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**Original Research Article**

# A study to assess the various factors and treatment modalities of pressure sore in a tertiary care hospital

**Ravi H. S.[1], Milind A. Mehta[2]***

Department of Plastic Surgery, [1]JSS Medical College, Mysore, Karnataka, [2]V S Medical College, Ahmedabad, Gujarat, India

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***Correspondence:**
Dr. Milind A. Mehta,
E-mail: statisticsclinic2018@gmail.com



## ABSTRACT

**Background:** Pressure sores can cause physical, social and psychological suffering. The distress is caused by local factors such as pain, wound exudates and malodour (which may lead to social isolation), delayed rehabilitation (which may result in economic hardship), and serious complications such as cellulitis, osteomyelitis, septicemia, limb amputation and death. The objective of the study was to assess the various factors affecting the outcome of pressure sore and various treatment modalities in the management of pressure sore.
**Methods:** A hospital based prospective study was carried out from August 2007 to January 2010 at V S Medical College, Ahmedabad, Gujarat. All the cases admitted with pressure sores in the hospital across all the departments were included in the study. A total of 50 cases of pressure sores which met our inclusion criteria were included in the study.
**Results:** 50 patients of pressure sore were studied out of which, 28 (56%) patients are non-paraplegics and 22 (44%) patients are paraplegic. The most common site is sacral region 45 (60.8%), followed by ischial region 12 (16.2%) and Trochanteric region 10 (13.5%). 47 (94%) patients were treated with systemic antibiotics and 6 (12%) patients were treated with muscle relaxants for spasticity.
**Conclusions:** Non ambulatory paraplegic patients with deep pressure sores needs surgical intervention to cover the pressure sore; while non-paraplegic patients with superficial pressure sores can be treated successfully by conservative line of management and deep pressure sores needs to be operated.

**Keywords:** Pressure sore, Paraplegic, Skin flap, Trauma

## INTRODUCTION

Pressure sore are wounds that result from ischemic tissue damage due to pressure against a bony prominence.[1]

Pressure sores can cause physical, social and psychological suffering. The distress is caused by local factors such as pain, wound exudates and malodor (which may lead to social isolation), delayed rehabilitation (which may result in economic hardship), and serious complications such as cellulitis, osteomyelitis, septicemia, limb amputation and death.[2]

Pressure sore is a global problem concerning the bedridden, infirm, debilitated and malnourished patients in hospitals and community setups. The cost of treatment is enormous to nations and individuals. Mortality increases two to six times if pressure sores are present. They mainly occur over bony prominences on the lower half of the body, with the most commonly affected areas being the base of the spine (the sacrum), the hips and the heel bone (calcaneus). Pressure sores vary in size and severity, i.e. from a reddening of intact skin to severe tissue destruction involving skin (epidermis and dermis), subcutaneous fat, tendon, muscle and bone. Pressure

ulcers are relatively common and that they can affect all age groups (babies, children and adults) in all care settings (hospital and community). However, they are particularly common in critically ill patients; older adults and people who have reduced sensation or mobility, e.g. patients with spinal injuries or fractures.[3-5]

Preventing pressure sore is important, but not always easy to achieve. The most effective measures decrease the duration of the pressure and shearing force. With thorough and comprehensive medical management, many superficial pressure sores many heal completely without the need for surgical intervention. Successful conservative line of management of pressure sores relies on key principles, including pressure reduction, adequate debridement of necrotic and devitalized tissue, control of infection, optimization of nutrition and meticulous wound care. Most pressure sores do not need surgical intervention. Candidates for surgery are a selected group of patients where debridement and conservative measures are not enough to ensure healing of a sufficient quality or speed, and where the patients will benefit from surgical intervention. In general, these patients will have grade 3 and 4 pressure sores.[6,7]

The cornerstone of successful surgical treatment of pressure sores are a competent staff, correct selection of patients, correct and meticulous surgical method, and sufficient postoperative support.

