradiated tissue. In avoiding the donor site morbidity of other options, we describe a fasciocutaneous option for the reconstruction of the perineum and posterior vaginal wall. We present our technique of superior and inferior gluteal artery perforator (SGAP or IGAP) flaps to reconstruct such defects. Fourteen patients between 2004 and 2008 underwent 11 SGAP and three IGAP flaps. There were no flap failures or partial flap losses and no postoperative hernias. All female patients reported resumption of sexual intercourse following this procedure. Our experience in both the immediate and delayed setting is that this technique produces a good functional outcome with low donor-site morbidity. ©2009 Wiley-Liss, Inc. *Microsurgery* 29:626–629, 2009.

Perineal and posterior vaginal wall reconstruction following abdominoperineal and local cancer resection entails replacement of volume between the perineum and sacrum and restoration of a functional vagina. Ideal local reconstructive options include those which avoid functional muscle sacrifice, do not interfere with colostomy formation, and avoid the use of irradiated tissue.

The previous techniques which have been used in this role have each been associated with complications relating to donor site morbidity, patient positioning, and the need to include irradiated tissue, precluding their widespread success. Rectus abdominis, gracilis, and musculocutaneous gluteal artery flaps are all associated with muscle harvest and resultant donor-site morbidity. Used in this role, the rectus flap has resulted in abdominal wall dehiscence and hernias in up to one third of patients,¹ and gracilis harvest associated with wound breakdown and deep pelvic infections in up to 12% of cases.² In avoiding these complications, we describe a fasciocutaneous option for the transposition of well-vascularized tissue in reconstruction of the perineum and posterior vaginal wall after extended resection for local cancers.

Although the gluteal region has been described for perineal reconstruction previously, its main use has been as a musculocutaneous gluteal flap.^{3–5} The gluteal artery perforator flap has been used locally for lumbosacral defects^{6–8} and as a perforator-based advancement flap for perineal reconstruction,⁹ however, these are associated with advancement of irradiated tissue into the defect and the associated complications. We present our technique of superior and inferior gluteal artery perforator (SGAP or IGAP) flaps for transposition to reconstruct such defects. This reconstructive option enables the import of local vascularized tissue for reconstruction of the irradiated perineum and posterior vaginal wall with low donor site morbidity.

METHODS

A cohort of consecutive patients undergoing extended abdominoperineal resection for rectal cancer requiring reconstruction of the perineum and posterior vaginal wall were recruited (Table 1). Fourteen patients between 2004 and 2008 underwent 11 SGAP and three IGAP flaps. All patients were female with mean age 62.4 (range, 57–83). Six cases were performed as primary reconstruction and eight cases were delayed with all receiving preoperative radiotherapy. Immediate reconstructions underwent preoperative imaging with ultrasound only, whereas delayed reconstructions underwent preoperative CTA.

The cancer resection in all cases was performed in the supine position for the abdominal resection initially, and the patient necessarily placed in the prone position for the perineal resection. The reconstructive procedure was thus undertaken without any position changes.

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Table 1. Summary of Patient Data

Age (years)	Mean 62.4 (range, 57–83)
Sex	14/14 female
Diagnosis	Rectal adenocarcinoma
Radiotherapy	14/14 preoperative radiotherapy
Chemotherapy	14/14 preoperative chemotherapy
Resection	Abdomino-perineal resection
Defect	Perineum, pelvic floor, and posterior vaginal wall
Timing	6 immediate/8 delayed
Flap type	3 IGAP flaps/11 SGAP flaps
Preoperative imaging	8 CTAs/14 Doppler ultrasound
Imaging findings	14/14 cases suitable SGAP perforators > 1 mm 6/14 cases suitable IGAP perforators > 1 mm
Imaging concordance	100% concordance Doppler ultrasound and CTA
Major complications	0/14
Minor complications	4/14 perineal wound dehiscence
Secondary procedures	3/14 resuturing of perineal wound 3/14 debulking of flap
Length of follow-up	6–48 months (mean 18 months)

Operative Technique

Preoperative imaging was routinely performed for perforator mapping, using both computed tomographic angiography (CTA) and Doppler ultrasound. The location, size, and course of both superior and inferior gluteal artery perforators bilaterally were assessed (Fig. 1). Infero-medial perforators were preferred as these enabled an ideal pivot point for transposition. The choice of either SGAP or IGAP was made with the use of preoperative imaging in all cases with perforator location and course related to the donor defect. The choice of side was also based on imaging findings.

