



COMPREHENSIVE MANAGEMENT OF PRESSURE ULCERS – 5 YEAR EXPERIENCE

Plastic Surgery

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ABSTRACT

Background: Pressure ulcers can be defined as lesions caused by unrelieved pressure between a hard surface and a bony prominence leading to molecular death of the skin and soft tissue. Many external and internal factors also contribute to the condition. The basic treatment strategy is wide and adequate debridement of dead and scarred tissue, excision of underlying bursa and involved bony prominence, f/b tissue coverage. In this article we are sharing our experience in coverage of pressure ulcers and our analysis of patient characteristics, outcomes, and complications.

Methods: A total of 80 pressure ulcers were treated, most prevalent of which was sacral ulcer. In 90 % of the cases pressure sore developed during hospital stay. 95 % were quadri/paraplegics. Treatment comprised of wide debridement by pseudo tumor technique f/b primary suturing, random skin flaps, myocutaneous flaps of the gluteus maximus, classic fasciocutaneous flaps of fascia lata, and posterior fasciocutaneous flaps of the thigh.

Results: Healing achieved in all the patients. Most common complication was suture dehiscence. Proper Post operative care is must to prevent recurrence.

Conclusions: The best therapy for Pressure ulcers management is its prevention. Multi-professional and family participation is essential for the treatment of patients with pressure ulcers since recurrence is the rule if preventive measures are not taken.

KEYWORDS

Pressure ulcer, flaps, prevention, recurrence

Introduction -

Pressure ulcers (PUs) can be defined as lesions caused by unrelieved pressure between a hard surface and a bony prominence leading to molecular death of the skin and soft tissue^{1,2}. There are many external and internal factors which aggravates the condition. Classification of the pressure ulcers in various stages is important for choosing the appropriate therapeutic strategies^{3,4}. Major extrinsic factors that can lead to the appearance of these lesions are: pressure, shear, friction, and moisture⁵. Pressure is the main culprit factor. The pathological effects in the tissue are related to the pressure intensity, pressure duration, and tolerance of the tissue. Ischemia occurs when the external pressure is greater than the capillary perfusion pressure (32 mmHg. Pressure more than 70 mm Hg for 2 hours is sufficient to cause pressure ulcer. PUs are larger over bony prominences⁷. Most affected region is the ischium, an area of high pressure among wheelchair users while Sacral, calcaneal, and trochanteric ulcers are more common in bedridden patients^{8,9}. In our Indian setup even during the rehabilitative phase most patients prefer to remain bed ridden so in our study, in both the phases most common site of PUs was sacrum. Trochanteric PUs are commonly seen in patients with lower limb spasticity, which is seen in upper motor neuron disease. Intrinsic factors for PU includes: anemia, hypoproteinemia, age, malnutrition, tissue perfusion, the use of drugs (central nervous system depressants and hypotensive drugs), and chronic diseases (diabetes mellitus, cardiovascular diseases, stroke, etc.)^{6,10}. Before proceeding for surgical intervention all these external, internal factors and other major risk factors should be sorted out and treated accordingly. The most widely used classification is from the National Pressure Ulcer Advisory Panel, in which four progressive stages of tissue injury are described:

- Stage I – intact skin, but with non blanching hyperemia that persists for more than an hour after pressure relief;
- stage II – dermis injury, with or without infection;
- stage III – subcutaneous injury and/or muscle;
- stage IV – injury to the bone and/or joint, with or without infection.

We always keep Following points in mind in planning a flap.

1. The flap for coverage should be as large as possible so that in future it can be re advanced in case of recurrence.
2. Suture lines should be placed outside of the pressure area whenever possible.

3. Flap should be planned in such a way that it should not violate adjacent flap areas in order to preserve future treatment options.
4. Muscle component is very useful in filling dead space and dealing with infection.
5. Musculocutaneous flap have best outcome because it has advantage of both the skin and muscle components, also the plane between muscle and skin is kept preserved so it will provide better resistance to shear forces.
6. Blood supply of all the flaps is robust and dependable.
7. We prefer the use of faciocutaneous flaps in recovering / ambulatory patients and myocutaneous flaps in paralyzed patients.

METHODS

From August 20012 to February 2017, a descriptive and longitudinal study was conducted in patients with PUs admitted to Civil Hospital associated with B.J. Medical college Ahmadabad. A protocol was prepared for assessing the following data: gender, age, environment in which the PU developed, location, classification according to the National Pressure Ulcer Advisory Panel, treatment, postoperative complications, success rate, and recurrence one month after surgery. Preoperative laboratory tests such as capillary blood glucose, serum albumin, hemoglobin and cardiopulmonary functions were considered for possible correction to prevent postoperative complications.

The following aspects were considered for risk factor assessment in PU development: age, occurrence of spinal cord injury, urinary or fecal incontinence, deficiency of albumin and hemoglobin in serum, and poor pulmonary function test. PU was assessed for location: sacral, ischial, trochanteric, and occipital. Regarding the type of treatment, only the surgical options of known techniques were used.

