

Institutional Study for Different Treatment Modalities for Bed Sores in Chronic Bed-ridden Patients at Three Different Hospitals in Gujarat

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Abstract

Introduction: Pressure sore develops due to ischemic changes at epidermis. Pressure ulcers develop primarily from pressure and shears are progressive in nature and most frequently found in bedridden, chair bound, or immobile people. They often develop in people who have been hospitalized for a long time generally for a different problem and increase the overall time as well as cost of hospitalization that have detrimental effects on patient's quality of life. Loss of sensation compounds the problem manifold and failure of reactive hyperemia cycle of the pressure prone area remains the most important etiopathology.

Materials and Methods: Pressure ulcers are largely preventable in nature and their management depends on their severity. From January 2021 to January 2022, total 125 individual surgical cases were considered for study from three different institute in Gujarat. The present treatment options include various approaches of cleaning the wound, debridement, optimized dressings, role of antibiotics, and reconstructive surgery.

Results: Bed sore managed by conservative and operative method such as debridement, vacuum assisted closure therapy, flap coverage depending on wound condition, and patient general condition. Majority of cases were managed with debridement and dressing along with regular physiotherapy. Reconstructive flap was considered for larger defect.

Conclusion: The treatment of pressure ulcers requires careful patient education, intensive multidisciplinary optimization, and meticulous wound care. Post-operative complication was studied and wound infection and recurrence are most common. There for early bed sore care is better.

Key words: Decubitus ulcer, Ischial sore, Wound dehiscence

INTRODUCTION

Pressure ulcers are a type of injury that breaks down the skin and underlying tissue when an area of skin is placed under constant pressure for certain period causing tissue ischemia, cessation of nutrition, and oxygen supply to the tissues and eventually tissue necrosis.^[1] Constant pressure

resulting in “distortion or deformation damage” is probably the most accurate description of a pressure ulcer. The areas that are particularly prone to pressure sores are those that cover the bony areas such as occiput, trochanters, sacrum, malleoli, and heel.^[2] Pressure ulcers are especially morbid after spinal cord injury, leading to high rates of hospitalization and longer hospital stays.^[3-5] Despite this high expenditure, patients die as a direct result of these preventable wounds.^[6] Septicemia, pneumonia, urinary tract infection, congestive heart failure, respiratory failure, and complicated diabetes mellitus are the most common diagnoses in patients with pressure ulcers.^[7] These medical comorbidities significantly impact wound healing, Surgical reconstruction can only be considered following wound debridement and stabilization, infection management, and

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medical and nutritional optimization. Although flap closure is the most commonly recommended reconstruction technique, some surgeons may perform direct closure or skin grafting, these methods are often suboptimal. Unfortunately, failure rates and ulcer recurrences after attempted surgical repair are high.^[8] The tissues are capable of sustaining pressure on the arterial side of around 30–32 mm hg for only a small duration of time.^[9] However, when pressure increases even slightly above this capillary filling pressure, it causes microcirculatory occlusion and this, in turn, initiates a downward spiral toward ischemia, tissue death, and ulceration. To put it more simply, any individual, with or without a medical condition, who is incapable of avoiding prolonged periods of an uninterrupted compression, is at a risk of pressure ulcers.^[10]

Treatment

Where possible, the treatment of ulcers is planned with an aim to reverse the factors that have originally caused the ulcer. Careful assessment is needed before planning for the treatment. In general the possible causative factor should be removed (pressure, shear, and friction) and the associated general condition should be taken into the control (like treatment of associated comorbid illness and improvement in the nutrition).^[11] The affected area requires thorough cleaning and dressing. However, since the full range of motion and active physiotherapy of joints do improve circulation, even non-weight bearing physiotherapy is desirable. Wound healing requires adequate protein, iron, Vitamin C, and zinc. Supplements may be prescribed if they are deficient in the diet.^[12]

