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Split Gluteus Maximus Musculocutaneous Islanded Flap Based on Inferior Gluteal Artery for All Sacral Sore Management: A New Technique

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Abstract: ***Background: Surgical management of sacral sore has always been a challenge. Majority of the cases are encountered in patients with spinal cord injuries due to poor nursing care. Numerous flaps are described for resurfacing these defects. However there is high rate of failure leading to recurrence due to multiple factors. The most common being lack of tension free lie of the flap once it is advanced. To avoid this one is forced to raised two flaps from the either side of the sacral defect. This limits the option of future flap harvest in case there is a complication. These drawbacks can be circumvented by using a new technique. Split gluteus maximusmusculocutaneous islanded flap based on inferior gluteal arteryis a robust vascular flap with better reach ensuring tension free lie, and at the same time due to its ability to cover defects of any size, no second flap is needed to be raised from the other buttock. Materials and Methods: 20 Cases of sacral sores were included in the study. All these patients had sustained spinal cord injuries at various levels who had earlier undergone decompression and fracture fixation/ stabilization procedures. Recurrent sacral sores following flap cover were also included in the study. However the pressure soresin ventilator dependent moribund patients due to any medical or surgical cause were excluded from the study. In all these cases resurfacing of the sacral defects were carried out using split gluteus maximusmusculocutaneous islanded flap based on inferior gluteal artery. Adequate dissection of the inferior gluteal artery pedicle ensured sufficient mobilization of flap across the midline. Tension free lie of the flap was therefore accomplished. Patients were managed in prone and lateral position post operatively. Results: There were no flap loss. No recurrence of sacral sore was detected once the patients were made to lie supine or wheel chair bound and followed up for 01 year post operatively. The gluteal contour bilaterally remained same with adequate bulk on the operated side comparable with the non operated side. Conclusion: The split gluteus maximusmusculocutaneous islanded flap based on inferior gluteal artery can therefore be considered a superior viable option to resurface sacral sore of any dimension without sacrificing the superior half of the muscle and without any need of contra lateral flap elevation for tension less covering of the defect.***

Keywords: Inferior gluteal artery, Musculocutaneous Flap, Sacral sore

Key Message: Surgical management of sacral sore has always been a challenge. Number of flaps: fasciocutaneous flaps, muscle flaps, musculocutaneous flaps and perforator flaps have been designed and described in literature which can be singly or in combination applied to resurface the defect. But so far no single flap can alone cover all types of sacral sore. The split gluteus maximusmusculocutaneous V-Y advancement flap islanded on inferior gluteal artery has proved to be reliable flap to cover all types of sacral sores without any need for any other regional flap. It is a robust flap and has a good reach making it an ideal flap for all sacral sore.

1. Introduction

Pressure sore is one of the common clinical condition seen in prolonged bedridden patients following traumatic brain injuries, spinal cord injuries or other medical conditions. Usually seen over bony prominences, most commonly involving the thin skin overlying the sacrum. Unfortunately by the time they present for medical attention they are already quite advanced. The associated co-morbidities like old age, malnutrition, urinary and stool incontinence, anemia, spasticity, low immunity profile, diabetes, obesity coupled with poor infrastructural and inadequate para-medic support makes the condition even more challenging to treat. The surgical outcome is therefore directly dependant in these variables. Optimization of clinical status is an important preoperative pre-requisite to obtain the best surgical results. Notwithstanding this, despite ideal optimization failure of flap leading to reoccurrence of pressure sore is not uncommon, which highlights the need for accurate preoperative flap planning. Various loco regional flaps are described. The choice of the procedure is dependent on the gradeand the size of the pressure sore. Nearly all the flaps mentioned in literature for resurfacing sacral sore are affective for small to medium sized defects. However for larger defects the failure rate are high if used alone. This therefore necessitates use of two flaps. In this study we present a new flap "split gluteus maximusmusculocutaneous V-Y advancement flap islanded on inferior gluteal artery". This flap is large versatile robust with sufficient mobility which can singularly resurface sacral sores of any defect size without the need for a second flap.

2. Material and Methods

This prospective study was conducted in a tertiary care centre from Apr 2013 to Dec 2017. A total of 20 consecutive patients with sacral sore following spinal cord injury with permanent neurological deficit were included in the study. The age group varied from 22 yrs to 53 yrs with mean age being 36.9 yrs. 17 patients were male and 03 patients were female. All had previously undergone spinal cord decompression and fracture stabilization surgery in the same centre or elsewhere. 02 patients were quadriplegic and therefore bed ridden, and the rest 18 were paraplegic who were wheel chair bound. All were urinary and stool incontinent. Sacral sores were graded as per the National Pressure Ulcer Advisory Panel (NPUAP) staging system[1].

