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Reconstructive

Comparative Study between Gluteal Artery Perforator Flaps and Local Fasciocutaneous Flaps in Reconstruction of Gluteal Pressure Ulcers

Abdel Nasser Mohamed El Naggar, MD, PhD
Mostafa Fathy Ibrahim, MD, PhD
Khaled Mohamed Abdel Azeem, MD, PhD
Ahmed Hamdy
Mahmoud Ibrahim, MSC, MRCS
Emad Mohamed Hawas, MD, PhD

Background: Gluteal pressure ulcers are a common problem, associated with great morbidity and cost, and their surgical treatment includes debridement with complete bursectomy, followed by soft tissue coverage. Gluteal artery perforator flaps and gluteal fasciocutaneous flaps are commonly preferred for reconstruction because they preserve the gluteal muscle, allowing for revision in recurrent cases. The aim of this study was to evaluate the differences between these two flaps in the reconstruction of gluteal pressure ulcers regarding operative time, postoperative hospital stay, postoperative complications, and recurrence.

Methods: This prospective comparative study was conducted on 30 patients who presented with stage IV gluteal pressure ulcers. Patients were randomly allocated into two equal groups: each group consisted of 15 patients. Cases in group A were reconstructed using gluteal artery perforator flaps, and those in group B were reconstructed using local fasciocutaneous flaps.

Results: There was statistically significant long operative time and short postoperative hospital stay in gluteal artery perforator flaps when compared with local fasciocutaneous flaps. Also, the fasciocutaneous group reported a higher nonsignificant complication rate when compared with the gluteal perforator group. No recurrent cases were reported, and most patients had satisfactory outcomes in both groups.

Conclusion: Both techniques are safe, reliable, and effective and can be considered as a first-line option in the reconstruction of gluteal pressure ulcers. *(Plast Reconstr Surg Glob Open 2024; 12:e5671; doi: 10.1097/GOX.0000000000005671; Published online 4 March 2024.)*

INTRODUCTION

Pressure ulcers are defined as a localized injury either to the skin or to the underlying subcutaneous tissues. These ulcers mostly occur over bony prominences as a result of pressure or shear injuries that initially lead to tissue necrosis and, eventually, ulcer formation. Bedridden patients are commonly affected by pressure ulcers, specifically older patients. In addition, young patients with spinal cord injuries represent another affected category due to sensory deficit.[1]

Ulcers of the gluteal region (sacral, ischial, and trochanteric) are common, and the surgical intervention for these ulcers is challenging for plastic surgeons due to the bad general condition of the most affected patients that eventually leads to recurrence in the long term, even after a successful intervention.[2] Treatment focused mainly on adequate surgical wound debridement, including the affected bone, followed by soft tissue transfer so as to provide a suitable dead space filling along with healthy skin coverage.[3]

Gluteal fasciocutaneous flaps are frequently used for the reconstruction of these ulcers because they preserve both the integrity and function of the gluteal muscle.[4] On the contrary, these flaps lack the bulk for deep defects, and the arc of rotation of the vascular pedicle limits them. Also, sometimes the donor site may require a skin graft, resulting in donor site deformity.[5]

From the Department of Plastic and Reconstructive Surgery, Beni-suef University Hospital, Faculty of Medicine, Beni-Suef University, Beni-Suef, Egypt.

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Furthermore, the evolution of perforator flap surgery has increased donor site availability because these flaps can be supplied by any musculocutaneous or septocutaneous perforator(s), thus reducing donor site morbidities.[6] Although the gluteal artery perforator flap has been primarily used in breast reconstruction, it has also been gaining popularity in the reconstruction of pressure ulcers with success because of the long pedicles of superior and IGA perforator flaps that facilitate the transfer of nearby healthy tissue into the defect area.[7]

Another advantage of perforator flaps is the large number of sizable perforators that belong to the superior and inferior gluteal arteries, making the design of various sizes and shapes of flaps around the defect area easy and possible.[8] On the contrary, the disadvantages of these flaps include the need for meticulous dissection to isolate the perforator vessels; increased operative time, especially in muscle perforators; and variability in the position and size of the perforator vessels. In addition, they need a steep learning curve.[9]

The aim of our study was to evaluate the differences between the use of superior (SGAP) and inferior (IGAP) gluteal artery perforator flaps and the local facsiocutaneous flaps in reconstruction of gluteal pressure ulcers regarding operative time, postoperative hospital stay, postoperative complications, and recurrence.