Cleaning and debridement

Cleaning of the wound and meticulous skin care is the most essential part of the treatment. Besides the conventional surgical debridement other types of debridement like mechanical debridement which includes use of repeated wet to dry dressings to removes slough, enzymatic debridement using enzymes to liquefied dead tissue in the



wound, and remove them with the dressings and biological debridement or maggots and larval therapy (in which the larvae eat all the dead tissue and make the wound clean without harming the living tissues) also find a mention in the literature. Sharp surgical debridement using blade or scissors is the most commonly used and most effective method of debridement in able surgical hands.^[13]

Cleansing and pressure irrigation

Where dead tissue is removed using high-pressure water jets, there is no evidence available to support any specific and effective cleansing techniques or solution, in particular.^[14]



Wound dressings

The dressing used for various stages of wound healing is specialized for every stage; in fact, there is a whole range of dressings available to assist with the different stages of wound healing. These are classified as non-absorbent, absorbent, debriding, self-adhering, and many others. It is vital to determine the most appropriate dressing as it ultimately depends on the site/type of ulcer, for hospital care or domiciliary management, personal preference, and cost to the patient.^[15] Contaminated or weeping wounds may require more frequent dressing changes, sometimes every few hours. Heavily contaminated ulcers are treated with negative pressure wound therapy (NPWT).

Specialized dressings and bandages are used to protect and speed up the healing process of the pressure ulcers. These dressings include:

Hydrocolloid dressings

These contain a special gel that encourages the growth of new skin cells in the ulcer and keeps the nearby healthy area of skin dry.

Alginate dressings

These are made from seaweed that contains sodium and calcium known to speed up the healing process. Honey-



impregnated alginate dressings are known to accomplish total wound healing to pressure ulcers.

Nano silver dressings

These use the antibacterial property of silver to clean the ulcer.

Creams and ointments

To prevent further tissue damage and help speed up the healing process, topical preparations such as cream and ointments are frequently used.

Antibiotics

All pressure sores do not require antibiotics. Antibiotics are usually only prescribed to treat an infected pressure ulcer and prevent the infection from spreading. If tissue infection exists, antibiotics are necessary to treat the infection, but effort must be made to debride the ulcer thoroughly and leave all viable tissues only, otherwise antibiotics alone will not clean up the ulcer. Antibiotics are adjunct to surgical debridement and not an alternative to it.

Biofilm

It has been noticed that the longstanding pressure ulcers are frequently colonized by micro-organisms in a biofilm. The biofilm may be composed of bacteria, fungi, or other organisms, which are embedded in and adherent to the underlying wound. We address the problem of biofilm by changing the pH of the wound dressing with dilute acetic acid if it is alkaline, which it usually is and curetting out all the undermining, cracks and crevices of the ulcer, or by surgical debridement.

NPWT

This is an invaluable tool in the management of pressure sores and involves the application of sub-atmospheric pressure to a wound using a computerized unit to intermittently or continuously convey negative pressure to promote wound healing. NPWT is effective for deep, cavitating, infected, and copiously discharging pressure ulcers, particularly with exposed bone.^[15] With growing clinical experience, it can be said with certainty that it assists wound healing, and its benefits can be summarized thus:



- Assists granulation
- Applies controlled and localized negative pressure to help uniformly draw wounds closed
- Helps remove interstitial fluid allowing tissue decompression
- Helps remove infectious materials and quantifies exudates loss
- Provides a closed and moist wound healing environment
- Promotes flap and graft survival
- Both hospital and domiciliary use
- Reduces hospital/dressings/nursing cost (if we can discharge the patient to home).

Reconstructive Surgery

Sometimes the severe pressure ulcer (Grade III or IV) fail to heal, in such cases, surgery is required to fill the wound and prevent any further tissue damage. This is usually done by cleaning the wound and closing it by bringing together the edges of the wound (direct closure), application of various type skin grafts, or using local and regional flaps and free tissue transfer.^[16]



There are many risks and complications that can occur after surgery, including infection, necrosis of flap, muscle weakness, blisters, recurrence of the pressure ulcers, septicemia, infection of the bone (osteomyelitis), bleeding, abscesses, and deep vein thrombosis. Despite the risks, surgery is often a necessity and the only option to prevent limb and life-threatening complications.^[17]

The available reconstructive options are.

