

# Management of Sacral Pressure Sore by Clinically Isolated Superior Gluteal Artery Perforator-based Fasciocutaneous Flap in Patients with Spinal Cord Injury

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### Abstract

Prolong confinement to bed in spinal injury patients imparts constant pressure on bony prominences resulting impairment of blood flow to local tissue. Constant pressure of 2 hours or more produces irreversible changes leading to tissue necrosis and development of pressure sore. Sacrum encounters highest pressure in supine position and is the commonest site of pressure sore in spinal cord injury patients followed by trochanter and heel.

**Objective of the study:** Observation on management of sacral pressure sore by superior gluteal arterial perforator-based flap using anatomical land marks in the absence of facility of Doppler probe for isolation of superior gluteal arterial perforators.

**Materials and methods:** Thirteen patients of spinal cord injury presented with sacral pressure sore were managed surgically using superior gluteal artery perforator-based flap coverage. The location of the artery was identified using anatomical land marks. In 10 patients the flap was healed uneventfully, one had significant complication with wound dehiscence.

**Conclusions:** Management of sacral pressure sore by superior gluteal arterial perforator-based flap using anatomical land marks is a simple and reliable procedure. The learning curve is not that stiff. Sophisticated instruments are not required for this procedure.

**Key words:** Pressure sore, sacrum, fasciocutaneous flap, spinal cord injury, paraplegia.

### Introduction:

Up to 80% of spinal cord injury patients develop pressure sore at some point in their life time. Sacrum encounters highest pressure in supine position and is the commonest site of pressure sore (Fig1) in spinal cord injury patients followed by trochanter and heel.

Reconstruction of pressure sore has always been challenging. Immobile patients are prone to develop pressure sores from unrelieved pressure on tissue over the sacral area, with shear, friction, moisture and malnutrition as contributing factors. Up to one-third of immobilised patients in long-term care facilities will develop pressure sores<sup>1,2</sup>. These defects have traditionally been reconstructed with gluteus maximus musculocutaneous flaps. However, there has been a change from the musculocutaneous flap to the fasciocutaneous flap, with the superior gluteal artery perforator (SGAP) fasciocutaneous flap adapted for sacral pressure sore reconstruction.

An anatomical study of the gluteal region by Ahmadzadeh *et al*<sup>3</sup> revealed that (i) the superior gluteal region is supplied by 5±2 cutaneous perforators arising from the superior gluteal artery; (ii) all perforators are musculocutaneous, with 50% passing through the gluteus maximus muscle while the remaining 50% pass through the gluteus medius muscle; (iii) the average diameter of the perforators arising from the superior gluteal artery is 0.6±0.1 mm and the average pedicle

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length from the deep fascia is 23±11 mm; and (iv) the average cutaneous vascular territory for the superior gluteal artery is 69±56 cm<sup>2</sup> with each perforator supplying an area of 21±8 cm<sup>2</sup>. The superior gluteal artery perforating vessels are vertically orientated, travelling directly to the superficial tissue up through the muscle. Generally laterally placed perforators are preferred, as they yield a longer vascular pedicle after dissection of the perforator and its main source.

**Materials and Methods:**

All the patients with spinal cord injury admitted to Physical medicine and Rehabilitation Department of SVNIRTAR from January 2012 to December 2014 were evaluated for presence of sacral pressure sore. Out of 53 patients presenting with pressure sore over different pressure bearing areas, 13 patients with stage 4 sacral pressure sore were included for the study; 11 were male and 2 female (Chart I) with average age 45.3 years (range 32 – 58 years). Eight patients were paraplegic and 5 were quadriplegic (Chart II), 9 had incomplete lesion, 4 had complete lesion (Chart III) and all were non-ambulatory patients; 11 patients with spinal cord injury had traumatic origin and 2 cases were Potts’ paraplegia. Primary debridement of the ulcers and regular dressing were done till the wound bed appears healthy. There were no features of healing in primary intention. All these 13 cases were planned for pressure sore coverage with superior gluteal artery perforator based fasciocutaneous flap.

As a part of pre-operative evaluation, x-ray pelvis with sacrum was done for all cases to look for bone involvement. Routine blood investigations including Hb, DC, TLC, ESR, CRP, HIV HbSAg and serum albumin was done for all the patients. Cases with hypoalbuminaemia (serum albumin <3.5g/ml) and anaemia were corrected pre-operatively. One unit of blood was kept reserve for surgery in all the cases.