Takeaways

Question: Gluteal pressure ulcers and how to find good flap designs to reconstruct them.

Findings: A comparative study was done between gluteal artery perforator flaps and local fasciocutaneous flaps to reconstruct 30 defects with stage IV gluteal pressure ulcers. There was a nonsignificant increase in complication rate in fasciocutaneous flaps and a significant increase in operative time in gluteal perforator flaps. Most patients in both groups were satisfied.

Meaning: Both flaps are safe and reliable for reconstruction of gluteal pressure ulcers.

METHODS

Study Design

This prospective randomized comparative study was conducted during the period between August 2020 and April 2022 on 30 adult patients who presented with stage IV gluteal pressure ulcers (ulcers with full-thickness skin and tissue loss with exposed bone, tendon or muscle). Patients were randomly allocated into two equal groups; each group consisted of fifteen patients. Cases in group A were reconstructed using gluteal artery perforator flaps, and those in group B were reconstructed using local fasciocutaneous flaps. A simple randomization method was used in our study, in which each patient was marked with a specific number, and random patients were chosen using random number tables. Patients were collected from the outpatient plastic surgery clinic of Beni-Suef University Hospital, where they were operated upon.

Ethical Approval

The study was approved by the institutional review board of Beni-Suef Faculty of Medicine (IRB No. FMBSUREC/07062020/Ibrahim) and performed in accordance with the principles of the Declaration of Helsinki.

Inclusion Criteria

Adult patients between 18 and 60 years old of both sexes.

Exculsion Criteria

1. Patients with medical comorbidities like uncontrolled diabetes mellitus or severe cardiac, hepatic, or renal diseases.
2. Recurrent or previously reconstructed gluteal pressure ulcers.
3. Gluteal pressure ulcers which were previously exposed to radiation.
4. Mentally or psychologically challanged patients.
5. Patients with peripheral vascular diseases and blood coagulopathies.

Patient Counseling and Consent

Patients were counseled about the procedure steps in detail, the duration of the hospital stay, the possibility for wound dehiscence or infection, and about any suspected complications. A written informed consent was obtained from each patient for the publication and the use of their images after being informed of the study objectives and the operative procedures.

Preoperative Assessment

A full medical history was taken from all patients along with proper physical examination of the affected pressure ulcer regarding its anatomical site and size. Examination of the donor site, with regard to any scars, inflammation or infection, was done. Laboratory investigations, in the form of CBC, coagulation profile, liver and renal function tests and HbA1c, were ordered. A plain x-ray of the pelvis in the antero-posterior view was done so as to evaluate the status of the underlying bone and to rule out any underlying osteomyelitis.

Patient Evaluation

Both color duplex ultrasonography and a hand-held Doppler device were used for preoperative identification of the gluteal artery perforators. Patients who presented with infected gluteal ulcers underwent two stages: the surgical debridement of the wound first as a separate preliminary stage and the final stage of flap reconstruction after that.

Operative Technique

A: Photography

Standard photographs were taken of all prone-positioned patients in the top view. Photographs were taken preoperatively, intraoperatively, and 6 months postoperatively.

B: Marking:

(1) Group A

All patients were placed in the prone position, and the locations of the posterior superior iliac spine (PSIS), the greater trochanter (GT), the ischial tuberosity and the coccyx (C) were identified. A line was then drawn from the PSIS to the GT, and the intersection of the upper and the mid-third of this line represented the location of the superior gluteal artery (SGA) (Fig. 1A). Another line was then drawn from the PSIS to the ischial tuberosity, and the intersection of the lower and the mid-third of this line represented the location of the inferior gluteal artery (IGA) (Fig. 1B). A third line was drawn from the midpoint of the line connecting the PSIS and the coccyx to the GT, and it represented the location of the piriformis muscle. Perforators of the SGA and IGA are located above and below the piriformis muscle, respectively.

