



STUDY OF EFFECTIVENESS OF MASSAGE THERAPY AS A THERAPEUTIC ADJUVANT IN THE MANAGEMENT OF PRESSURE ULCER

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ABSTRACT

Pressure ulcer (PU) is a common cause of morbidity and mortality in spine injuries. We now know that pressure is the single most important etiological factor. The compression of soft tissues results in ischemia and if not relieved, will progress to cause necrosis and ulceration; the basic cause is pressure followed by ischemia and necrosis. PU can develop in Traumatic Brain injured, paraplegic and nonparaplegic patients. Patients with spinal cord injury have reported prevalence of 25 – 40%. Management of pressure ulcer is multicentric. This study was conducted on paraplegic patients admitted in the ward with PU to determine the effectiveness of massage therapy in the management of PU as a therapeutic adjuvant to standard treatment protocol. 36 cases of paraplegic inpatients with stage II and III PU were selected, properly randomized and divided into two groups, A & B. The dimensions of ulcer were recorded. Both groups received standard conventional treatment. Group A received, in addition, massage therapy around the ulcer area using commercially available vibrator for five minutes continuously, two times daily. Group B patients served as controls. Ulcer diameter and area were measured every week and documented. **RESULTS:** The group which received massage showed better ulcer healing.

CONCLUSION. Massage therapy is a cost effective method for management of pressure ulcer and can be easily delivered to the patient by a reliable care giver once it is taught to them.

KEYWORDS : Pressure ulcer, Massage therapy

The term “pressure ulcer” is the most accurate nomenclature to describe both the cause and nature of soft tissue wounds, caused primarily by excessive applied pressure¹. The definition has recently been updated by the National Pressure Ulcer Advisory Panel (NPUAP) to be a ‘localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction’². Appropriate and effective care of pressure ulcers is essential for proper and fast healing and also to minimize medical complications like amyloidosis, osteomyelitis, septicemia, and even death.

Incidence and prevalence vary widely, both between studies and across different health care settings. Patients with spinal cord injury have reported prevalence of 25 – 40%³. Compared with the ulcers which develop in the non paraplegics, the ulcers in spinal injured tend to have an ‘ice-berg’ quality, with extensive undermining and osteitis of underlying bone or even pyoarthroses in severe cases⁴. Pathomechanics implies noxious application of pressure on and shear stress tangential to the skin surface. Prolonged pressure leads to ulcers if it exceeds the tissue capillary pressure of 32 mm Hg. Known as the critical tissue interface pressure, this benchmark is 75 years old and serves as a basis for design of clinical pressure relieving surfaces⁵. Common sites of PU development will vary depending on the most prevalent posture. For example, bed-bound patients will predominantly be lying supine; thus the occiput, sacrum, and heels are the highest risk regions. For mobilized wheelchair users these are ischia, sacrum, and heels.

The risk factors in PU development are both extrinsic and intrinsic. The former includes applied pressure, surface shear, friction, local microenvironment^{6,7}, psychosocial factors, orthoses & prostheses⁸. The intrinsic factors are muscle atrophy, impaired nutritional status⁹, anemia¹⁰, impaired mobility^{11,12}, vascular status and sensation, spasticity and advanced age. As applied pressure increases, the local capillaries will become progressively occluded, impeding blood flow. Lymphatic circulation will be impaired, reducing local drainage of intracellular waste materials leading on to edema. Removal of applied loads after a period of vascular

occlusion results in a transient increase in regional blood flow. During this period of reactive hyperemic phase, tissue damage can occur due to oxygen free radical activity, which is incompletely buffered in tissue under oxidative stress¹³. Although it has been found that shear force alone does not appear to induce tissue breakdown, shear in combination with normal applied pressure will occlude blood vessels at much lower applied forces than normal applied pressure alone¹⁴.

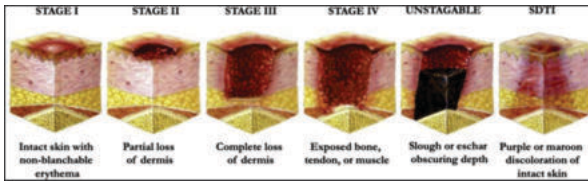
The three most widely used PU risk assessment scales are the Braden¹⁵, Norton¹⁶ and Waterlow¹⁷ scales. Of these, the Braden scale has been most widely used and validated in several different settings. The intent of staging of Pressure ulcer is to provide an objective description of the severity of Pressure ulcer. The most accepted one was the four-stage system proposed by the NPUAP in 1989¹⁸. The NPUAP system was based on the layers of the tissues involved. The four stages described are not necessarily based on histopathology or the progression of the pressure ulcers. This widely adopted staging system was revised in 2016¹⁹. Recently added to the staging system is suspected deep tissue injury (DTI), where the skin is intact but discolored (Table-1, Fig 1). Pressure ulcer healing evaluation scales include the Pressure Ulcer Scale for Healing (PUSH)²⁰, the Pressure Sore Status Tool (PSST)²¹ and the Leg Ulcer Measurement Tool (LUMT)²². The PUSH tool is the most extensively validated tool for assessment of pressure ulcer healing in clinical settings. In order to evaluate and monitor the progress of PU, measurements of maximum horizontal diameter, maximum vertical diameter and depth are commonly used in clinical practice. Clinical applicability of various digital methods may be limited by their cost and the increased time needed to produce the measurements²³.