Better management will, of course need the help of a plastic surgeon, orthopedic surgeon, neurosurgeon, physiotherapist, trained nurses and devoted relatives- a team effort towards prevention, treatment and rehabilitation.

### *Objective*

To assess the various factors affecting the outcome of pressure sore and various treatment modalities in the management of pressure sore.

## METHODS

A hospital based prospective study was carried out from August 2007 to January 2010 at V S Medical College, Ahmedabad, Gujarat. All the cases admitted with pressure sores in the hospital across all the departments were included in the study. A total of 50 cases of pressure sores which met our inclusion criteria were included in the study.

### *Inclusion criteria*

Inclusion criteria were all the patients who were admitted or referred to the OPD with diagnosis of pressure sore; person who had could perform physiotherapy, regimes different for paraplegics and non-paraplegics; person who were considered fit for the surgery; patients who had completed follow up for the minimum of 3 months.

### *Exclusion criteria*

Exclusion criteria were patients who didn't give consent for the study; patients who were suffering from cardiovascular and respiratory disorders who were declared unfit for the surgery.

At the time of admission, thorough history was taken. Pressure sores were examined in detail, recorded and photographed. Staging of pressure sores were done consistent with the recommendations of National Pressure Ulcer Advisory Panel (NPUAP) Neurological motor and sensory examination was done, and nutritional parameters like anaemia and hyperproteinaemia were recorded. Base line, blood biochemistry and roentgen graphic examinations were done. Blood investigations are repeated at frequent intervals. Immunization done with tetanus immunoglobulin.

### *Management*

Patients are treated either conservatively or surgically.[8]

Assessment of result was done and patients classified as having satisfactory or unsatisfactory results. Patients who had good durable healing with flap or skin graft for at least 6 months without any major complication and who were satisfied with the results were classified in the "satisfactory category", while patients with nondurable unstable flap or graft coverage, infections, recurrence, needing re-operation and dissatisfactory with the result were classified in the "unsatisfactory category".

Case records were maintained in a proforma and photographic records were maintained at all levels of management.

All the information was collected in a pretested predesigned semi structured proforma by the investigator and entered in MS Excel sheet and analysis was done using SPSS v21 software. Descriptive statistics were expressed in percentage and proportions.

## RESULTS

A total of 50 cases of pressure sore were included in the study and analyzed.

The youngest patient in this study is 7 yrs old male, non paraplegic; and the oldest patient is 85 yrs old female, non paraplegic. Maximum number of patients (15:30%) was found in 31-40 yrs age group. In this group 11 are paraplegic and 4 are non-paraplegic. Minimum number of patients (1:2%) are found in age group 1-10 yrs. 14 (28%) patients were more than of >50 yrs, of whom 12 no paraplegic and 2 were paraplegic.

Out of 50 patients, 39 (78%) were male and 11 (22%) were female. 17 (34%) male patients and 5 (10%) female patients are paraplegic while 22 (44%) male patients and 61 (12%) female patients were non paraplegic.

**Table 1: Distribution of social and etiological factors among study subjects.**

| Factors | | Frequency | % |
|---|---|---|---|
| **Age (in years)** | 0 to 10 | 1 | 2 |
| | 11 to 20 | 4 | 8 |
| | 21 to 30 | 6 | 12 |
| | 31 to 40 | 15 | 30 |
| | 41 to 50 | 10 | 20 |
| | >50 | 14 | 28 |
| **Gender** | Male | 39 | 78 |
| | Female | 11 | 22 |
| **Paraplegic** | Yes | 22 | 44 |
| | No | 28 | 56 |
| **Etiology** | Fall from height | 10 | 20 |
| | RTA | 8 | 16 |
| | Others | 4 | 8 |
| | Old age and depilating condition | 13 | 26 |
| | Medical diseases | 6 | 12 |
| | Orthopedic conditions | 5 | 10 |
| | Plaster sore | 3 | 6 |
| | Meningomyelocele | 1 | 2 |

50 patients of pressure sore were studied out of which, 28 (56%) patients are non paraplegics and 22 (44%) patients are paraplegic.