18 patients were categorized as stage III. 02 patients belonged to stageIV. 05 patients had trochanteric sores. The dimension of sacral sore varied from 8 to 12 cm in cranio-caudal axis, 6 to 10 cm in transverse axis. 06 were located superiorly in relation to the body of sacrum. 11 were in mid half and 03 were in relation to the lower half of the sacrum. 17 of the ulcers were located in the midline. the other 03 were extending laterally predominantly to one side. These three were recurrent cases of sacral sore operated once in other centres.

In all cases the presurgical optimization of the clinical conditions were ensured, like correction of anemia, nutritional status, muscle spasticity, control of wound infection. All underwent preanaesthesia assessment and were accepted in ASA , Grade - III. The preoperative preparation started a day prior to surgery with patient placed in fluid diet followed by bowel preparation, in the morning of surgery. All patients were kept nil by mouth 8 hours prior to surgery. Two packed cells were demanded and kept standby.

3. Technique

The procedure were carried out in prone jack-knife position under supervised anaesthesia monitored for any episode of autonomic dysreflexia. The bursa were excised. Final dimension of the recreated defect were measured. In case of a midline defect the flap can be raised from either side. However in reoperated cases the flap planning were done from the contralateral side. Posterior superior iliac spine, Ischial tuberosity, Greater trochanter and the ilio tibial tract were marked (Fig.I). The emergence of Inferior Gluteal artery from the inferior border of pyriformis muscle were surfaced marked with hand held doppler. Subsequently a musculocutaneous V - Y flap based on inferior gluteal artery was marked on the inferior half of gluteus maximus muscle. 35- 40 ml adrenaline (1: 200,000) was infiltrated all along the marking of the flap. The flap dissection began by incising the skin along the marked lines and deepened till the muscle was reached (Fig 2). The muscle was hitched to the skin paddle to prevent any shearing injury to the underlying perforators. The inferior border of the gluteus maximus muscle was dissected laterally from its insertion at the greater trochanter and ilio-tibial tract, medially till its lower fibre origin from thesacrotuberous ligament andinfero-lateral border of sacrum. The midline of the inferior border of the muscle is marked which corresponds to the emergence of sciatic nerve from undersurface of the muscle into the posterior compartment of thigh. The muscle is divided from this point and retracted upwards till the fascia covering the sciatic nerve is visible (Fig 2). The division of the muscle is continued superiorly along the course of sciatic nerve, thereby splitting the gluteus muscle in equal superior and inferior half. The division is terminated approximately 5 cm lateral to doppler marking of the inferior gluteal artery(Fig 3). At this point with careful dissection, the main trunk of the inferior gluteal artery is identified on the undersurface of the retracted inferior half of the gluteus maximus muscle medial to the sciatic nerve at the inferior border of pyriformis muscle. The neurocutaneous branch of the inferior gluteal artery which traverses along the posterior cutaneous nerve of the thigh is identified and divided between ligatures. The gluteus maximus is carefully divided lateral to the inferior gluteal artery thereby including the artery in the flap. Care is taken to clip all the intra muscular communicating branches from the superior gluteal artery. This ensures preservation of the superior gluteal artery and the vascularity of the superior half of the muscle. The flap is subsequently raised medially from the lateral edge of sacrum. The lateral sacral arteries, the perforators from the internal pudendal artery lateral to sacrotuberous ligament and the superior most perforators from the profundafemoris artery were identified and ligated as the musculocutaneous flap was lifted from its bed (Fig 3). Attempt to identify the gluteus medius must be made and should not be taken with the flap in order to prevent destabilization of the hip joint. Though at times due to extreme muscle wasting it may be difficult to segregate one from the other. Once the flap is islanded the inferior gluteal artery pedicle is dissected dividing the pyriformis. The branches of the inferior gluteal artery : sciatic artery, branches to the cruciate anastomosis can be divided to increase the pedicle length.On an average 6 cm of pedicle length is achieved after complete mobilization. This ensures adequate advancement of the flap across the midline (Fig 4). A tension free lie on the defect is therefore obtained.