As a prerequisite all the patients must be able to sleep in prone posture for a long period. For ensuring flap success and preventing recurrence, strict guidelines were followed like: (i) Strict pre-operative as well as postoperative control of medical conditions such as diabetes mellitus and hypertension. (ii) Good control over spasticity. (iii) Adequate intra-operative debridement of the sore with complete bursectomy. (iv) Maintaining a prone position for 2 weeks postoperatively. (v) Pre-operative and postoperative optimisation of nutrition.

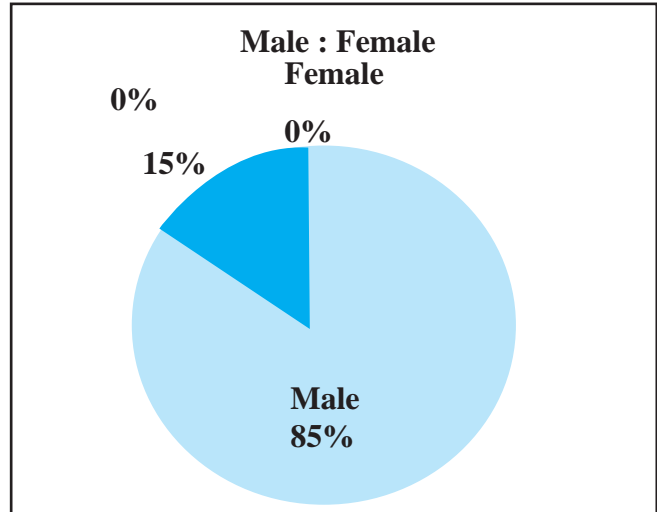


Chart I - Male to Female Ratio

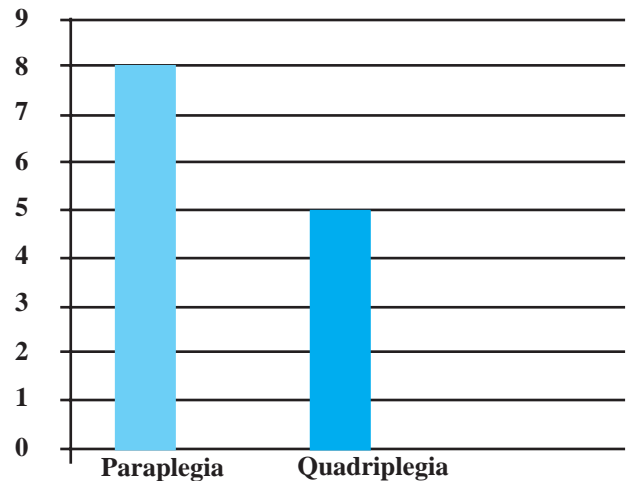


Chart II - Patients with Para / Quadriplegia

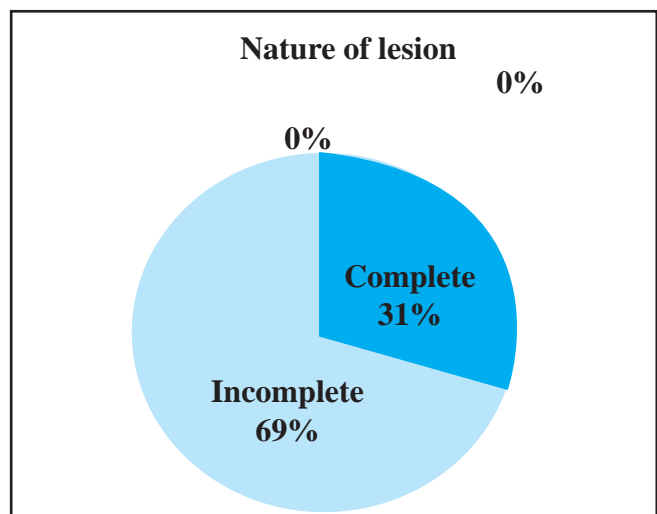
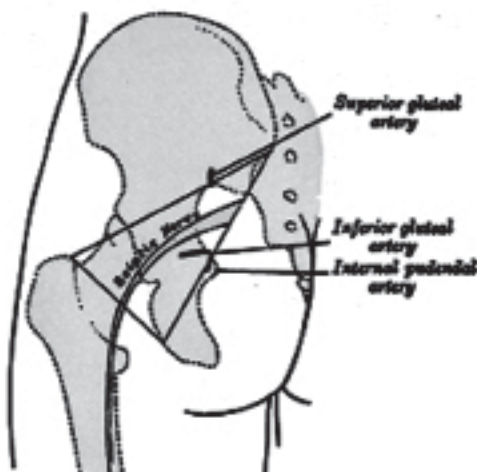


Chart III - Nature of Lesion

Those patients having sacral sore with features of chronic osteomyelitis, urethral fistula, fecal soiling of pressure sore and patients with poor compliance are excluded from the study.