Flap length and width were marked around the selected perforator, providing sufficient skin to reconstruct the posterior vaginal wall and extend distally toward the natal cleft (Fig. 2). As shown in Figures 2 and 3, flap dimensions varied according to body habitus and perforator location. Flap elevation began medially from within the defect in primary reconstruction with sufficient pedicle length to allow unrestricted rotation around the pivot point. Dissection of the exposed ischio-rectal fossa was performed to identify any perforators emerging medial to the gluteus maximus muscle. The marked ellipse was incised distally and inferiorly and elevated superomedially for further isolation of perforators. The preferred perforator was identified and dissected throughout its length or around the muscle to its base until free rotation around the pivot point was achieved. The elevation was completed as an elliptical island flap and transposed through 90° to reconstruct the defect. Any tension on the pedicle was relieved by division of adjacent muscle fibers. The islanded flap was transposed through 90°

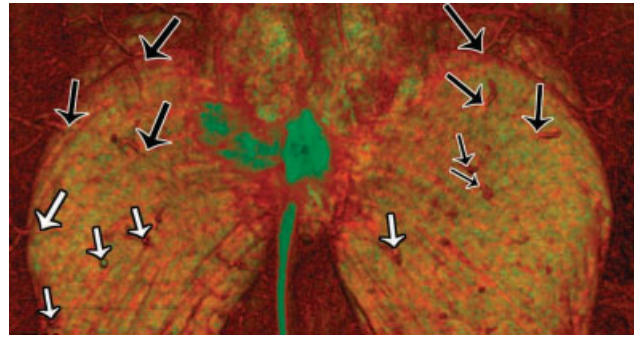


Figure 1. Preoperative computed tomographic angiogram (CTA) demonstrating the subcutaneous course and location of superior gluteal artery perforators (SGAP; black arrows) and inferior gluteal artery perforators (IGAP; white arrows). [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

to reconstruct the defect with the lateral apex of the skin of the flap inset as a chevron into the posterior cephalad vagina to reduce the risk of vaginal stenosis secondary to circumferential contracture. Flap skin lined the mucosal side of the vaginal wall and was reflected cephalad on reaching the introitus to resurface the perineum as required (Figs. 2 and 3). Recipient site drains were used in all cases and donor site drains used selectively.

Postoperatively, patients were ambulated immediately with all bedrest and sitting performed on the contralateral buttock or side for 4 weeks.

RESULTS

In all 14 cases, there were no flap failures or partial flap losses and no postoperative hernias. Follow-up ranged from 6 months to 4 years (mean 18 months). Four patients developed early minor wound dehiscence all of which occurred on the perineal pressure areas with treatment comprising resuturing in three cases and dressings alone in the other. Revisional surgery was performed for reduction of three bulky flaps with debulking required within the introitus.

All patients reported high levels of satisfaction with the outcomes and resumption of sexual intercourse following this procedure in all cases.

DISCUSSION

There are various options in reconstruction of the perineum following abdominoperineal resection with universal goals of surgery being volume replacement, reconstruction of the vagina, and restoration of sexual function. Vaginal wall defects have been classified by Cordeiro et al.¹⁰ according to the extent of absence into types I–III, as an aid to choosing an appropriate reconstruction. Posterior wall defects are classified as type Ib with their preferential reconstructive option being the rectus abdominis musculo-



Figure 2. Superior gluteal artery perforator (SGAP) flap. Top: Preoperative photograph of Doppler and computed tomographic angiogram (CTA) localized superior gluteal artery perforator. Middle: Intraoperative photograph of SGAP flap raised on the single localized perforator. Bottom: Postoperative photograph of the inset flap, having reconstructed the posterior vaginal wall and perineum. The donor site is also seen. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

cutaneous flap or if inappropriate, then bilateral Singapore fasciocutaneous flaps. The rectus flap is reliable and provides adequate bulk, but its harvest may weaken the abdominal wall, in addition to the effects of laparotomy and stoma formation.¹¹ The Singapore flap (neurovascular pudendal thigh flap) is useful, but may not supply sufficient bulk in the setting of extended pelvic extirpation.¹²

Other authors describe the use of gracilis or gluteus maximus musculocutaneous flaps for partial vaginal defects.¹³ The gracilis flap can be bulky in women and difficult to orientate and mold into the defect, whereas gluteus maximus muscle is important for gait and thus better preserved if possible.¹⁴ Avoiding the donor site