Identification of the Gluteal Artery Perforators

Following the previous markings, perforators were then preoperatively identified using the 8 MHz hand-held Doppler device, wherein the ones with the higher sound intensity were marked. In the case of the SGAP flap, the skin paddle to be harvested was then marked around the perforators of the SGA. [**See figure, Supplemental Digital Content 1,** which display a photograph of SGAP flap for sacral ulcer. Stage IV sacral pressure ulcer, with a final defect 14 cm × 6 cm, of 57-year-old ambulant diabetic man. A 20 cm × 8 cm SGAP flap was planned, and the flap was advanced to the defect area over three perforators. (A) Preoperative identification of the SGA perforators with Doppler and designing the SGAP flap. (B) Intraoperative photograph shows flap dissection, isolation of three musculocutaneous perforators, and their marking with vessel loops. (C) postoperative photograph after 6 months shows good healing of the flap. **http://links.lww.com/PRSGO/D109**.]

In the case of the IGAP flap, it was marked around those of the IGA. More than one perforator could be included in the flap.

(2) Group B

Marking was done according to the design of the planned fasciocutaneous flap. In both groups, flaps were designed longer and wider than the defect to fill up dead space and provide sufficient padding.

C: Operative Steps

All procedures were performed while the patient was in the prone position under general anesthesia, and the operative steps included:

(1) Excision of the Ulcer

After injecting a tumescent solution containing epinephrine 1: 200,000, the ulcerated area and the underlying bursa were completely excised down to healthy tissue, followed by smoothly trimming any bony spicules with an osteotome.

(2) Flap Reconstruction Techniques

(2A) Group A

All procedures were carried out under loupe magnification (4×). The incision was started at the superior border of the flap.The flap was elevated in the subfascial

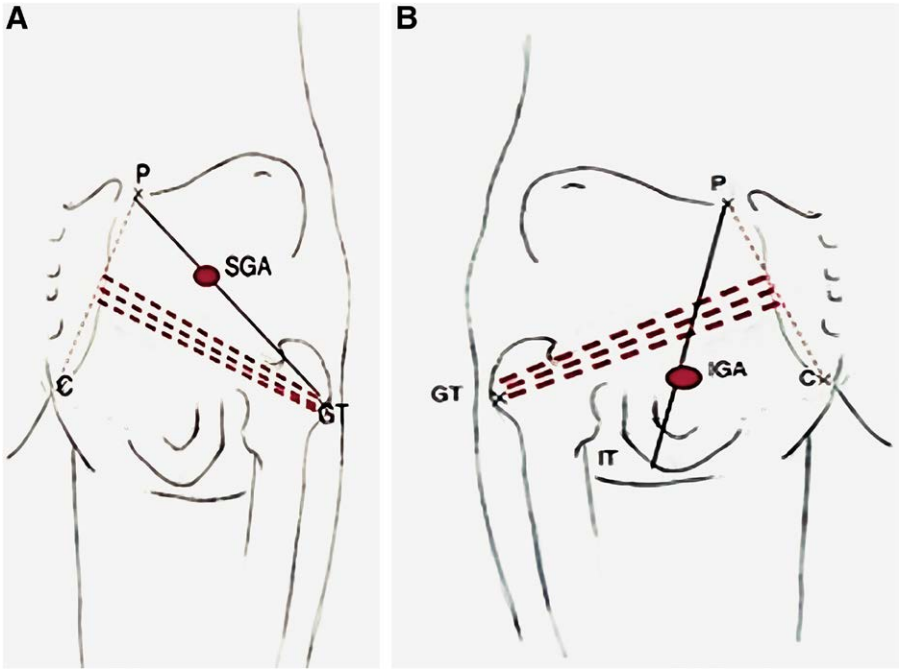

Fig. 1. Images of the marking of the gluteal arteries. A, Marking of the SGA. B, Marking of the IGA. P, posterior superior iliac spine; C, coccyx. Thick dotted lines represent the piriformis muscle.[6]

plane from lateral to medial, parallel to the gluteal muscle fibers. Perforators were then identified by direct visualization in this avascular plane and marked with a vessel loop around. After that, the flap was completely dissected all around. Before insetting, the flap was checked for dermal bleeding at its edges; carefully lifted from the donor bed; and advanced into the recipient defect, taking care to avoid kinking or twisting the dissected perforator.