The flap wasinsetted onto the defect over a single closed suction drain (Fig 4), which was removed after 7 days. Intra operative blood loss was less than 150 ml. Flap dissection time was 45 mins. All patients were subjected to wound culture and sensitivity based antibiotic cover for 7 days. The patients were kept on fluid diet for the first post operative day thereafter switched to normal diet. Nursing was done in prone position for 7 days thereafter they were allowed to turn to one side. Sutures were removed on the 14th post op day.

4. Results

No complication were encountered during the surgery. There were episodes of autonomic dysreflexia which were adequately controlled by the anaesthetist. There were no indication of blood transfusion post operatively in any. All flaps were healthy and viable. There were no wound dehiscence in any case. There were no requirement of contra-lateral fasciocutaneous, musculocutaneous advancement flap or skin grafts in any. All flaps were followed up for one year. No recurrence of sacral sore were noted despite the patient lying supine and being wheel chair bound. There were no marked contour irregularity post op and the flap remained robust (Fig 7).

5. Discussion

Following Traumatic brain and spinal cord injuries, the post operative rehabilitation of these patients are plagued with increased incidence of decubitus ulcers. Sacral sores are the commonest of all affecting more than 60 % of quadriplegics[2]. Approximately 25 % of all paraplegics who are even wheel chair bound suffer from sacral pressure sores. Concomitant involvement of ischial and the trochanteric region are seen in more than 30 % of the cases. Malnutrition associated with muscle wasting, spasticity, lack of proper rehabilitation, disuse atrophy, poor personal

hygiene, associated co-morbidities like diabetes, parkinsonism, cardiac dysfunction,self neglect due to low esteem and increase cost of rehabilitation have made the treatment challenging. Unfortunately even in the eyes of majority of plastic surgeons surgical management of these conditions come way down the priority list, leaving the responsibility in the hands of junior surgeons. This reflects on to an inevitable poor surgical outcome due to lack of proper planning and execution.

Sacral pressure sores can be managed conservatively with daily dressings, reducing pressure off the area and vacuum assisted closure apart from treating the systemic and the general factors influencing poor wound healing. Alternatively, they can be resurfaced surgically using the principle of reconstructive ladder, reconstructive triangle or quadrangle tailor made to the need of the hour. The ultimate aim is to restore form and function with avoidance of recurrence which can be achieved by providing a well padded stable cover with endless durability. Numerous techniques and their modification have been described in the literature in last 4 decades.

Griffith BH et al[3] in 1956 based on experience with 1000 cases of decubitus ulcers described gluteal rotation skin flap based on superficial branch of superior gluteal artery and inferior gluteal artery. This flap was adequate to resurface small to medium sized sacral defect. Rotation of the flap was possible for a distance of 2 - 3 cm across the midline. The defect larger than this would necessitate second rotational flap from the contra-lateral side. 11 % recurrence rate was noted in patients who could not avoid putting pressure over the sacral area. Thereby attributing it to flap atrophy and breakdown over time.

Hoehn JG et al[4] in 1977 describedLimberg fasciocutaneous transposition flap based on subdermal arterial plexus to resurface small sacral sore defects. Of 64 cases that was operated there were 14 recurrences in 1- 16 yr follow up. 02 cases were reconstructed by transferring a contra-lateral Limberg flap.

More robust flap in form of muscle transposition flaps were described by Ger R et al[5] in 1971. Turn over muscle flaps based on superior and inferior gluteal artery were described in 1974 by Stalling JO et al[6]. The limitations with such flaps were that the reach was limited either by the superior or the inferior gluteal artery pedicle distance from the lateral edge of the defect. These flaps were good for resurfacing small to medium sized midline sacral defects. They needed an Split skin graft cover either to resurface the flap donor site defect in case of transposition flap or on the advanced muscle over the sacrum in case of turnover flap. Additionally they would invariably need an additional flap raised from the contra-lateral side to resurface a larger defect as described by Parry SW et al[7] in 1980.

Islanded musulocutaneous flap were described based on superior gluteal artery by Maruyama Y et al[8] in 1980. Superior half of gluteus maximus was islanded based on the superior gluteal artery for resurfacing sacral defects less than 6 cm in maximum diameter. Bilateral flaps were advocated for defects more than 6 cm.

Islanded flap based on inferior half of gluteus maximus was avoided in ambulatory patients to preserve the function of the muscle. However in our study all patients were paraplegic or quadriplegic who would never walk in their life time. The gluteal contour was not lost and remain to be robust and had retained their bulk and form even after follow up of one year.

