

EVALUATION OF RESULTS OF FLAP SURGERY IN PATIENTS OF SPINAL CORD INJURY WITH PRESSURE ULCERS

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ABSTRACT

Sensory and motor impairment places persons with spinal cord injury (SCI) at risk of numerous long term secondary medical conditions such as pressure ulcers (PU). Conservative management lengthens the healing time and early surgical therapy may offer the best hope in the form of earlier closure and improved ability to withstand subsequent trauma. The present study was conducted on 25 patients of pressure ulcers (PU) admitted or followed up in the Department of Orthopaedic Surgery, Pt. B.D. Sharma PGIMS, Rohtak, India. Twenty five patients with 27 PU with SCI were included in this study. Patients were in the age group of 16-50 years (mean = 33 years). Seven (26%) fasciocutaneous rotation flaps; six (22%) tensor fascia lata flaps; three (11%) gluteus maximus island flaps; and 11 (39%) gluteus maximus V-Y advancement flaps (4 unilateral and 7 bilateral) were done. Hematoma (7%), seroma (4%), superficial infection (7%), total flap necrosis (4%), recurrence (11%), and short flap (7%) were main complications observed. The overall results were excellent in 89%, good in 7% and poor in 4% of flaps. Though possible surgical complications are numerous and the recurrence rate is relatively high, the surgical management of patients with PU can be very rewarding. Goals for surgical closure of PU include reduction of protein loss through the wound, reduction of rehabilitation costs, prevention of progressive osteomyelitis, improvement of personal hygiene, and early rehabilitation & societal reintegration.

KEYWORDS: Pressure Ulcer, Flap Surgery, Spinal Cord Injury

Traumatic spinal cord injury (SCI) produces immediate and profound physiologic and functional changes. The sensory and motor impairment placed persons with SCI at risk of numerous long term secondary medical conditions such as pressure ulcers (PU) (Krause et. al., 2001). The most frequent diagnosis after initial hospitalization for a SCI is PU, with an annual incidence of 23% (Whiteneck et. al., 1992). The cost of treating a PU that required surgery was typically above \$50,000 (Staas and Cioschi, 1991). The model SCI System Statistical center recently reported that the risk of getting PU is about 15% in the first year after injury and increased steadily thereafter (National Spinal Cord Injury Statistical Centre, the University of Alabama at Birmingham, 2005). The recurrence rate was even higher at 40-80% (Kierney et. al., 1998). At any given time, an estimated 17-39% of the SCI population suffered from a PU (Charlifue et. al., 2004).

The most important factors in the prevention of PU in paraplegics appears to be maintenance of good nutrition with high protein, high vitamin intake, whole blood when indicated, management of muscle spasm; and avoidance of trauma over bony prominences by postural turning and water/air mattresses (Berger, 1957). Local treatment of the ulcers consists of dressing at least once and preferably three times a day with dried blood plasma, silver sulfadiazine, diluted acetic acid, Povidone-Iodine

solution or platelet rich plasma (Clark and Rusk, 1953). Conservative treatment, not only lengthens healing time, but also there may be repeated periods of morbidity due to minor trauma and tissue breakdown. In view of these factors early surgical therapy may offer the best hope in form of earlier closure and improved ability to withstand subsequent trauma (Griffith and Schultz, 1961).

MATERIALS AND METHODS

The study was conducted on 25 patients of pressure ulcers (PU) admitted or followed up in the Department of Orthopaedic Surgery, Physical Medicine, Paraplegia and Rehabilitation, Pt. B.D. Sharma PGIMS, Rohtak, India. All patients who developed PU were treated in paraplegic centre for rehabilitation and associated problems like muscle spasm, urinary tract infection (UTI) and PU. The sores were graded according to European Pressure Ulcer Advisory Panel (Kucan et. al., 1981). Surgery was conducted in Grade-III and IV PU.

Surgical Flaps

Various flaps like gluteus maximus V-Y advancement flap (unilateral and bilateral), gluteus maximus island flap, tensor fascia lata flap and fasciocutaneous rotation flaps were done depending upon the size, site and requirement of PU.

Evaluation Criteria

Result were calculated using the criteria showed in table 1 and 2 (Knauer, 1990).

