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ORIGINAL ARTICLE

Superior Gluted Artery (S-GAP V-Y) rotation advancements flap for large sacral pressure sores.

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ABSTRACT… Objective: To stress the superb utility and easy movement of gluteal soft tissue in reconstruction of sacral pressure sores, while preserving further options for future use, in multiply moribund patients. **Study Design:** Retrospectively analyzed. **Setting:** Department of Plastic Surgery, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan. **Period:** November 2019 till March 2022. **Methods:** Twenty-seven patients were retrospectively analyzed, who underwent coverage of moderate to large grade III and IV, sacral pressure sores with 28 V-Y rotation advancement flaps based on superior gluteal artery perforator. The cause of injury, demographic details, and wound characteristics were obtained from patient records. **Results:** The study included 24 men and 3 women, with mean age of 31 years, including three children. Spinal injury secondary to road traffic accident was the most common cause of spinal injury followed by firearm injury and meningomyelocele. Patients were followed for 6 months to one year. All flaps survived completely, with one incidence of dehiscence which was managed by delayed closure, with readvancement. **Conclusion:** Among the many strategies for sacral pressure sore coverage, perforator-based movement of gluteal soft tissue is very reliable, easy to master and lends itself to reuse in future circumstances.

Key words: Flap, Pressure Sores, Reconsturction, Superior Gluted Artery Perforator.

INTRODUCTION

Pressure sore presents a significant challenge to reconstructive surgeon[1], not only because of its high incidence in hospitalized patients[2] and in patients with paraplegia and quadriplegia[3,4,5], but also because of high recurrence rates of 80 %.[6,7] Majority of pressure sores occurs around pelvic region[8,9] and surgical intervention is usually required for grade III and grade IV injuries, as these cannot heal on their own, and will definitely require stable soft tissue coverage.[10,11,12] Adding to the complexity of the problem, the high recurrence rates and the frail patient population, does necessitates the future need for reoperations.[13,14]

Of the plethora of reconstruction options spanning from skin grafting to microvascular techniques[15,16,17,18,19], cutaneous flaps may have a better long-term outcome as opposed to musculocutaneous flaps, because these flaps better tolerate pressure ischemia.[20]

For sacral pressure sores, mostly flaps based on the perforators of superior gluteal artery (SGAP) and inferior gluteal artery (IGAP) have been used, in a variety of configurations including advancement, propeller design or freestyle perforator-based.[21,22,23]

This study describes the movement of gluteal soft tissues based on the SGAP, in terms of Rotation and Advancement, which combine the benefits of both to allow for coverage of more extensive sacral defects, while at the same time, lends itself well to future uses, in case of recurrences, which are very common in this population group.

METHODS

Approval from Ethical Review Committee of Gomal Medical College was obtained through

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Twenty seven patients with grade III and grade IV sacral pressure sores, with no previous history of surgery for their sacral pressure sores presented to Plastic Surgery unit, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan, during November 2019 to March 2022, were retrospectively analyzed, from patient records. Patient who had grade I or II sacral pressure sores, or patients that had been previously operated for the same sacral pressure sore were excluded. After thorough clinical assessment and necessary laboratory investigations, a full disclosure of the general care, surgical plan and post operative rehabilitation was discussed (Table-I).

Surgical Technique

All patients were positioned prone on operation table. Procedures were performed either under local anesthesia with adrenaline to limit blood loss, spinal anesthesia for patients with recovered spinal function or with intravenous sedation in pediatric cases to alleviate anxiety.

All sacral pressure sores were painted with methylene blue, to better visualize the extent of excision, which always included the rim of indurated ulcer margins. The lengths and widths measured.

Superior gluteal artery and inferior gluteal artery perforators were preoperatively identified using hand held 8-MHz Doppler probes and marked on both sides of the ulcer (Figure-1).

V shaped curvilinear incisions were marked from the superior and inferior edges of the pressure sore towards greater trochanter of the femur. Hence the resultant flaps were tailored to the lengths and widths of the defect. Flaps were raised in subfascial plane over Gluteus Maximus muscle using monopolar cauterization from all sides. Inferior gluteal vessels were ligated in all cases. Blunt scissors dissection was employed once dissection reached near the marked superior gluteal artery perforator, which was more easily identified from the superior aspect of the flap, rather than the inferior or lateral sides. The perforator was dissected all around, leaving a thin cover of soft tissues around the pedicle. All the flaps were rotated and advanced in V-Y fashion. Whenever the advancement allowed, the leading two to three centimetres of flaps were de-epithelized and inverted to better fill the dead space.