Trauma is the most common etiologic factor in 22 (44%) patients, of whom all are paraplegic; while depilating condition of old age is the 2nd most common factor which includes 13 (26%) patients of whom all are non-paraplegic.

Among 22 paraplegic patients of trauma, 10 (45.5%) patients had spinal injury secondary to fall from height, 8(36.3%) patients secondary or RTA and 4 (18.2%) patients secondary to other cause (Pathological fracture, spine surgeries).

3 (7.5%) patients had heel sores secondary to plaster cast and 1 (2.5%) patient had Ischial sore secondary to meningomyelocele.

Among 50 patients, most common site is sacral region 45 (60.8%), followed by ischial region 12 (16.2%) and Trochanteric region 10 (13.5%). Least common site is occipital and malleolar area 1 (1.3% each).

**Table 2: Distribution of pressure sores and its feature among study subjects.**

| Characteristics | | Paraplegic | | | | Non-paraplegic | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | | Female | | Male | | Female | | | |
| | | N | % | N | % | N | % | N | % | N | % |
| **Site of pressure sores** | Sacral | 17 | 23 | 4 | 5.4 | 17 | 23 | 7 | 9.5 | 45 | 60.8 |
| | Ischial | 1 | 1.3 | 0 | 0 | 11 | 14.8 | 0 | 0 | 12 | 16.2 |
| | Trochanteric | 3 | 4 | 2 | 2.7 | 4 | 5.4 | 1 | 1.3 | 10 | 13.5 |
| | Heel | 0 | 0 | 0 | 0 | 3 | 4 | 0 | 0 | 3 | 4 |
| | Scapular | 1 | 1.3 | 0 | 0 | 0 | 0 | 1 | 1.3 | 2 | 2.9 |
| | Malleoli | 1 | 1.3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1.3 |
| | Occipital | 0 | 0 | 0 | 0 | 1 | 1.3 | 0 | 0 | 1 | 1.3 |
| **Number of pressure sores** | Single sore | 12 | 24 | 4 | 8 | 18 | 36 | 4 | 8 | 38 | 76 |
| | Multiple sores | 5 | 10 | 1 | 2 | 4 | 8 | 2 | 4 | 12 | 24 |
| **Duration of pressure sores** | <15 days | 8 | 16 | 2 | 4 | 10 | 20 | 3 | 6 | 23 | 46 |
| | 15 to 30 days | 3 | 6 | 2 | 4 | 8 | 16 | 2 | 4 | 15 | 30 |
| | 1 to 2 months | 5 | 10 | 1 | 2 | 2 | 4 | 0 | 0 | 8 | 16 |
| | 2 to 3 months | 1 | 2 | 0 | 0 | 1 | 2 | 0 | 0 | 2 | 4 |
| | 3 to 4 months | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 2 |
| | >1yr | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | 2 |

**Table 3: Neurological and clinical examination of pressure sores.**

| | | Paraplegic | | Non paraplegic | | Total | |
|---|---|---|---|---|---|---|---|
| | | N | % | N | % | N | % |
| **Spasticity** | Yes | 4 | 8 | 2 | 4 | 6 | 12 |
| | No | 18 | 36 | 26 | 52 | 44 | 88 |
| **Sensation around pressure sore** | Present | 2 | 4 | 25 | 50 | 27 | 54 |
| | Absent | 20 | 40 | 3 | 6 | 23 | 46 |
| **Level of consciousness** | Conscious | 21 | 42 | 21 | 42 | 42 | 84 |
| | Unconscious | 1 | 2 | 3 | 6 | 4 | 8 |
| | Conscious but disoriented | 0 | 0 | 4 | 8 | 4 | 8 |

Continued.