Table 1: Staging Of Pressure Ulcer

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|---------|---|
| STAGE 1 | Non blanchable erythema not resolved in 30 minutes, epidermis intact reversible with intervention |
| STAGE 2 | Partial thickness loss of skin involving the epidermis, possible into dermis |
| STAGE 3 | Full thickness destruction through dermis into subcutaneous tissue |

| | |
|------------|--|
| STAGE 4 | Deep tissue destruction through subcutaneous tissue to fascia, muscle, bone |
| UNSTAGABLE | Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed. |

Fig1: Pressure Ulcer Staging (pictures Adapted From <http://www.npuap.org>)



As a general rule, conservative management is the first line of treatment. The treatment starts with prevention. This includes identification and correction of risk factors. Specific treatment includes appropriate dressings, management of the wound bed, proper nutrition, maintenance of mobility as well as specific methods of pressure relief like appropriate seating systems and mattresses. Specific steps for wound care are: maintenance of level of moisture²⁴, debridement of necrotic tissues²⁵, wound cleansing, protection of wounds²⁶. Adjuvant therapeutic modalities used in the treatment of pressure ulcer are: Hydrotherapy—whirlpool^{27,28} and pulsatile lavage therapy, Electrical stimulation²⁹, Negative pressure wound therapy (NPWT)³⁰, therapeutic ultrasound³¹, electromagnetic therapy³² and phototherapy³³. The Agency for Health Care Policy and Research (AHCPR) Guidelines supported use of hydrotherapy for the cleansing of the ulcers and ES for non-healing Stage III and IV pressure ulcer³⁴. Newer concepts in PU care such as prone trolleys, standing wheelchairs, dynamic wheelchairs and cushions³⁵ aim at minimizing bedrest for PU treatment. The increased use of negative pressure wound therapy and the strength of evidence for its clinical use is evolving³⁶. Surgical procedures may be used to treat pressure ulcers especially in nonhealing Stage III or IV pressure ulcers. In a comprehensive study including 19,889 elderly residents in 51 nursing homes in US, 28% of stage III and 20% of stage IV ulcers were healed using optimal treatment strategies after 3 months of treatment, with the majority healed within 1 year³. This report illustrates that PU pose challenges for healing. Recent studies on adjunctive treatments have the goal of improving these outcomes. Massage therapy is one such oldest treatment modality in medicine³⁷. It has waxed and waned in popularity throughout the millennia in different cultures. However in recent years, there has been a resurgence of interest in massage that has generated scientific inquiry into its usage as a therapeutic modality. Massage has multiple effects on the body, including mechanical, reflexive, neurologic, and psychologic. The exact therapeutic mechanism by which massage works is not fully understood, and probably represents a combination of the above. Massage is administered for the purpose of producing effects on the nervous and muscular systems, as well as the effects on the local and general circulation of the blood and lymph³⁸. Massage can have an immediate effect on cutaneous blood flow, with hyperemia being noticed even with superficial techniques. The belief is that proximal blockage areas in the lymph channels must be opened first, perhaps reflexively, to allow subsequent distal mobilization of the fluid and protein^{39,40}. Recent findings suggest that massage may decrease blood viscosity and hematocrit and increase circulating fibrinolytic compounds. It has been postulated that massage results in neural reflex reactions⁴¹.

Contraindications and complications to massage are rare and usually not serious. These are malignancy, cellulitis, lymphangitis, deep venous thrombosis, atherosclerotic plaques, patients on anticoagulants or with low blood pressure and edema. Massage continues to provide a

valuable modality for physical medicine practitioners since it is user friendly and is with low risk. As a result, it is available worldwide and has the potential to continue to provide valuable future health benefits.

Very few studies have been reported involving the effectiveness of massage therapy in pressure ulcer healing. Arashi, Midori MHS, RN; Sugama, Junko PhD et al. have found that Vibration Therapy Accelerates Healing of Stage I Pressure Ulcers in Older Adult Patients⁴². The conclusion was that the use of the vibrator may facilitate the healing of Stage I PU. Another study by G.W. Cherry and T.J. Ryan found that cycloidal vibration therapy which is a special form of vibration is useful in stimulating circulation and enhance healing of leg venous ulcers which in turn can significantly reduce treatment costs⁴³.