(2B) Group B

The pedicled flap was dissected in a subfascial plane above the gluteal muscle layer. The flap was superiorly or inferiorly based according to its design, with careful attention to the flap's pivot point so as to avoid tension of the pedicle. Care should be taken during dissection toward the base of the flap to avoid cutting the blood supply of the flap. The flap was then carefully lifted from the donor bed and either rotated, advanced, or transposed into the recipient defect. [**See figure, Supplemental Digital Content 2**, which display a photograph of Limberg flap for left ischial ulcer. Stage IV left ischial pressure ulcer, with a final defect 6 cm × 5 cm, of a 20-year-old paraplegic woman. An 8 cm × 8 cm fasciocutaneous Limberg flap from the left medial thigh was planned, and the flap was transposed to the defect area. (A) Preoperaive marking of the flap. (B) Intraoperative photograph shows the flap after being elevated, transposed, and insetted. (C) Postoperative photograph after 6 months shows good healing of the flap. **http://links.lww.com/PRSGO/D110**.] [**See figure, Supplemental Digital Content 3**, which displays a photograph of IGAP flap for left ischial ulcer. Stage IV left ischial pressure ulcer, with a final defect 9 cm × 8 cm, of a 44-year-old paraplegic man. A 13 cm × 10 cm IGAP flap was planned, and the flap was advanced to the defect area over one perforator. (A) Preoperative identification of the IGA perforators with Doppler and designing the IGAP flap. (B) Intraoperative photograph shows flap dissection, isolation of one musculocutaneous perforator and marking it with a vessel loop. (C) Intraoperative photograph shows the advancement of the dissected flap to the defect. (D) Postoperative photograph after 6 months shows good healing of the flap. **http://links.lww.com/PRSGO/D111**.] [**See figure, Supplemental Digital Content 4,** which displays a photograph of Limberg and rotational flaps for sacral and left ischial ulcers. Stage IV sacral and left ischial pressure ulcers, with a final defect of 11 cm × 8 cm and 13 cm × 9 cm, respectively, of a 27-year-old paraplegic woman. A 13 cm × 9 cm gluteal fasciocutaneous rotational flap and 15 cm × 11 cm fasciocutaneous Limberg flap from the left lateral thigh were planned for the sacral and left ischial ulcers, respectively. (A) Preoperative marking of both flaps. (B) Immediate postoperative photograph shows both flaps after being insetted. (C) Postoperative photograph after 6 months shows good healing of both flaps. **http://links.lww.com/PRSGO/D112**.]

At the end of the operation (whether group A or group B), closure of the wound was done in two layers: subcutaneous by 2-0 Vicryl sutures and skin by 3-0 polypropylene sutures. The donor site was closed primarily. We preferred to close the donor site first to reduce the tension between the flap and the defect. A closed suction drain was then inserted to prevent any donor site collections.

Postoperative Care

The patient was allowed to lie in the prone position for three weeks on air-flotation beds. Any source of flap compression was avoided. Close monitoring of the flap was done for any possible complications. Intravenous antibiotics were prescribed for one week postoperatively. The donor site drain was removed after 5-7 days, and sutures were removed after one month postoperatively. Later on, a sitting protocol, including a gradual increase in pressure on the operation site, was introduced.

Follow-up

Patients were followed up for 6 months after the operation. Postoperative assessment included pre- and postoperative photographic documentation, analysis of postoperative complications, and patients' postoperative satisfaction score.

Patients' Postoperative Psychological Satisfaction

It was evaluated using a subjective quartile evaluation scale (not satisfied, low satisfaction, satisfied, and very satisfied).