Preoperative protocol

Correction of anemia (Hb > 10), hypoproteinemia (S. Albumin >3), Use of air bed with frequent change of position in every 2 hours (alarm clocks are beneficial), change of position every 15- 20 minutes if patient is sitting, regular massage of PUs prone areas, proper rehabilitation for bowel and bladder incontinence, high protein and high residue diet, intensive spirometry to improve lung functions and most importantly training to sleep in that position which will be required in postoperative period.

Intraoperative protocol

We always operate under general anaesthesia as these patients have lost the reflex to compensate hypovolemia, these patients also bleed more due to lack of sympathetic tone. So GA provides better intraoperative hemodynamic control and prevents reflex muscle contraction during surgery. After adequate positioning, padding and DVT prophylaxis debridement is started. Where possible pseudotumor technique is used, ulcer filled with betadine or methylene blue gauze and ulcer margins sutured over it. Now whole of the ulcer, bursa and underlying bony prominence is removed in toto without entering the ulcer cavity. After this true defect is measured and appropriate flap is planned. Suction drains were used wherever we found it necessary. It is advisable to use drains in most of the cases as the discharge from the raw areas beneath the flaps is almost always significant.

Post operative protocol

The treatment was assessed through success and complication rates. The success rate was determined by including ulcers that healed within one month after surgery. The presence or absence of complications were assessed during the postoperative period and the following were described: infection at the surgical site, hematoma, wound dehiscence and total or partial flap necrosis.

RESULTS

A total of 72 patients, 45 men and 27 women with ages ranging from 11 to 50 years (an average of 37 years), were assessed. A total of 80 PUs were surgically treated. PUs were most prevalent in the sacral region (58 cases), followed by the ischial (12 cases), trochanteric (8 cases), occipital (2 cases) (Figure 1). PUs development in hospitals and at home accounted for 90% and 10% of the cases, respectively. 95% of them were quadri/paraplegics. According to the classification of the National Pressure Sore Advisory Panel (1989), the prevalence of grade III and IV ulcers was 62% and the prevalence of grade II was 25%. Grade III and IV ulcers were prevalent in the sacral and trochanteric regions. The surgical treatment was based on the classification, Area of occurrence, patient's general condition, and the availability of flap donor area. All patients who underwent surgery with the use of flaps for tissue coverage also underwent debridement of granulation tissue and bursa during the same surgical procedure. In the case of grade III and IV ulcers, patients underwent partial osteotomy for excision and/or reduction of bony prominences. Coverage options for various sores.

Position of PUs	Type of procedure	No. of Cases
Sacral PUs (58)	Delayed primary closure	1
	Debridement and split skin grafting	1
	Inferiorly based fasciocutaneous rotation flap	2
	Unilateral Inferiorly based Gluteus maximus musculocutaneous rotation flap (using superior half of muscle based on superior gluteal artery) (Figure 2)	24
	Bilateral Inferiorly based Gluteus maximus musculocutaneous rotation flap (using superior half of muscle based on superior gluteal artery)	10
Ischial PUs (12)	Unilateral V-Y Gluteus maximus musculocutaneous advancement flap (using superior half of muscle based on superior gluteal artery)	2
	Bilateral V-Y Gluteus maximus musculocutaneous advancement flap (using superior half of muscle based on superior gluteal artery)	8
	Uni/Bilateral V-Y Gluteus maximus musculocutaneous perforator based advancement flap (using superior half of muscle based on superior gluteal artery perforator) (Figure - 3)	10
	Inferior Gluteus Maximus musculocutaneous Island flap (based on inferior gluteal artery)	8
	Posterior gluteal thigh flap (based on terminal branch of inferior gluteal artery) (Figure - 5)	4

Trochanteric PUs (8)	Tensor fascia lata fasciocutaneous V-Y advancement flap (Figure - 4)	8
	Tensor fascia lata fasciocutaneous transposition flap	4
Occipital PUs (2)	Scalp transposition flap	2

Complications observed were

- suture line dehiscence – 10
- (treated by dressing and bed side secondary suturing where required)
- infection at the surgical site leading to prolong seropurulent discharge – 6

Managed by systemic antibiotics according to culture sensitivity

- hematoma - 1
- partial flap necrosis – only marginal necrosis seen in 3 cases probably due to tension on suture line (managed conservatively by dressing and bed side secondary suturing where required)
- no total flap necrosis observed

Discussion

We included all the patients in study where plastic surgery opinion was taken. Plastic surgeon opinion was only requested when there was a total loss of skin, that's why there is lack of grade I PU reports in this study. In our study, 90% of PU cases developed in the hospital and 10% developed at home. These findings, indicates the need for guidance and hospital treatment systematization for patients with PU risk factors. The high incidence of PU in the hospital is due to lack of knowledge about PU prevention as non-surgeons did not recommend changes in position and supportive care in any case¹¹. The highest incidence of PU was in the sacral region, resulting from the greater frequency of the supine position in a population of patients with chronic diseases and the elderly. Our strategy for various methods for PUs closure is as follows