### Surgical Procedure:

The patient was placed in a prone position on the operating table. The site where the SGA enters the buttock is identified at the junction of the proximal and middle-thirds junction of a line connecting the posterior superior iliac spine (PSIS) to the apex of the greater trochanter of the femur corresponding to greater sciatic notch (Fig 2). A line is then drawn between the PSIS and the coccyx. The position of the piriformis is located by joining the middle of the PSIS-coccyx line to the superior edge of the greater trochanter. As the SGA supplies the suprapiriform portion of the gluteus maximus, perforators located cranial to the piriformis and lateral to the SGA exit point are the important perforators considered for designing the flap. The sacral sore was then thoroughly debrided with complete bursectomy (Fig 3). According to the resultant sacral defect, the superior gluteal artery perforator based flap was fashioned in an elliptical design of corresponding size (Fig 4). As per anatomical land marks superior gluteal arterial perforators were marked. The skin, subcutaneous tissue and deep fascia were incised at the superior border of the flap. Elevation was performed strictly in a subfascial plane. All cares were taken to avoid injury to major perforators. Good haemostasis was secured after the flap circulation was ensured. The flap was transposed into the sacral defect, taking care to avoid any twisting, kinking, compression or



**Fig 2 - Anatomical Diagram of the Vessels**

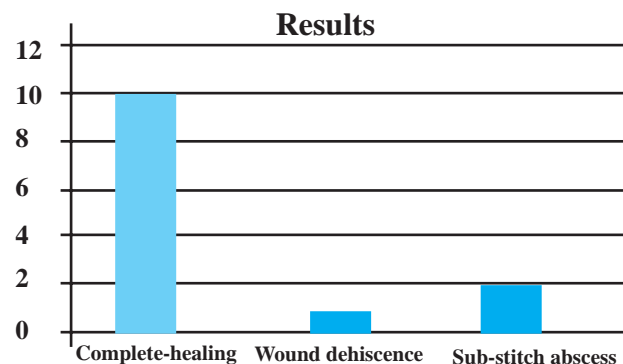
undue tension on the pedicle (Fig 5). The donor site was closed primarily. Close suction drain was placed under the flap. Drain was removed on an average on 4th day. The patient was maintained in a prone position for 2 weeks after which suture removal and gradual mobilisation was allowed. Good control of spasticity being an essential factor to prevent tension over the flap. Postoperative therapy carried out by therapist to reduce spasticity and immobilisation related complications. All the patients were instructed to avoid sleeping in supine posture for 8 weeks.

### Results:

Out of 13 flaps 10 cases (77%) were healed uneventfully without any major complications. One case of postoperative haematoma below the flap was encountered leading to wound dehiscence. (Fig 6) subsequently healed with dressing. Superficial stitch abscess was marked in 2 cases (Chart IV) managed with antibiotics. No recurrence of a bedsore occurred after an average follow-up of 9 months (range 5 - 18 months).

### Discussion:

Looking towards morbidity of a spinal cord injury patient, conservative approach still remains the first line of management for pressure sores. Pressure relief, daily wound dressing, and optimising the patient's nutrition aim at prevention of infection and enhancing wound healing. Conservative treatment is mostly effective in stage 1 and 2 pressure sores. Stages 3 and 4, as well as failure of conservative treatment in treating stage 1 and 2 sores, require surgical management. Common options include primary closure, skin grafting, local random flaps, muscle flaps and the recently developed pedicled perforator flap.



**Chart IV - Results after Surgery**



**Fig 1 - The Commonest Site of Pressure Sore**



**Fig 5 - Flap Transposed into Sacral Defect**



**Fig 3 - Sacral Sore Debridement**



**Fig 6 - One Case of Postoperative Haematoma Leading to Wound Dehiscence**



**Fig 4 - Superior Gluteal Artery Perforator-based Flap**

Pressure sore cover with surgical management has always been a challenge, with the ideal operation still being sought. Davis in 1938, 1st suggested replacing

the unstable scar of a healed pressure sore with a flap tissue.

The most commonly used method of sacral pressure sore reconstruction is the gluteus maximus musculocutaneous flap, which has a good reliable vascularity and greatly reduces postoperative wound complication. However, taking out of a portion of gluteus maximus may cause gait disturbances in patients with expected ambulation in future. Modification to that procedure was made by sliding gluteus maximus flap, whereby structural and functional integrity of the muscle was preserved<sup>4</sup>. Other disadvantages such as intra-operative blood loss and limitation of future reconstructive options in case of recurrence encouraged surgeons to try new methods of reconstruction, which marked the beginning of perforator based flap era. Koshima *et al*<sup>5</sup> 1st described the gluteal artery perforator flap based on parasacral perforators.