Sliding plication gluteus maximus flap was described by Ramirez OM et al[9]1987for large sacral defects of 10 cm in size. Here again bilateral flaps from both the gluteal region were raised enbloc.

Numerous other fasciocutaneous flaps were described raised ipsilaterally or bilaterally like the slide swing skin flap by Schrudde J et al[10] in 1963, and the Lumbo sacral back flap by Hill HL et al[11] in 1978; described for burn scar over sacrum, and resurfacing sacral meningo-myelocele defects respectively. However compared to muscle flaps they were less robust.

Sensory Skin Flaps for coverage of sacral sores were described by Daniel RK et al[12] in 1976. This innovative intercostal island flap innervated by the intercostal sensory nerve was hoped to provide sensibility to paralyzed patient in the area of sacrum is practically an anecdotal procedure. Difficult operative technique and variability of sensibility results have decreased it use.

Koshimaet al[13] in 1993 described perforators flaps for resurfacing sacral sores based on gluteal arteries. These were fasciocutaneous flaps with superior arc of rotation and adequate reach suitable for small to medium sized defects. However for larger defect a second flap needs to be raised from the contra- lateral side. Even a large donor site defect which could not be closed primarily needed a regional rotation flap for closure. Being fasciocutaneous its durability is inferior to musculocutaneous flaps.

The split gluteus maximus V -Y islanded musculocutaneous flap based on inferior gluteal artery; new flap has clearly demonstrated superiority in its outcome when compared with the above mentioned flaps due to following reasons:

a) Its a robust compositemyocutaneous flap based on a dominant inferior gluteal artery. This flap is extremely vascular therefore is ideal in setting of infection, osteomyelitis of the sacrum.
b) This flap can be used to resurface large defect. In our study the largest defect was 15 cm in cranio caudal axis. The advancement of the flap across the midline was adequate enough to ensure a tension free lie over any defect that was operated. The mobility of the flap was good enough to resurface defect in the superior, mid and lower thirds of the sacrum. There were no need to elevate other flaps from the contra-lateral side as were done in most of flaps described in literature. In view of which there is no violation of the contra-lateral buttock, which can be utilized in case of flap failure.
c) Flap dissection time was 45 mins. With maximum blood loss of 150 ml. It is technically easy to dissect and therefore is reproducible.

d) It does not jeopardise the planning of other flaps. In case of inadvertent total loss of the flap the other options of local flaps still remain open. In our study in 03 cases the arterial neuro cutaneous branch to posterior cutaneous nerve of the thigh had to be ligated for better mobility of the pedicle, thereby jeopardizing the planning of the posterior thigh flap in them. However in all the three cases the flap was healthy and robust at the end of one year so there were no need to use any other flap.
e) Donor site was closed primarily in all. There were no loss of contour of the buttock.
f) The perforators to the overlying skin paddle are also preserved, so in case there is a wound dehiscence in future causing recurrence of sacral sore, then the skin can be further advanced or rotated as fasciocutaneous perforator based flap to resurface the defect.
g) Though it is not a sensate flap, and despite expected atrophy of the underlying inferior half of gluteus maximus muscle, the flap has remained healthy and has maintained the contour in all the patients.

6. Conclusion

The split gluteus maximus V-Y musculocutaneousadvacement flap islanded on inferior gluteal artery is therefore highly reliable flap providing a durable and robust cover. The large flap dimension with good vascularity spares the need for any other flap dissection. Its superior mobility compared to other allows for a tension free lie on the defect. There is no donor site defect. We therefore recommend its use for resurfacing all sacral sore defects.

Figures

Figure 1: 8 cm sacral sore involving the superior and mid third of the sacrum. Post excision of bursa the recreated defect measured 10 cm. Flap marking done based on Posterior Inferior Iliac Spine (PSIS), greater trochanter,iIliotibialTract,iIschial tuberosity. Flap based on inferior half of gluteus maximus muscle vascularized by Inferior Gluteal artery (IGA) marked by Doppler

Figure 2: The Flap incised along the skin marking. Incision deepened till the gluteus maximus muscle. Inferior edge of the muscle dissected. Midpoint of the inferior edge of the muscle marked. Muscle divided and retracted up to identify the sciatic nerve