Statistical Analysis

Quantitative data was expressed as mean ± SD for normally distributed variables and median with IQR for nonnormally distributed variables, whereas qualitative data was expressed as numbers and percentages. The independent samples *t* test was used for normally distributed variables, while the Mann-Whitney test was used for nonnormally distributed variables. The chi-square (χ^2) test was used to compare between two qualitative variables. A *P* value less than or equal to 0.05 was considered the cutoff value for significance. These statistical analyses were conducted in SPSS version 28.0 (IBM Corp., Armonk, N.Y.).

RESULTS

Thirty adult patients (20 men and 10 women) with stage IV gluteal pressure ulcers were included in our study and were equally randomized in two groups. The demographic data for each group, including sex, patient status, etiology and anatomical site of gluteal ulcers, and the need for surgical debridement, were outlined in Table 1, and the data of the mean defect size and the flap size for each group were outlined in Table 2. All the aforementioned parameters showed no significant differences between both groups ($P > 0.05$).

Most of the gluteal artery perforator flaps were elevated on two perforators, and all of the perforators were musculocutaneous. All patients in the gluteal perforator group were reconstructed with a V-Y advancement flap. Regarding the fasciocutaneous group, eight patients were reconstructed with gluteal rotational flaps, six patients with Limberg flaps, and one patient with a V-Y advancement flap.

Table 1. Patient Demographics in the Two Groups

Variables	Gluteal Artery Perforator Flaps	Fasciocutaneous Flaps	Total	*P**
Sex				
Male	11 (73.3)	9 (60.0)	20 (66.7)	0.439
Female	4 (26.7)	6 (40)	10 (33.3)	
Etiology of gluteal pressure ulcers				
Traumatic spinal cord injury	8 (53.3)	5 (33.3)	13 (43.3)	0.712
Iatrogenic spinal cord injury	4 (26.7)	6 (40.0)	10 (33.3)	
Post orthopedic surgery	3 (20.0)	3 (20.0)	6 (20)	
Post brain surgery	0	1 (6.7)	1 (3.3)	
Patient status				
Paraplegic	12 (80.0)	11 (73.3)	23 (76.7)	>0.999
Ambulatory	3 (20.0)	4 (26.7)	7 (23.3)	
Anatomical site of gluteal pressure ulcers				
Sacral region	6 (40.0)	5 (33.3)	11 (36.7)	0.705
Ischial region	9 (60.0)	10 (66.7)	19 (63.3)	
Surgical debridement to gluteal ulcers				
No need for surgical debridement	11 (73.3)	10 (66.7)	21(70)	>0.999
Surgical debridement was done	4 (26.7)	5 (33.3)	9 (30)	

Values are presented as number (%).
**P* value is considered nonsignificant by Chi-square test.

Table 2. Defect Size and Flap Size in the Two Groups

Variables	Gluteal Artery Perforator Flaps	Fasciocutaneous Flaps	Total	*P**
Defect size	Mean ± SD	Mean ± SD	Mean ± SD	
Defect length (cm)	10.67 ± 2.80	9.87 ± (4.29)	10.27±3.58	0.55
Defects width (cm)	6.60 ± 1.12	7.33 ± (2.97)	6.97 ± 2.24	0.378
Flap size				
Flap length (cm)	15.27 ± 3.94	12.8 ± 5.02	14.03 ± 4.60	0.145
Flap width (cm)	8.6 ± 1.18	9.53 ± 3.2	9.07 ± 2.42	0.299

**P* is considered nonsignificant by Independent samples *t* test.

The operative time was higher in the perforator group compared with the fasciocutaneous group, while postoperative hospital stay was higher in the fasciocutaneous group compared with the perforator group. Both were statistically significant when being compared in both groups ($P < 0.05$; Table 3).

With regard to postoperative outcomes, 21 patients healed eventually without complications, while nine patients had flap complications in both groups, with a higher complication rate in the fasciocutaneous flap groups when compared with the perforator flap group. Wound infection was managed by topical and systemic antibiotics along with repeated dressing. Wound edge dehiscence required secondary suturing for one patient in the perforator group, while it healed by secondary intention in the remaining four patients in both groups. Donor site–wide scars were managed with topical creams in both groups. Postsurgical complications were compared, and there were no significant differences between both groups ($P > 0.05$). There were no reported recurrent cases in either group during the follow-up period (Table 4).