Perforator-based fasciocutaneous flap evolved on further development of the work by Kroll and Rosenfield<sup>6</sup>. The superior gluteal artery perforator flap was elevated on perforators from the superior gluteal artery by careful dissection of the musculocutaneous perforators from the gluteus maximus muscle. This yielded a fasciocutaneous flap consisting exclusively of skin and subcutaneous fat, which retains the reliable blood supply of the musculocutaneous flap but is associated with reduced donor site morbidity. This flap is muscle-sparing and therefore beneficial in ambulatory patients. Higgins *et al*<sup>7</sup> suggest that muscle sparing should be considered not only in ambulatory and sensate patients, but in paraplegic patients as well. Muscle sparing is also advantageous in that future reconstructive options still exist in the case of failure of the perforator flap or recurrence. Comparative study done by Wong<sup>8</sup>, between gluteal fasciocutaneous flaps and myocutaneous flap for treatment of sacral sore. The results are comparable for both the procedure. The likelihood of perforator flap failure is minimal. Fasciocutaneous flaps provide better long-term results in surgical reconstruction of pressure sore than musculocutaneous flaps as shown by Yamamoto *et al*<sup>9</sup>. They have suggested that the fasciocutaneous flap has the first priority and is superior to the gluteal maximus myocutaneous and muscle flaps in reconstruction of sacral pressure sores. Korambayil *et al*<sup>10</sup> suggested pre-operative isolation of perforators of superior gluteal artery by hand held Doppler ultrasound scanner and flaps can be elevated more precisely. A cadaveric study disclosed the existence of several perforators all around the gluteal region<sup>5</sup>. Several main perforators are of large calibre passes through muscle and fascia to supply the skin. Using anatomical land marks, those perforators can be isolated for designing a flap coverage for sacral pressure sore.

### Conclusions:

Superior gluteal artery perforator based fascio-cutaneous flap can be elevated on a single perforator without fear of flap necrosis for sacral pressure sore reconstruction in spinal cord injured patients. Complete flap survival with stable wound coverage, muscle-sparing properties for future reconstructive options, minimal intra-operative blood loss and minimal donor site morbidity make the superior gluteal artery perforator based flap a reliable option for sacral pressure sore reconstruction. Superior

gluteal artery can be very well isolated by clinical means using anatomical land marks. A sophisticated ultrasound probe is not always necessary for isolation of perforators.

### References:

1. Berlowitz DR, Wilking SVB. The short-term outcome of pressure sores. *J Am Geriatr Soc* 1990; **38**: 748-52.
2. Perez ED. Pressure ulcers: updated guidelines for treatment and prevention. *Geriatrics* 1993;**48**:39-41.
3. Ahmadzadeh R, Bergeron L, Tang M, *et al*. The superior and inferior gluteal artery perforator flaps. *Plast Reconstr Surg* 2007;**120**:1551-6.
4. Ramirez OM, Orlando JC, Hurwitz DJ. The sliding gluteus maximus myocutaneous flap: its relevance in ambulatory patients. *Plast Reconstr Surg* 1984;**74**:68-75.
5. Koshima I, Moriguchi T, Soeda S, Kawata S, Ohta S, Ikeda A. The gluteal perforator based flap for repair of sacral pressure sores. *Plast Reconstr Surg* 1993;**91**:678-83.
6. Kroll SS, Rosenfield L. Perforator-based flaps for low posterior midline defects. *Plast Reconstr Surg* 1988;**81**:561-6.
7. Higgins JP, Orlando GS, Blondeel PN. Ischial pressure sore reconstruction using an inferior gluteal artery perforator (IGAP) flap. *Br J Plast Surg* 2002;**55**:83-5.
8. Wong TC. Comparison of gluteal fasciocutaneous flaps and myocutaneous flaps for treatment of sacral sores. *Int Orthop* 2006;**30**:64-7.
9. Yamamoto Y, Tsutsumida A, Murazumi M, Sugihara T. Long-term outcome of pressure sores treated with flap coverage. *Plast Reconstr Surg* 1997;**100**:1212-7.
10. Korambayil PM, Allalasundaram KV, Balakrishnan T. Perforator propeller flaps for sacral and ischial soft tissue reconstruction. *Indian J Plast Surg* 2010; **43**: 151-7.