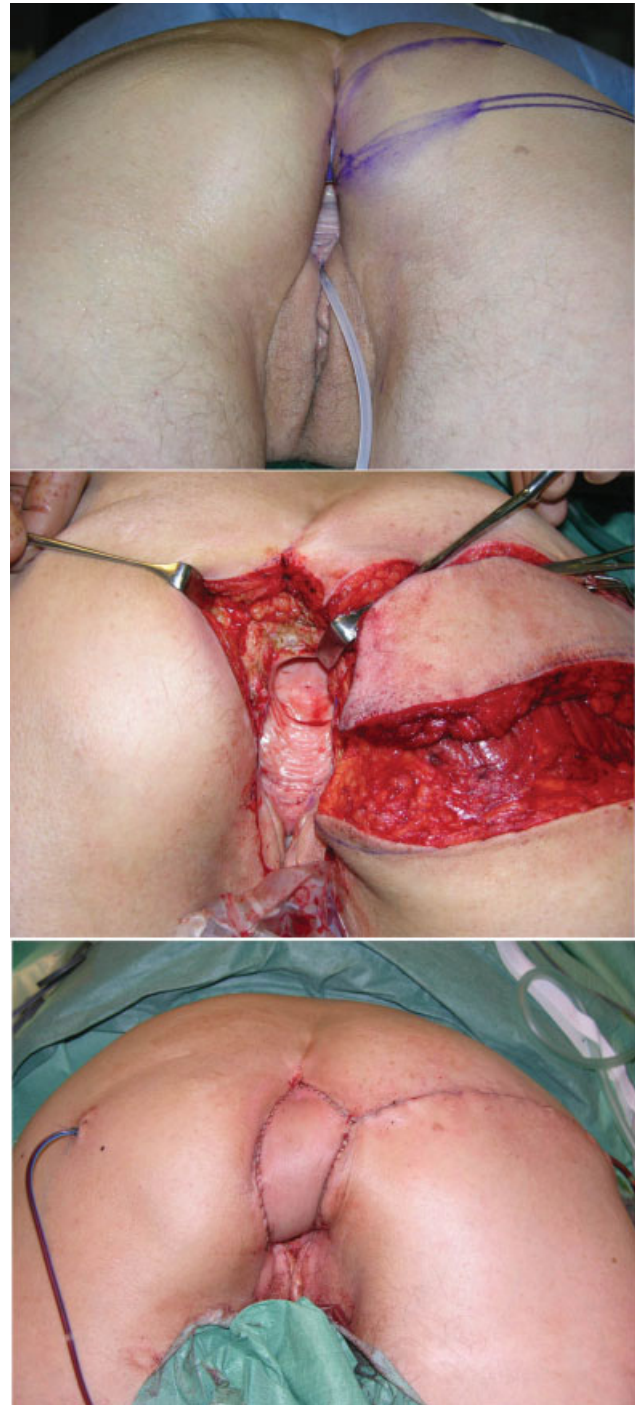


Figure 3. Inferior gluteal artery perforator (IGAP) flap. Top: Preoperative photograph of defect and flap design. Middle: Intraoperative photograph of IGAP flap raised adjacent to defect. Bottom: Postoperative photograph of the inset flap, having reconstructed the posterior vaginal wall and perineum. The donor site is also seen. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

morbidity associated with rectus abdominis or gluteus maximus muscle harvest, we describe the use of fasciocutaneous IGAP and SGAP flaps in this role.

Although the use of the gluteal region has been described previously for this role, this use has been limited to the musculocutaneous gluteal flap or as an advancement flap, which are each limited by the need to include muscle harvest or the advancement of irradiated tissue into the defect.^{3–5} While popularized for use in breast reconstruction as free flaps,¹⁵ pedicled gluteal artery perforator flaps have been described for local advancement into defects such as sacral pressure ulcer defects^{16,17} and other lumbosacral defects.^{6,7} Judge et al.⁹ described the gluteal artery perforator flap for this role, however, used these as advancement flaps, with irradiated tissue necessarily used in the flap, and contributing to complications such as wound dehiscence and infection. However, the transposition of these flaps for use in perineal and vaginal wall reconstruction after extended abdominoperineal resection, an increasingly utilized procedure for wide margins in the treatment of rectal cancers, has not been described. Our experience in both the immediate and delayed setting is that this technique produces a good functional outcome with low-donor site morbidity.

In addition, the use of preoperative CTA has been shown to help with surgical planning and thereby reduce operative times in other perforator flap surgery,^{18,19} and this too has been our experience in the current series. As demonstrated in Figure 1, the use of CTA can highlight optimal perforators in terms of size, course, and location, and match the most suitable flap perforator to the defect. Preoperative awareness of perforator anatomy can determine the feasibility of flap design and indeed the choice of flap being planned, select the optimal perforator, and aid dissection and dissection times. Unique to this region is the often large number of perforators of small size (0.3–0.8 mm) and oblique course in the subcutaneous fat, which may confound perforator selection when only a single two-dimensional image is reviewed (as in Fig. 1). In all of our cases, the perforators selected preoperatively were utilized in the flap and the use of preoperative imaging was able to contribute to successful outcomes. The choice of either SGAP or IGAP was made with the use of preoperative imaging in all cases with perforator location and course related to the donor defect. CTA was preferred as the imaging modality and performed in all delayed reconstructions with Doppler ultrasound always available as an adjunct to CTA or as a stand-alone technique.

CONCLUSIONS

Gluteal artery perforator flaps are a useful technique in the reconstruction of the perineum and posterior vaginal wall following wide oncological resections. The technique

is reliable, has low-donor site morbidity, provides a suitable bulky flap, and is convenient in terms of patient positioning. The use of preoperative imaging is highlighted as a technique to improve preoperative planning, operative times, and outcomes. Our experience in both the immediate and delayed setting is that this technique produces a good functional outcome with low-donor site morbidity.

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