Patients' postoperative psychological satisfaction was compared, and there was no statistically significant difference between the two groups ($P > 0.05$). Most patients in both groups had a satisfactory outcome (Table 5).

DISCUSSION

Pressure ulcers, especially of the gluteal region, have a negative psychological impact on the life of the affected patients and often cause personal, family, health, and social problems in a high percentage of the population, especially in paraplegic and tetraplegic patients. In addition, these ulcers represent a difficult challenge for plastic surgeons owing to their high rates of wound complications and recurrences.[10]

Table 3. Distribution of Operative Time and Postoperative Hospital Stay in the Two Groups

	Gluteal Artery Perforator Flaps	Fasciocutaneous Flaps	Total	
Variables	Median (IQR)	Median (IQR)	Median (IQR)	*P**
Operative time (min)	210 (60)	100 (30)	160 (112.5)	< 0.001
Hospital stay (d)	17 (6)	20 (3)	19 (4.25)	0.004

**P* < 0.05 is considered significant by Mann-Whitney test.
IQR, interquartile range.

Table 4. Distribution of Postoperative Outcomes in the Two Groups

Variables	Gluteal Artery Perforator Flaps	Fasciocutaneous Flaps	Total	*P**
Postoperative complications				
No complications	12 (80)	9 (60)	21 (70)	0.591
Wound infection	0 (0)	1 (6.7)	1 (3.3)	
Wound edge dehiscence	2 (13.3)	3 (20)	5 (16.7)	
Donor site-wide scar	1 (6.7)	2 (13.3)	3 (10)	
Postoperative recurrence	0 (0)	0 (0)	0 (0)	-

Values are presented as number (%).
**P* value is considered nonsignificant by chi-square test.

Table 5. Patients' Postoperative Psychological Satisfaction in the Two Groups

Variables	Gluteal Artery Perforator Flaps	Faciocutaneous Flaps	Total	*P**
Patients' postoperative psychological satisfaction				
Not satisfied	1 (6.7)	2 (13.3)	3 (10)	0.901
Low satisfaction	2 (13.3)	2 (13.3)	4 (13.3)	
Satisfied	5 (33.3)	6 (40)	11 (36.7)	
Very satisfied	7 (46.7)	5 (33.3)	12 (40)	

Values are presented as number (%)
**P* value is considered nonsignificant by chi-square test.

Traditionally, myocutaneous flaps have been considered the workhorse for the reconstruction of these ulcers; however, donor site morbidity, muscle atrophy and large blood loss represent their main drawbacks, especially in ambulatory patients, as these flaps sacrifice the gluteal muscle function. On the contrary, gluteal fasciocutaneous flaps and gluteal artery perforator flaps are two commonly used flaps for the same purpose, but they preserve the function and the integrity of the gluteal muscle with fewer donor site morbidities, less blood loss, and less postoperative pain.[11]

Ulcers of the gluteal region are considered chronic wounds that need special management and care. Guarro et al[12] used the modified TIME-H scoring system as a versatile tool for chronic wound management. Unfortunately, we did not use this scoring system in our study. Also, Guarro et al[13] recommended the use of the digital measuring system (digital smartphone analysis) as a versatile tool for wound morphologic assessment, but we used the traditional method (paper ruler) for assessment of the morphology of the wound (the gluteal ulcer defect) in our study.

In our study, the median operative time of the surgical procedure was 210 and 100 minutes for the gluteal perforator flaps and the local fasciocutaneous flaps, respectively. This reflects the statistically significant short duration of the fasciocutaneous flaps when compared with the gluteal perforator flaps. Vivek et al[4] agreed with our study in their findings as regards the operative time. We could explain that by the fact that the perforator flap is a more difficult technique than the fasciocutaneous flap; thus, it needs tedious and meticulous dissection of perforators, which will require significantly longer operative time to complete the procedure. In a systematic review by Altiparmak,[14] the same concept was agreed upon.