| | | Paraplegic | | Non paraplegic | Total | | |
|---|---|---|---|---|---|---|---|
| | | N | % | N | N | % | N |
| **Complications** | Death | 2 | 4 | 5 | 10 | 7 | 14 |
| | Septicemia | 1 | 2 | 2 | 4 | 3 | 6 |
| | Osteomyelitis | 1 | 2 | 2 | 4 | 3 | 6 |

**Table 4: Treatment and outcome of the pressure sores.**

| | | Paraplegic | | Nonparaplegic | | Total | |
|---|---|---|---|---|---|---|---|
| | | N | % | N | % | N | % |
| **Protein supplementation** | Enteral | 22 | 44 | 28 | 56 | 50 | 100 |
| | Parenteral | 9 | 18 | 11 | 22 | 20 | 40 |
| **Treatment of anemia** | Enteral | 22 | 44 | 28 | 56 | 50 | 100 |
| | Parenteral iron | 10 | 20 | 9 | 18 | 19 | 38 |
| | Blood transfusions | 18 | 36 | 19 | 38 | 37 | 74 |
| **Systemic treatment** | Antibiotics | 22 | 44 | 25 | 50 | 47 | 94 |
| | Spasticity Rx | 4 | 8 | 2 | 4 | 6 | 12 |
| **Dressing material** | SSD | 17 | 34 | 14 | 28 | 31 | 62 |
| | Povidone iodine solution | 4 | 8 | 11 | 22 | 15 | 30 |
| | Collagen sheets | 0 | 0 | 2 | 4 | 2 | 4 |
| | Moist occlusive dressing | 1 | 2 | 1 | 2 | 2 | 4 |

**Table 5: Surgical treatment in pressure sore and their results.**

| | Primary closure | | Split thickness graft | | Gluteal rotation flap | | V-Y advancement flap | | Inferior gluteal thigh flap | | TEL flap | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| **Sacral sore** | 5 | 11.9 | 5 | 11.9 | 13 | 30.9 | 2 | 4.7 | 0 | 0 | 0 | 0 | 25 | 59.5 |
| **Ischial sore** | 6 | 14.2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4.7 | 0 | 0 | 8 | 19 |
| **Trochanteric sore** | 1 | 2.3 | 2 | 4.7 | 0 | 0 | 0 | 0 | 1 | 2.3 | 3 | 7.3 | 7 | 16.9 |
| **Heel** | 0 | 0 | 1 | 2.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2.3 |
| **Scapular** | 0 | 0 | 1 | 2.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2.3 |

**Table 6: Success rate in pressure sore surgery.**

| Sacral sore surgeries | Complication in paraplegic | | | | Complication non paraplegic | | | | Total | Success (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | WD | FN | I | GL | WD | FN | I | GL | Complication/ total surgery | |
| **PC** | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3/5 | 40 |
| **STG** | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1/5 | 80 |
| **BGRSF** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1/10 | 90 |
| **UGRSF** | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 3/3 | 0 |
| **BVYAMCF** | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1/2 | 50 |

PC: Primary closure; STG: Split thickness graft; BGRSF: Bilateral gluteal rotation skin flap; UGRSF: Unilateral gluteal rotation skin flap; BVYAMCF: Bilateral V-Y advancement musculocutaneous flap.

**Table 7: Outcome of ischial sore surgeries.**

| Ischial sore surgeries | Complication in paraplegic | | | Complication in non paraplegic | | | Total | Success (%) |
|---|---|---|---|---|---|---|---|---|
| | WD | FN | I | WD | FN | I | Complication/ total surgery | |
| **PC** | 3 | 0 | 0 | 0 | 0 | 0 | 3/6 | 50 |
| **STG** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| **Inferior gluteal thigh flap** | 0 | 0 | 0 | 0 | 0 | 0 | 0/2 | 100.00 |

PC: Primary closure; STG: Split thickness graft.