Split thickness skin grafting

When the ulcer is superficial and vital tissues such as bone, vessels, nerves, or tendons are not exposed, and the ulcer is not copiously discharging, skin grafting is the first option for surgical treatment. The slimy layer over the surface of ulcer is sharply debrided to get a healthy vascular bed for skin grafting.

Local flaps

Variety of local flaps can be used to reconstruct the defect created by excision of pressure ulcers. Local transposition, rotation, and limberg flap are the available options. Biceps femoris V-Y advancement (in paraplegics only) for ischial pressure sore and perforator based V-Y advancement is another good options if the anatomy permits.



Regional flaps

Sometimes the local or limberg flap cannot close the larger defects due to their size or location resulting in need for regional flaps. For Sacral pressure sores, there are many flap options such as gluteus maximus myocutaneous flap,



superior gluteal artery based rotation fasciocutaneous flap, superior gluteal artery perforator flaps, perforator based V-Y advancement flap, and lumbogluteal sensory flap. For lower extremity pressure ulcer reconstruction; Islanded medial planter flap, lateral or medial calcaneal flaps, reverse sural flap, and varieties of fasciocutaneous flaps may provide a huge reconstructive option.

Microvascular free flaps



Microvascular free flaps are usually reserved for some selected cases where the local and regional flap options are either not available or have failed, and the depth of the pressure ulcer demands adequate volume restoration for proper weight bearing. In fact, the latter reason is so vital that many large pressure ulcers on weight bearing soles or on tip of amputation, stumps are today being primarily treated with microvascular free tissue transfer.

Prevention: Mattresses and cushions

Protection is the best way to prevent ulcers. Patients who are at risk of developing pressure ulcers should have the skin carefully inspected for any damage or redness (particularly over bony areas) twice daily. The skin should be kept clean and dry. Any pressure causing damage to skin or tissue should be immediately eliminated. This can be done with the help of special mattresses, cushions, and by many protective devices that can relieve the external pressure on vulnerable areas of body limbs.^[18] For small areas like hand, ankle, and foot, we use water filled tied surgical hand gloves as pressure relieving devices at hospital setup and we advise the patients to use these at their home as a very easy to make and very low-cost pressure relieving device.^[19]

Pressure ulcers put a greater health risk to regular users of wheelchairs or those who are bound for prolonged sitting. The most frequently involved areas while seating are sacrum, coccyx, ischial tuberosities, and greater trochanters. Further, patients or their caretakers are taught to conduct pressure release movements or weight shifts

on regular intervals to prevent pressure concentration and tissue damage. Patients who sit for a long time need to use protective cushioning/fabricated air mattresses for protection of bony points and do periodic change of postures and offloading of pressure points by side bending, forward bending, and lifting off the chair with powerful upper body muscles.^[20-22]

MATERIALS AND METHODS

This retrospective study was carried out at B. J. Medical College, Ahmedabad. Government Medical College, Surat, and M. K. Shah Medical College and Research Center, Ahmedabad. Inclusion criteria were adult patients of any age and sex with sacral, ischial, and trochanteric pressure ulcers that required of surgical intervention between January 2021 and January 2022. Patients with pressure ulcers managed conservatively or that required wound debridement and/or primary closure without flap coverage were also included in the study. Further exclusion criteria were patient with general condition poor and not willing to participate in study. Database that collects variables for each surgical procedure including pre-operative risk factors, intra-operative variables, and 30-day post-operative mortality and morbidity outcomes.