In our study, the median postoperative hospital stay was 17 and 20 days for the gluteal perforator flaps and the local fasciocutaneous flaps, respectively. This reflects the statistically significant short hospital stay of the gluteal perforator flaps when compared with the fasciocutaneous flaps. This could be explained by the higher rate of complications among the fasciocutaneous group that required a longer postoperative hospital stay.

In our study, we did not report the readmission of any patient in any of the two groups after being discharged from the hospital. Winter et al[15] demonstrated that the LACE index is suitable for predicting 30-day readmission after hospital discharge. Unfortunately, we did not use this index in our study.

In our study, only minor complications such as wound infection, wound edge dehiscence, and donor site–wide scar were reported in both groups. Our results were not far from the results of the comparative study of Vivek et al,[4] in which wound dehiscence was reported among two patients versus one patient in fasciocutanoeus and perforator flaps, respectively, and was managed by secondary suturing. Also, wound infection was reported in two patients in the fasciocutaneous group and was managed by antibiotics.

Boissiere et al[16] reported, in their systematic review, salvage options for flap venous congestion such as leeches, local subcutaneous injection of heparin with scarification, venocutaneous catheterization, negative pressure wound therapy, and hyperbaric oxygen therapy. Fortunately, no major complications such as flap venous congestion, flap necrosis, or hematoma were reported in our study. This may be due to the use of donor site drains and our attention not to remove it except after enough time postoperatively. Unlike our study, Bali et al[17] reported a total flap loss in their study due to venous insufficiency, which was caused by hematoma around the pedicle, and they advised the use of drains.

In our study, most patients had a considerable postoperative satisfactory outcome in both groups. Unfortunately, four patients had low satisfaction due to donor site scar and wound dehiscence, while three patients were not satisfied because they had wound infection or wound dehiscence. Tzeng et al[18] agreed with our study and reported that most of their patients were

satisfied with the outcome of their study except for five patients; two of them were unsatisfied with wound edge dehiscence, while the other three were unsatisfied with partial flap necrosis.

Our study has some limitations in that it included a small sample size in each group along with a short postoperative follow-up period. One of the major limitations was that the study did not focus on a specific anatomical site of pressure ulcers in the gluteal region, resulting in different patient numbers for each anatomical site, making samples more heterogeneous. Furthermore, the design of both flaps was not uniform and varied; therefore, comparisons could be negatively affected by different flap designs in both groups. The unavailability of rehabilitation data of our patients was a major limitation. Also, We did not use CT angiography for preoperative mapping of gluteal artery perforators. We did not measure the flap thickness, location, size, length of gluteal artery perforators, or the distance between them.

Despite the above limitations, we believed that the strength of this study was that it was a randomized one, keeping it away from selection bias. We recommend a further comparative study that focuses on a specific anatomical site in the gluteal region with a larger sample size and a longer follow-up period, along with available rehabilitation data, so that we can better evaluate the outcomes in terms of morbidity and recurrence.

CONCLUSIONS

We can say that both gluteal artery perforator flaps and local fasciocutaneous flaps had comparable postoperative outcomes regarding complication rates and donor site morbidities. Nevertheless, gluteal artery perforator flaps had a slightly insignificant lower complication rate. Furthermore, the fasciocutaneous flap technique had significantly lower intraoperative time, which reflects the simple nature of the technique compared with the perforator flap technique. However, in case of complications, a significantly longer duration of hospitalization has to be considered. Both techniques had considerable postoperative patient psychological satisfaction.

Therefore, our study concluded that the superior and IGA perforator flaps and the local fasciocutaneous flaps are safe and reliable flap designs. Both are effective and can be considered as a first-line option for reconstruction of gluteal pressure ulcers, with preservation of the underlying muscle tissue, leaving it available for future reconstruction.

Ahmed Hamdy Mahmoud Ibrahim, MSC, MRCS
Department of Plastic and Reconstructive Surgery
Beni-Suef University Hospital, Faculty of Medicine
Beni-Suef University, Beni-Suef 62511
Egypt
E-mail: docsendbad2010@gmail.com

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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