**Table 8: Outcome of trochanteric sore surgeries.**

| Trochanteric sore surgeries | Complication in paraplegic | | | | Complication in non paraplegic | | | | Total | Success (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | WD | H | I | GL | WD | H | I | GL | Complication/ total surgery | |
| **PC** | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1/1 | 0 |
| **STG** | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | ½ | 50 |
| **Inferior gluteal thigh faciocut-aneous flap** | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1/1 | 0 |
| **TFL musculo-cutaneos flap** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0/3 | 100 |

In this study multiple pressure sores are found in 12 (24%) patients with equal distribution in paraplegic and non paraplegic. 5 (10%) male and 1 (2%) female patients are paraplegics; while 4 (8%) male and 2 (4%) female patients are non-paraplegic. Among 12 multiple pressure sores, sacral and trochanter sores (5 in No) constitutes most common combination followed by sacral, trochanter and ischial sores (2 in No). This shows patient who has one sore has a very high chance of developing a second sore.

In 23 (46%) patient's duration of the pressure sores at the time of presentation was less than 15 days of whom 10 were paraplegic and 13 were non paraplegic. 1 (2%) male non-paraplegic patient who has been operated for meningomyelocele in childhood presented with bilateral ischial pressure sore of more than 1yr duration

In 23 (46%) patient's sensation was absent around the pressure sore. In these 20 (87%) patients were paraplegic and 3 (13%) patients were non paraplegic. Out of 50 patients, spasticity is seen in 6 (12%) patients; 4 (8%) were paraplegic and 2 (4%) were non paraplegic. All these patients had multiple pressure sores. All these patients had the pressure sores of stage ≥3.

Out of 50 patients, 4 (8%) patients were in unconscious state of whom 1 is paraplegic and 3 were non paraplegic. On other 4 (8%) patients were in disoriented state of whom all are non-paraplegic.

Complications of pressure sores were found in 7 (14%) patients. In these patients 2 were paraplegic and 5 were non paraplegic. Death occurred in 7 patients. In these patient's septicemia and osteomyelitis of underlying bone were present in 3 patients each.

In this study, at the time of initial examination 90% of the patients were hypoproteinemic with their serum albumin levels below 3.5 mg%. In this study while treating hyperproteinaemia, for 20 (40%) patient's parenteral protein supplementations were given. Oral protein supplementation is given in all patients.

In this study at the time of initial examination, 84% of patients are anaemic with their Hb% less than 12%. While treating anaemia 19 (38%) patients were given parenteral iron preparations and 37 (74%) patients were given blood transfusions. 47 (94%) patients were treated with systemic antibiotics and 6 (12%) patients were treated with muscle relaxants for spasticity.

In this study pressure sore wounds are most commonly dressed with 1% silver sulphadizine cream [in 31 (62%) patients]. Povidone iodine solution was used to dress in 15 (30%) patients. Collagen was applied in 2 (4%) patients and for on other 2 patient's semi occlusive dressings are used.

In this study, 1% silver sulphadizine cream is used to dress the pressure sore wound initially when the eschar is present. When the wound becomes free of eschar, we started doing dressing with povidone iodine solution

Out of 74 pressure sores in 50 patients, 42 (56.7%) pressures sores are operated. These 42 operated pressure sores include 25 (59.5%) sacral sore, 8 (19%) Ischial sore, 7 (16.9%) Trochanteric sore, 1 (2.3%) heel sore and 1 (2.3%) scapular sore.

Out of 3 heel sores in non-paraplegic patients, STG is done for 1 sore. Out of 2 scapular sores STG is done for 1 sore.

In this study gluteal rotation flaps were done in 31%, primary closure in 28.5%, skin grafting in 21.4%, myocutaneous flap in 11.9% and fasciocutaneous flaps in 7.1% of sores.

Highest success rate for sacral sore surgery was found in bilateral gluteal rotation skin flap (90%) in which partial flap necrosis was found in 1 paraplegic patient. Out of 5 STG done for sacral pressure sore, partial graft loss found in 1 patient with success rate of 80% bilateral V-Y advancement musculocutaneous flap had 50% success rate with 1 wound dehiscence seen out of 2 operations. Among 5 primary closure done for sacral sores, 3 wound dehiscence (WD) was found postoperatively with success rate of 40%.