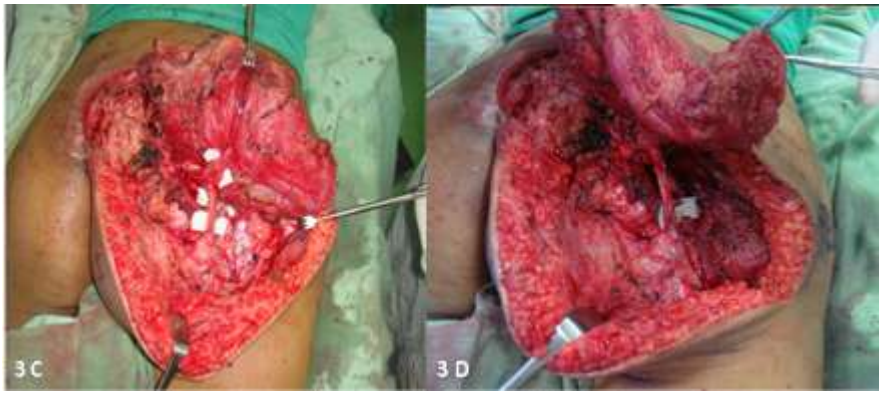

Figure 3: 3A: The Gluteus maximus muscle is divided along the sacral nerve therby dividing the muscle into two equal halves. The division is carried superiorly till approx 5 cm lateral to Doppler marking of IGA. 3B: Identification of lateral sacral artery and branches of Internalpudendal artery identified and ligated. 3C: IGA identified emerging from the inferior border of pyriformis muscle medial to sacral nerve. 3D: Flap islanded.

Figure 4: Adequate advancement of the flap 5 cm across the midline possible. A tension free inset onto the defect possible.

Figure 5: Another case with 11 cm sacral sore involving superior half of the sacrum successfully resurfaced with the flap without the need of any contralateral flap harvested from the other gluteal region.

Figure 6: 15 cm size sacral sore involving the entire sacrum is successfully resurfaced with the flap without the need for any other flap

Figure 7: Post op follow up after 01 year. The flap is healthy. Maintained its bulk, remained robust providing a durable and stable cover

References

[1] Laura E. Joyce M. Black, Margeret Goldberg, Laurie Mc Nichol, Lynn Moore, and Mary Sieggreen. Revised National Pressure Ulcer Advisory Panel Pressure Injury Staging System. Journal of Wound, Ostomy and Continence Nursing. 2016 Nov; 43(6): 585-597.

[2] Ervin A Kruger, Marilyn Pires, Yvette Ngann, Michelle Sterling, SallahRubayi. Comprehensive management of pressure ulcers in spinal cord injury: Current concepts and future trends. The Journal of Spinal Cord Medicine. 2013 Nov; 36(6): 572 - 585.

[3] Grifith BH, Conway H. Plastic surgical closure of decubitus ulcers in patients with paraplegia: based on experience with 1000 cases. Am J Surg. 1956;91: 946.

[4] Hoehn JG, Elliot RA, Stayman JW. The use of Limberg flap for repairing small decubitus ulcer. Plast Recon Surg. 1977; 60:548.

[5] Ger R. The surgical management of decubitus ulcer by muscle transposition. Surgery 1971; 69:106.

[6] Stalling JO, Delgado JP, Converse JM. Turn over island flap of gluteus maximus muscle for repair of sacral decubitus ulcer. PlastReconstr Surg 1974; 54:52.

[7] Parry SW, Mathes SJ. Bilateral gluteus maximusmyocutaneous advancement flaps: Sacral coverage for ambulatory patients. Ann Plast Surg 1980; 8: 443.

[8] Maruyama Y, Nakajima H, Wade M, et al. A gluteus maximusmyocutaneous island flap for the repair of a sacral decubitus ulcer. Br J Plast Surg 1980; 33:150.

[9] Ramirez OM. The distal gluteus maximusadvacementmyocutaneous flap for coverage of trochanteric pressure sore. Ann Plast Surg 1987; 18: 295.

[10] SchruddeJ,Deckung von HautdefektendurchgestielteLappenplastik. Aesthet Med 1963; 12: 166.

[11] Hill HL, Brown RG, Jurkiewicz MJ. The transverse Lumbosacral back flap.PlastReconstr Surg 1978; 62: 177.
[12] Daniel RK, Terzis JK, Cunningham DM. Sensory skin flaps for coverage of pressure sores in paraplegic patients: a preliminary report. Plat Reconstr Surg 1976; 58: 317.
[13] Koshima I, Moruguchi T, Soeda S, Kawata S, Ohta S, Ikeda T. The gluteal perforator based flap for repair of sacral pressure sores. PlastReconstr Surg. 1993; 91: 678-83.