Table 1: Scoring for evaluation of results

Extent of wound dehiscence	Flap necrosis	Recurrence	Score
No wound dehiscence	No necrosis	No recurrence after 6 months	4
Minor wound dehiscence not requiring suturing	Minor flap necrosis not requiring surgical procedure	Recurrence between 3 to 6 months	3
Wound dehiscence requiring secondary stitching	Necrosis requiring closure of defect produced by it	Recurrence between 6 weeks to 3 months	2
Wound dehiscence requiring skin grafting	Major necrosis or complete loss of flap, use of some other flap necessary	Recurrence within 6 weeks of operation	1

Table 2: Results of the surgery

Results	Points
Poor	3
Fair	4-6
Good	7-9
Excellent	>10

Follow-up

Inspection of the flaps was done daily till the patient was discharged with successful take up of the flaps. After that, follow up was done monthly for minimum of six months. Final results were calculated at six months.

RESULTS

A total of 25 patients with 27 PU with SCI were included in this study. Patients were in the age group of 16-50 years (mean = 33 years). Seventy two percent were male and 84% of patients were married. Majority of the patients (60%) were engaged either in mechanical work or farming and majority (60%) were illiterate. Fall from height was the mode of trauma in majority of patients (72%) followed by motor vehicle accident (24%). Lower dorsal spine (60%) was the most common vertebral level of injury. Majority of patients were paraplegic (68%). Forty eight percent patients were smokers. Eighty percent patients had anaemia at the time of admission. Thirty six percent of patients suffered from UTI and *Klebsiella* (55%) was the most common offending organism. Two patients had osteomyelitis of femur with pathological dislocation of hip joint with trochanteric PU. Ostectomy of head and neck of femur was done in both. Flap surgery had excellent results in both. Swab culture from PU was

found positive in 60% of patients and *Staphylococcus* was the most common cultured organism (60%) followed by *Acinetobacter* (27%) and *Pseudomonas* (13%). Swab culture from perianal area was positive in 24% of patients and *Acinetobacter* (67%) was the most common offending organism followed by *Escherichia coli* (33%). Forty percent of patients had PU at multiple sites and sacrum (58%) was the most common site followed by trochanter (29%).

Out of 27 PU operated, 56% were grade III and 44% were grade IV, according to EPUAP (1999). Seven (26%) fasciocutaneous rotation flaps (figure 1); 6 (22%) tensor fascia lata flaps (figure 2); 3 (11%) gluteus maximus island flaps (figure 3); and 11 (39%) gluteus maximus V-Y advancement flaps (figure 4) (4 unilateral & 7 bilateral) were done as showed in table 3.



Figure 1



Figure 2



Figure 3



Figure 4

Average amount of blood loss in operation was 819 ml. The patients were given with an average of 1 unit of blood per surgery during operation or in the post-operative period. The average duration of stitch removal was 17 days with a range of 13-21 days. The average duration of drain removal was 15 days with a range of 7-22 days. There was an average follow up of 13.5 months. There was a rise in average hemoglobin level by 2.1 g% and in average serum protein level by 1.2 g%. There were following complications like haematoma under the flap in 2 (7%), seroma under the flap in 1 (4%), superficial infection in 2 (7%), total flap necrosis (figure 5) in 1 (4%), recurrence of PU (figure 6) at the same site in 3 (11%), and short flap in 2 (7%) patients. The overall results were excellent in 89%, good in 7% and poor in 4% of flaps.



Figure 5



Figure 6

Table 3: Types of Flaps Used

Type of flap		No. of PU	%
Fasciocutaneous rotation flap		7	26
TFL flap		6	22
Gluteus maximus island flap		3	11
Gluteus maximus V-Y advancement flap	Unilateral	4	15
	Bilateral	7	26

Table 4: Complications

Complications	Type of flap	No. of Patients	%
Haematoma under flap	Fasciocutaneous flap	1	4
	Bilateral Gluteus maximus V-Y advancement flap	1	4
Seroma under flap	TFL flap	1	4
Superficial infection	Fasciocutaneous flap	1	4
	TFL flap	1	4
Total flap necrosis	Bilateral Gluteus maximus V-Y advancement flap	1	4
Recurrence of PU	Fasciocutaneous flap	1	4
	Gluteus maximus island flap	1	4
	Bilateral Gluteus maximus V-Y advancement flap	1	4
Short flap	Unilateral Gluteus maximus V-Y advancement flap	1	4
	Bilateral Gluteus maximus V-Y advancement flap	1	4