Patient data collected included age, sex, body mass index (BMI), race, medical comorbidities, surgical history, medications, American Society of Anesthesiologists physical status classification system, and tobacco use. Pressure ulcer characteristics including wound location, size, and presence of osteomyelitis (acute or chronic) were also recorded. Operative details recorded included donor site, flap composition, and procedure length. Post-operative management and outcomes collected included length of follow-up and complications including recurrence, wound dehiscence, and infection. The primary outcomes for our review were major complications, which included ulcer recurrence, wound dehiscence, post-operative infection, flap necrosis, and minor complications such as seroma and hematoma.

RESULTS

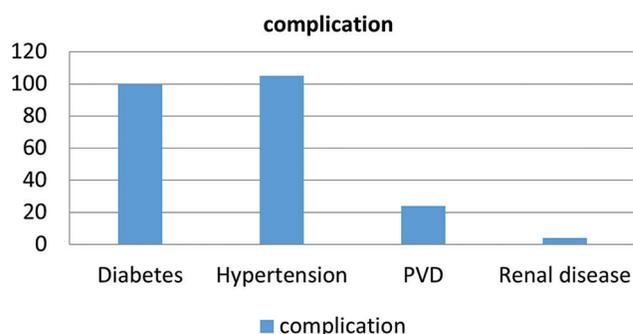
From January 2021 to January 2022, total 125 individual surgical cases were retrieved from the database and reviewed. Total cohort demographic information is listed below. The mean age at time of surgery was 52 years (± 17.12) and the majority of patients were male (64%). Ninety-six patients underwent flap coverage of their pressure ulcers. Following is patient demographic and wound characteristics. The average BMI was 24.1 and 40.3% of patients were active smokers. Paralysis was noted in 85.6% of chronic bed-ridden patients, with 16% having

quadriplegia and 72% having paraplegia. Of note, 28% of patients had ischial pressure ulcer.

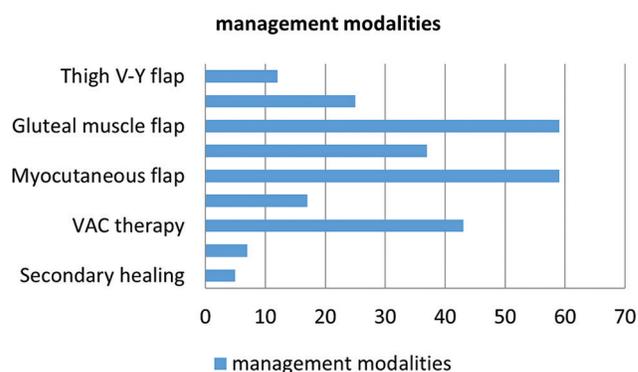
Demographic data		
Male	80	64%
Female	45	36%
Total	125	Mean age 52 year

Paralysis data		
Paraplegia	90	72%
Quadriplegia	20	16%

Type of ulcer		
Ischial	35	28%
Sacral	65	52%
Trochanteric	20	16%
other	05	04%

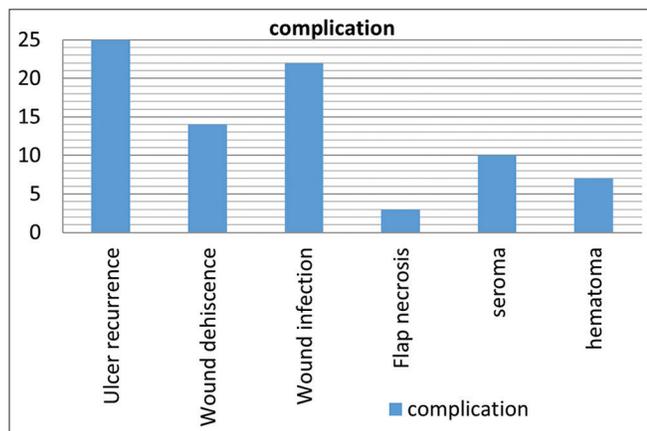


Management modalities		
Secondary healing	5	4%
Primary closure of wound	7	5.6%
Vacuum assisted closure therapy	43	34.4%
STG	17	13.6%
Myocutaneous flap	59	47.2%
Fasciocutaneous flap	37	29.6%
Gluteal muscle flap	59	47.2%
TFL flap	25	20%
Thigh V-Y flap	12	9.6%