The novel thought of using a mechanical vibrator in giving perilesional massage therapy is the basis of this work. As of other therapeutic adjuvants, this modality also believes to act by improving the blood supply and lymphatic drainage thereby augmenting the rate of healing of pressure ulcer. More over this therapy is a cost effective method and can be easily delivered to the patient by a reliable care giver once it is taught to him/her.

Aim Of The Study:

To study the effectiveness of massage therapy as a therapeutic adjuvant in the management of pressure ulcer.

Design:

This is a Randomised Control Trial on inpatients in Department of Physical Medicine and Rehabilitation, Govt. Medical College, Kozhikode, a tertiary level hospital in Kerala during April 2011 to March 2012. Paraplegic patients with pressure ulcer of grade III and below and neurological level T7 and below who were willing to give valid consent were included. Patients with lack of significant care giver, severely malnourished, anaemic and emaciated patients and ulcers with significant infection were excluded. Written informed consent is obtained from patient/reliable bystander before they entered in to the study. Patients were grouped into two: group A & group B. The outline of ulcer margin is traced into a transparent plastic (OHP) sheet using a blotting paper. Maximum vertical and maximum horizontal diameters are measured in centimetres using a transparent measuring scale calibrated in millimetres. Since all the ulcers studied were of having roughly circular or oval shape, the average of these diameters is calculated and then surface area is calculated using the formula $A = \pi r^2$ where π is the constant 3.14 and r is half the average diameter calculated and A = Surface area. Conventional cleaning and dressing of ulcer is done to all patients (both group A & B) daily. Group A additionally received massage therapy around the ulcer area using commercially available vibrator (Photo 1) for five minutes continuously.



Photo 1- Delivery Of Massage Therapy

The vibrator is an Indian made electrically driven mechanical vibrator purchased for the study from a surgical equipment shop. The vibrator can produce sinusoidal oscillations at 20 Hz (low frequency) and 40 Hz (high frequency) with constant amplitude. Low frequency vibrations are used for this study. The probe of the vibrator is wrapped over by a thin clean cloth each time of its use on the patient to prevent cross contamination. Then it is connected to the mains and the vibrator is switched on. Massage is delivered using the probe all around the ulcer continuously for five minutes in such a way that the edge of the probe is at least one to two centimetres away from the ulcer margin. This is done two times daily. Method of massage delivery is taught to the reliable caregiver on the first day and on subsequent days he/she continues the therapy as advised.

Ulcer diameter measurements and surface area calculations were repeated for Group A & B patients every week for consecutive 4 weeks. Statistical analysis was done using SPSS 10 software. Qualitative variables were assessed using Chi-square test and quantitative variables using students-t test. Probability values were calculated and a P value of ≤ 0.05 was considered as statistically significant.

RESULTS

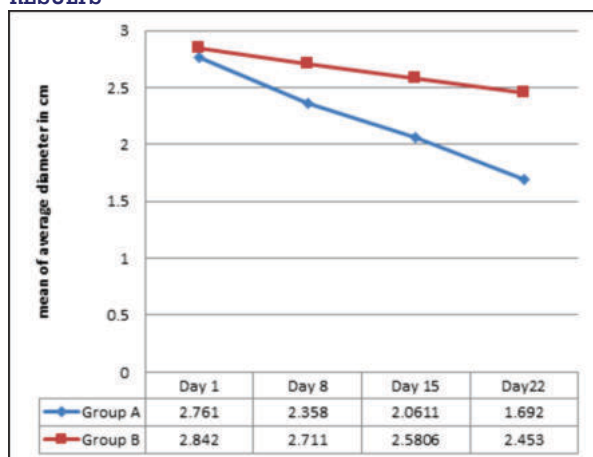


Chart 1: Weekly Reduction In Average Ulcer Diameter

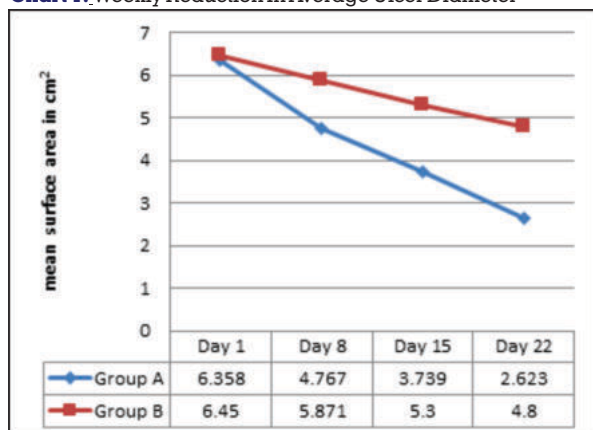


Chart 2: Weekly Reduction In Average Ulcer Surface Area

Majority of patients were males- 91.7 %. Group A consisted of 18 patients and received massage therapy along with conventional wound care. Group B also had 18 patients and received only wound care. All 18 in group A were male; in group B 2 were females (16.7%). Significance of differences in qualitative variables like age, gender difference, neurological level of lesion, presence of co-morbid conditions like diabetes, hypertension and dyslipidemia, ulcer site and stage, between cases and controls were statistically assessed using Chi-