2 inferior gluteal thigh fasciocutaneous flap (1each for paraplegic and non paraplegic) done for ischial sore was found to have no post-operative complication with success rate of 100%; while among 6 primary closure done for non paraplegic ischial sore, wound dehiscence was found in 3 sores with success rate of 50%

Among 2 TFL musculocutaneous flap in V-Y fashion and 1 TFL musculocutaneous island flap for trochanteric sores, there was no complication with success rate of 100%. Haematoma underneath the flap was found with no other complication in 1 trochanteric sore treated by Inferior gluteal thigh island fasciocutaneous flap. Primary closure done in 1 paraplegic sore had wound dehiscence. Among 2 STG done for ischial sore, partial graft loss was seen in one sore with success rate of 50%.

## DISCUSSION

The mean age of patients was 44.2 years. This correlates with studies by Joseph, Carlton and Goldberg, Harding and Costa et al who recorded the mean ages 42 years, 35.07 years and 34.78 respectively.[9-11] These studies confirmed that the greater prevalence of pressure sore in the young adult (20-40 yrs. 42%) population. These young adults are the most productive members of the society. This is causing great loss to the society. Pressure sores in the children are least prevalent as they well protected by their parents.

In this study males dominated (78%) in both paraplegics and non paraplegics with male to female ratio of 3.5:1. This correlates with studies of Costa et al in whom out of 45 patients 80% are male and 20% are female.[11] Studies of Majumadar et al. Also showed male dominance with 81.4% with male to female ratio of 4.2:1. This is possibly because the male population is the dominant work force in our social environment and more exposed to accidental trauma.[12]

Trauma was the only cause for paraplegia (100%) in this study which is comparable to studies of Majumdar et al in which trauma was the most common cause of paraplegia (92.6%).[12]

In this study, among paraplegic patients of trauma 45.5% patients had spinal injury secondary to fall from height, 36.3% patients secondary of RTA and 18.2% patients secondary to other cause (pathological fracture, spine surgeries). In contrast, in study of Costa et al 60% were due to gun shots, 31% were due to RTA and 8.2% were due to fall from height. This is because of low urban violence with gunshots in our region.[11]

In this study, 74 pressure sores were found among 50 patients with an average of 1.48 sores per patient. Patient who has one sore has a very high chance of developing a second sore as shown in present study by incidence of 1.48 sore per patient which is correlating to the study of Costa et al (1.71 sores per patient).[11]

This study showed higher incidence of sacral sore. The studies of Joseph et al and Costa et al showed the low incidence of sacral sores and the higher incidence of ischial and trochanteric sores. This difference may be attributed to better nursing, timely physiotherapy and early rehabilitation from supine to sitting and lateral posture in developed countries.[11]

Among ischial sore, 8.4% are found in paraplegic and 91.6% are found in non paraplegic. This is explained by the fact that paraplegics are immobilized in supine position for a very long period of their hospitalization due to spinal injury; while although non paraplegics are mobilized early, inadequate protection on wheel chair resulted in to ischial sores.

All trochanteric sores are associated with sacral sores. This is probably because of lateral position given for the patient having sacral sore during postural changes.

By these finding we can conclude that, the factors determining the site of involvement includes whether the patient is paraplegic or not, whether the patient is bed ridden or on wheel chairs and position of patients in beds.

In Petersen series 61% of patients developed pressure sores in less than 3 months where as in this study, in 96% of patients, duration of pressure sore was less than 3 months.[13] This discrepancy is probably because, most of our patients either paraplegic or nonparaplegics were totally immobilized for long duration during the initial periods of trauma or disease. In these patient's pressure sores developed within a short span or time.