The most commonly performed flap utilized the gluteal muscle flap (47.2%). The majority of reconstructive flaps

Complication		
Ulcer recurrence	25	20%
Wound dehiscence	14	11.2%
Wound infection	22	17.6%
Flap necrosis	3	2.4%
seroma	10	8%
hematoma	7	5.6%



were myocutaneously based (47.2%). Complications including major ones (ulcer recurrence, wound dehiscence, post-operative infection, and flap necrosis) and minor ones (seroma and hematoma) occurred in 81 (64.8%) patients in this series. The average albumin was significantly lower in those with complications. Age, sex, race, BMI, diabetes, smoking status, pre-operative osteomyelitis, and flap choice were not risk factors for complications.

DISCUSSION

Pressure ulcers continue to be a medical and economic burden. They represent a significant source of infection and can lead to complications including sepsis, osteomyelitis, immobility, and death. Despite widespread prevention campaigns, it is unclear which measures are cost-effective and there has been little change in the reported incidence of pressure ulcers over time. While some ulcers can be treated with conservative measures, many will go on to receive surgical reconstruction. Post-operative complications further raise the already substantial cost of surgery. Total dependency was associated with a decreased rate of surgical site infection. In this patient population, dependency on nursing staff for local wound care may account for this observation of decreased surgical site infection. The rate of wound dehiscence following pressure ulcer reconstruction is variable in the literature and difficult to quantify.

Ischial pressure ulcers were an independent risk factor for pressure ulcer recurrence and wound dehiscence. This finding is not surprising given that ischial tuberosities

have increased pressure over other bony prominences in the sitting position. The previous reviews have also found that ischial pressure ulcers are at risk for recurrence. Unfortunately, ischial pressure ulcers are the most common pressure ulcer, and avoidance of flap coverage for ischial pressure ulcers is not an ethical option. Rather, reducing other patient risk factors for flap complications may be important in those with ischial pressure ulcers.

Smoking was an independent risk factor for pressure ulcer recurrence in our retrospective series. Smoking has not been previously linked to pressure ulcer flap complications, so this appears to be a novel finding. Smoking is a risk factor in wound complications in the general plastic surgery population and especially those undergoing free flaps because smoking is a modifiable risk factor, motivational coaching directed toward smoking cessation may be an important step in preventing recurrence. Our data indicate that surgeons should be cautious about offering pressure ulcer flap coverage in smokers and patients should be counseled on the risks associated with smoking.

Nutritional factors are considered to play a role in the development and recovery from a pressure ulcer. Specifically, low prealbumin and albumin levels have been implicated in the development of pressure ulcers. Our review revealed that low albumin and prealbumin were associated with complications. Low albumin was specifically associated with wound dehiscence. However, albumin and prealbumin have inversely correlated with morbidity and mortality across surgical disciplines. Because these are imperfect markers, serum levels of albumin and prealbumin should be considered in light of other clinical findings when making the decision to offer elective flap coverage for a pressure ulcer.

Underlying osteomyelitis can be challenging to diagnose in patients with pressure ulcers and is likely underdiagnosed. In our study, acute osteomyelitis was an independent risk factor for wound dehiscence. Curiously, those with chronic osteomyelitis were not at increased risk for wound complications nor was there an increased risk of infection or ulcer recurrence noted in those patients with active osteomyelitis. Given these findings, it is appropriate to delay pressure ulcer reconstruction in those with active infections to avoid wound complications.

CONCLUSION

The treatment of pressure ulcers requires careful patient education, intensive multidisciplinary optimization, and meticulous wound care. The complication rate following

pressure ulcer repair is high. Careful patient selection and flap-based reconstruction may mitigate these risks.

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