For ambulatory and recovering patients

- Small shallow superficial sores may heal with secondary healing by conservative management.
- Large shallow sores may be skin grafted as in ambulatory patient chances of recurrence is less.
- Small deep sore up to 3cm wide can be closed with delayed primary suturing.
- Large deep sores should be managed by local fasciocutaneous flaps (rhomboid, rotational, rotation-advancement flaps)
- Muscle should be spares whenever possible as motor defect may be significant if gluteus maximus compromised.
- For paralyzed patient with no chance of recovery
- These patients have maximum chances of recurrence.
- We always prefer musculocutaneous flaps in these patients.
- Sacral sore –

1. **First choice** – Unilateral / Bilateral Inferiorly based Gluteus maximus musculocutaneous rotation flap (using superior half of muscle based on superior gluteal artery). These flaps can be readvanced in case of reoccurrence.
2. **Second choice** – Unilateral/Bilateral V-Y Gluteus maximus musculocutaneous advancement flap (using superior half of muscle based on superior gluteal artery). This flap is easy to mobilize, when unilaterally used it is possible to reach the contralateral side and enabling the suture line to be isolated from the pressure zone²⁰. Bilateral V-Y flap used where affected area is of large diameter.
3. **Third choice** - Unilateral/Bilateral V-Y Gluteus maximus musculocutaneous perforator based advancement flap (using superior half of muscle based on superior gluteal artery perforator). It has advantage of crossing midline up to 6 cm.

- **Ischial PUs** – more common in rehabilitative phase. Less common in Indian populations.

1. **First choice** - Inferior Gluteus Maximus musculocutaneous Island flap (based on inferior gluteal artery). It has the advantage of robust blood supply as well as excess muscle can be harvested to fill the dead space.
2. **Second choice** - Posterior gluteal thigh flap (based on terminal branch of inferior gluteal artery). This flap can be used in case of previously operated patients where no local flaps options are present.
- **Trochanteric ulcers** - often occur in patients in the lateral Position due to lower limb spasticity.

1. The best choice for coverage is reconstructions with classical fasciocutaneous flaps of fascia lata in V-Y advancement fashion or as a transposition flap. It has both the versatility as well as robust blood supply.

Salvage flaps – in case of multiple times operated patient where all the adjacent primary flap options has been consumed, lumbosacral transposition flap and posterior gluteal thigh flap can be used as salvage procedure.

Complications - Of the total cases with postoperative complications half occurred in the sacral region. The high incidence in the region may have been related to the frequent contact of suture line with stool and urine since most of the patients had urinary or fecal incontinence. The attempt to correct albumin and hemoglobin to normal levels prior to surgery was not achieved in some patients because of chronic diseases which may be a reason for imperfect healing. Also pressure at suture line was also a significant factor for suture line dehiscence. We were not able to calculate exact recurrence rates as most of the patients who were treated were from distant area and they don't come back once discharged. But what we learnt from the experience is that without proper post operative care, positioning and physiotherapy, recurrence is inevitable in paralyzed patients. The success rate of 70% after one month of treatment, with complete closure of the ulcer and no recurrence, was observed for an average of six months, confirming the results of other studies. The experience gained in this study contributed to a better surgical approach and non-surgical approach, the latter of which includes the participation of hospital staff, family members, and patients, in PU prevention.

Conclusions

PUs can be avoided in most cases given knowledge of their pathogenesis and proper management of patients at risk. The involvement of patients, families, and/or professionals is essential for the successful treatment of patients with PU because complications and recurrences are common. Risk factors for complications such as anemia shall be avoided for a better prognosis and proper closure of the PU.

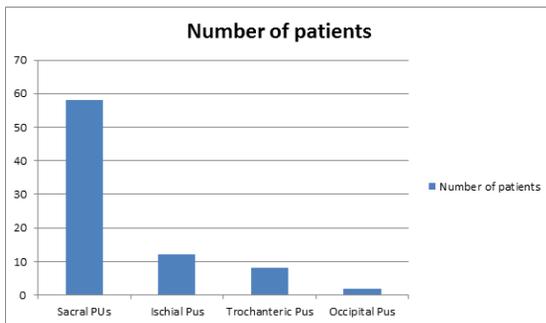


Figure – 1 (Number of patients with various PUs)



Figure –2 Unilateral Inferiorly based Gluteus maximus musculocutaneous rotation flap for sacral sore (using superior half of muscle based on superior gluteal artery)



Figure – 3 - Bilateral V-Y Gluteus maximus musculocutaneous perforator based advancement flap for sacral sore (using superior half of muscle based on superior gluteal artery perforator)



Figure – 4 - Tensor fascia lata fasciocutaneous V-Y advancement flap for recurrent trochanteric sore



Figure – 5 Posterior gluteal thigh flap for ischial sore (based on terminal branch of inferior gluteal artery)

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