Among patients in whom there was loss of sensation around pressure sore, all patients pressure sore is of stage ≥3. From this we can conclude that, reduced ability to respond to discomfort or pain secondary to loss of sensation predisposed these patients to prolonged and intense pressure and leaded in to developing deep pressure sores.

Among paraplegics 4.5% and among non paraplegics 25% were in altered state of consciousness which has lead to impaired mobility and made these patients bed ridden which is initiating factor for pressure sore in these patients. All these patients (100%) had sacral sore and staging of pressure sore in these patients is ≥3, as these patients are immobile for long duration in supine position. Management of these patients is challenging for both health staff and care takers.

Death occurred in 14% of patients in whom septicemia and osteomyelitis of underlying bone were present in 42.8% patients each. In Majumdar et al studies one patient (3.7%) died due to septicemia. High death rate in present study is probably because of having more number of aged non paraplegics patients in this study; these patients had comorbid medical disease and debilating condition of old age.[12]

For 40% of patients who are affordable, parenteral protein supplementations were given in the form of IV amino acids and IV albumin to bring the serum albumin above the normal values in short period of time. In Majumdar et al studies also IV amino acids are given to patients to improve hyperproteinemia, most of the patients receiving 11 to 20 units.[12]

Selection of appropriate dressing products for the wound at its specific stage and deciding on the length of application is essential. The clinical status of the wound and the tissue present determine the choice of product. Although other dressing materials are available, because of financial constraint we have not used it.

Surgical methods used to treat sacral sore were comparable with studies of Costa et al, in which primary closure and V-Y gluteal musculocutaneous flap were more commonly performed (28% each).[11]

Surgical methods used to treat ischial sore were comparable with studies of Costa et al, in which primary closure is done in 75.1% of sores and other flaps are done in 24.9% of sores.[11]

Surgical methods used to treat trochanteric sore were comparable with studies of Costa et al, there aloes most commonly performed surgical procedure for trochanteric sores are TFL musculocutaneous flap (68%).[11]

Considering the good long term surgical results of flap surgeries in our series and in outside publications, it can be safely stated that small, shallow non paraplegic sacral sores do well with skin grafts while large, deep, infected and paraplegic sores need flap coverage. Simpler conventional repairs should be tried first, saving the muscle and myocutaneous flap for the recurrence.

Most of ischial sores develop during the rehabilitation period as the patients starts sitting for a longer time. These sores are generally deep and chronic with exposed underlying ischial tuberosity. So flap coverage is better than primary closure and primary closure if done, better reserved for ambulatory non paraplegics.

In this series for the surgical management of trochanter sore first option was given to tensorfacialata musculocutaneous flap with success rate of 100% (2 TFL musculocutaneous flap in V-Y fashion and 1 TFL musculocutaneous island flap was done). Versatile TFL myocutaneous flap is the procedure of choice for trochanteric sore coverage.

## CONCLUSION

Non ambulatory paraplegic patients with deep pressure sores needs surgical intervention to cover the pressure sore; while non paraplegic patients with superficial pressure sores can be treated successfully by conservative line of management and deep pressure sores needs to be operated. Selection of appropriate dressing products for the wound at its specific stage and deciding on the length of application is essential. The clinical status of the wound and the tissue present determine the choice of product. Biological dressing with collagen sheets was found useful in early stages of pressure sore. Shallow non paraplegic sacral sores did well with skin grafts while large, deep, infected and paraplegic sores did well with flap coverage. Simpler conventional repairs should be tried first, saving the muscle and myocutaneous flap for the recurrence. For Ischial sores flap coverage is better than primary closure. If primary closure is done, better reserved for ambulatory non paraplegics. The versatile TFL myocutaneous flap is the procedure of choice for trochanteric sore coverage

***Recommendation***

To achieve better final outcome in pressure sore management, proper follow-up and appropriate rehabilitation is necessary, and during this period the active involvement of the patient and his family members in the day to day nursing care and to know detailed knowledge about the pressure preventing measures are most important.

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