Table 5: Flap Wise Results

Type of flap	Excellent (Percentage)	Good (Percentage)	Fair (Percentage)	Poor (Percentage)
Fasciocutaneous rotation flap	6 (86%)	1 (14%)	-	-
Gluteus maximus island flap	3 (100%)	-	-	-
TFL myocutaneous flap	6 (100%)	-	-	-
Gluteus maximus V-Y advancement flap	9 (82%)	1 (9%)	-	1 (9%)

Table 6: Overall Results

Results	No. of patients	Percentage
Poor	1	4
Fair	0	0
Good	2	7
Excellent	24	89

DISCUSSION

PU are frequent, costly, and potentially life-threatening complication of SCI. They interfere with the rehabilitation process and are a significant deterrent to participation in activities that contribute to independent, productive, and satisfying lives. PU result in long hospitalization, delayed community reintegration, reduced quality of life, and loss of self-esteem.

The concept of myocutaneous flaps for these was introduced by Ger who later in 1976 described the use of the gluteus maximus, rectus femoris and sartorius muscles for the treatment of sacral, ischial and trochanteric sores (Griffith and Schultz, 1961).

Excision of head and neck of femur and joint debridement were done in two patients of osteomyelitis of upper end of femur with pathological dislocation of hip joint. Evans et al also described such type of Girdlestone arthroplasty for ulcers that communicated with the hip joint (Evans et al., 1993).

Pressure sores occur over bony prominences because of prolonged continuous pressure. Thus ostectomy of the underlying bony prominence of the sacrum has been an important step in our management of these ulcers. This was done to distribute the pressure uniformly over a larger surface area, thus preventing the recurrence of sores. It also helped in the eradication of infection. In 48% of the patients, the drains were kept for 10-15 days. The average duration of drain removal was 15 days (range 7-22 days). This practice of keeping the

drains for 2-3 weeks helped in reducing the complications of postoperative infection and of wound dehiscence due to haematoma or seroma formation.

Few modifications and innovations were done during surgery as shown in table 7. Multiple epidermal nicks resulted in decrease in flap oedema, venous stasis and tension in the flap. Modified slide in flap decreased the tension along the closure line. Akan et al also described such modification (Akan et. al., 1999). This practice resulted in efficient redistribution of available tissue by the combined use of transposition and advancement principles and resulted in the repair of relatively large skin defects with reduced tension along the closure. Interdigitating gluteus maximus V-Y advancement flap was effective in breaking the midline vertical scar as described by Ay et. al., (2003). De-epithelialization of distal portion of TFL flap was done in one patient to fill the cavity remaining after resection of proximal end of femur in one patient of trochanteric PU associated with pathological dislocation of hip.

Table 7: Modifications and Innovations

Modifications and innovations	No. of PU	Percentage
Multiple epidermal nicks	15	56
Split skin grafting	11	41
Modified slide in flap	6	22
Interdigitating gluteus maximus V-Y advancement flap	1	4
Deepithelialization of distal portion of flap	1	4
Use of vastus lateralis muscle to fill the cavity	1	4

In the present study, the overall results of flap surgery were excellent in 24 (88%), good in 2 (7%), and poor in 1 (4%) flap. In a study by Josvay et. al., they

performed 64 operations for PU (Jósvay et. al., 2003). All patients had primarily healed barring one. The complication rate was 21%. According to them, surgery shortened the healing period and achieved the long lasting results.

CONCLUSION

Surgical management of PU have been considerably improved by application of muscle, myocutaneous and fasciocutaneous flaps. A team approach is required for the surgical management of the SCI patient with a PU, beginning preoperatively with patient selection and preparation, continuing through wound debridement and flap closure, and progressing to rehabilitation and patient education. Although possible surgical complications are numerous and the recurrence rate is relatively high, the surgical management of patients with PU can be very rewarding. Goals for surgical closure of PU include reduction of protein loss through the wound, reduction of rehabilitation costs, prevention of progressive osteomyelitis, improvement of patient's hygiene, and early rehabilitation & societal reintegration. We are of the opinion that flap surgery helps in achieving all these goals.

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