square test and the p-value was found to be more than 0.05. This means that the above mentioned variables have no significant difference between cases and controls and so have got no effect on final results. Significance of quantitative variables like ulcer duration, mean of reduction in average diameters and mean of reduction in average surface areas between cases and controls were assessed using Student's t-test. Duration of pressure ulcer showed significant difference between group A and group B patients with a p-value of 0.006 (ie. <0.05). This means that ulcer duration in group A patients (ie. Patients who received massage therapy) was significantly higher than that of control group B (mean of 8.83 for group A against 4.56 for group B). If that is the case, statistically it would have negatively affected on the role of massage therapy as an effective modality. But still, as the final result is favorable to the applied therapy, the effect of difference in duration of ulcer between two groups on final result is nullified.

Change in average diameters between two groups (Chart 1) showed significant difference as with change in average surface areas (Chart 2) on three consecutive weeks. P-values for change in average diameters between two groups on three consecutive weeks are 0.002, 0.000 and 0.000 respectively and the P-values for change in average surface areas between cases and controls on the three consecutive weeks are 0.005, 0.001 and 0.000 respectively. This means that patients who received massage therapy as an adjuvant modality showed significant reduction in ulcer size over three weeks when compared with those who received standard treatment alone.

DISCUSSION

Pressure ulcers have been challenging societies for centuries. Despite new understanding of wound causation and management, pressure ulcers continue to be a significant health-care concern. Failure to maintain skin integrity will extend length of stay in a health-care facility, increase health costs, increase nosocomial infections, and increase co-morbidities and other complications. Physiatrists should maintain pressure ulcer care as a clinical competency because of the specialty's focus on optimizing the function of patients, managing rehabilitation teams, prescribing orthoses and modalities, and understanding gait biomechanics and protected weight bearing. All these skills are critical components of conservative or nonsurgical chronic wound care.

Pressure ulcers develop from a complex process of tissue destruction. Although initial theories regarding pressure ulcer development by Charcot (1879), Leyden (1874) and Munro (1940) all stressed the importance of neurological impairment, we now know that pressure is the single most important etiological factor. The compression of soft tissues results in ischemia and if, not relieved, will progress to cause necrosis and ulceration. In susceptible patients, this sequence of events may be accelerated owing to other endogenous sources such as infections, diabetes or altered neurological states. So the basic cause is pressure followed by ischemia and necrosis.

As with many multifactorial disease processes, a multidisciplinary approach to treatment is required. Massage has waxed and waned in popularity throughout the millennia in different cultures. In recent years, however, there has been a resurgence of interest in massage that has generated scientific inquiry into its usage as a therapeutic modality. Massage is administered for the purpose of producing effects on the nervous and muscular systems, as well as the effects on the local and general circulation of the blood and lymph.

This study is conducted on 36 paraplegic patients admitted in the ward with pressure ulcers. The focus of study was to

determine the effectiveness of massage therapy in the management of pressure ulcers as a therapeutic adjuvant to standard treatment protocol. The study was on stage 2 and 3 pressure ulcers. Stage 1 ulcers are excluded due to lack of sensitive measurement variables. Stage 4 pressure ulcers were not taken in to study due to fear of deep seated infections and due to difficulty in measurement of depth of ulcer. Significant wound infection was ruled out in each case by doing a routine swab culture and sensitivity. Patients with neurological levels above T7 were not taken in to study in fear of development of autonomic dysreflexia. Only patients with reliable caregivers were selected as they served as cornerstones in delivery of massage therapy.

This study clearly brings out the effectiveness of massage therapy as a therapeutic adjuvant in pressure ulcer management. The added advantage are that the treatment can be effectively implemented by a properly trained care giver at home, thereby reducing cost and duration of treatment.

CONCLUSION

1. Therapeutic adjuvants have got a definite role in the successful management of pressure ulcers.
2. Massage therapy using a mechanical vibrator is effective as a therapeutic adjuvant in the comprehensive management of stage 2 and stage 3 pressure ulcers.
3. For the patient, the benefits include faster healing times, early return to the main stream active rehabilitation program and a better quality of life.

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