Number of patients	27 (26 male, 3 female)
Age (years)	31.18±14.29 years
Causes of Paraplegia	
Road traffic accident	11 (41%)
FAI spine	4 (15%)
Meningomyelocele	3 (11%)
Tuberculosis spine	2 (7%)
Fall with spinal injury	2 (7%)
Transverse myelitis	2 (7%)
Post spinal surgery	1 (4%)
Post stroke	1 (4%)
Blunt spinal Trauma	1 (4%)
Defect surface area	86.37±42.14 cm^2
Complications	
Dehiscence	1 (4%)

Table-I. Patient and pressure sore characteristics

Figure-1. Marking of SGAP and IGAP perforators on both side of the pressure sore helps to preserve the perforators on the opposite side for possible future use.

In larger defects, or in obese patients, the opposite side of the ulcer were dissected sub-fascially for a few centimetres but short of the opposite marked SGAP, to allow tension free closure and also not to limit the future use of the opposite side SGAP flap, in case the need for further surgeries arise.

Flaps were inset using VICRYL and Prolene at the leading edge, while the sides were closed with VICRYL and skin staples. Drains were placed for

2 postoperative days and incisions covered with antibiotic ointment. Patients were cared in lateral and prone positioning for three weeks, after which they were allowed to lie supine, with instruction for general pressure sore care.

RESULTS

Twenty-seven patients with grade III and IV sacral pressure sores (24 males and 3 female), with age range of 2 years to 57 years (mean±SD=31.18±14.29) were included. The surface area of the defect ranged from 10cm^2 to 168cm^2 (mean±SD=85.92±41.16).

All patients undergone one sided fasciocutaneous SGAP rotation advancement flap, except one patient with 168 cm^2 pressure sore, in which flaps were raised from both sides (Figure-2).

Figure-2. Use of bilateral SGAP rotation advancement perforator flaps in a largest pressure sore in the series having dimensions of 14x12 cm and surface area of 168 cm^2.

All flaps survived completely, with one incident of partial flap dehiscence at the lower advanced edge of the flap, which was closed in delayed fashion after two weeks. There were no other complications like seroma or wound infection. Patients were cared in prone or lateral position for a period of three weeks, after which they were allowed to lie supine or sit.

All the patients were followed for six months up to a year, or they had to come for management of pressure sores at other sites. There were no instances of aberrant scar healing like widening, hypertrophy and keloids.

DISCUSSION

Reconstruction of complex soft tissue defects of trunk like pressure sores have been challenging, owing to factors like poor general condition of the patient or deficient vascularization of the wound area, which are often associated with high complications and recurrence rates.[24,25]

The nuisance of high recurrence rate should be addressed at the outset when formulating the initial coverage plan, so that future options are not limited.[13] Studies have demonstrated that flaps containing muscles are not superior to fasciocutaneous or perforator flaps, but muscle flaps may restrict reoperations.

Furthermore, with regard to random pattern fasciocutaneous flaps, the rotation movement of the tissue has a better length: width ratio than simple advancements.[28]

Figure-3. The rotation movement of the flap enables to better traverse larger defects, than simple advancements.

The perforator design of V-Y rotation advancements combines the benefits of a perforator flap pivoting on a single point of attachment and the rotation movement of soft tissues, which may help traverse greater defects (Figure-3). Moreover, the superior and inferior edges of flap align well with the overall configurations of buttocks, while other options like propeller designs or hatchet type flaps may leave less anatomical scars (Figure-4).

Figure-4. Few examples of the utility of the SGAP rotation advancement flap in various age groups and configurations and more anatomical scars.

In the unfortunate event of recurrence, if the defect is small to medium, the same flap can be incised, rotated and advanced easily in either subfascial or subcutaneous level, while for large recurrent ulcers, a similar flap from the other side, or a muscle flap can be used as the Gluteus Maximus muscle was spared in a primary procedure. This strategy is particularly helpful in a patient that has multiple pressure sores around pelvis such as Trochanteric or Ischial, when there is always paucity of locally available tissues.

CONCLUSION

A V-Y rotation advancement of gluteal tissues over SGAP pedicle is a very simple, reliable and efficient design for large and complex sacral defects like pressure sores in a fragile patient population in poor general health, with the added benefits of reusing the same tissues in the event of recurrence and also the resultant scars are more anatomical than the other designs of flaps used for the same problem.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Asif Aziz:** Concept, data collection, analysis, research.
2	**Mansoor Khan:** Concept, data collection, analysis, research.