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MANAGEMENT OF GRADE III A AND III B TIBIAL FRACTURES: A COMPARISON BETWEEN VACUUM ASSISTED AND CONVENTIONAL THERAPY

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Abstract:

Background: Fractures accompanied by an open wound, at or near the fracture site are called open or compound. The simultaneous exposure of tissue and bone poses specific management challenges. As with most wounds, damage to the soft tissue increases the risk of infection. The severity of open fractures is generally assessed using the Gustilo-Anderson open fracture classification system.

Objective: To compare the outcomes of vacuum assisted therapy and standard normal saline dressing in the management of Gustilo Anderson compound grade IIIA and IIIB fractures of tibia.

Study Design, Settings And Duration: Randomized Control Trial, conducted at Department of Orthopaedics, Pakistan Institute of Medical Sciences (PIMS), Islamabad, Pakistan over Six months duration (20th March, 2020 to 19th Sep2020).

Materials And Methods: All patients who fulfilled the inclusion criteria were included in the study after Informed consent. Patients were randomly assigned into two study groups i.e. Group A (vacuum assisted therapy) and Group B (conventional dressing). The study outcomes were measured in terms of length of hospital stay and wound infection rate for one month follow up.

Results: The age of group A patients was 35.6±9.8 years and 33.7±8.4 years in group B patients. There were 35 (68.6%) male and 16 (31.4%) females in group A whereas 33 (64.7%) male and 18 (35.3%) females in group B. The hospital stay in vacuum assisted therapy group was13.1±5.6 days whereas it was12.4±5.1days in conventional dressing group, the difference was non-significant statistically (P=0.510). Wound infection was observed in 10 (19.6%) patients of group A and 6 (11.8%) patients of group B which was statistically non-significant (P=0.207).

Conclusion: The vacuum assisted therapy and standard normal saline dressing are equally effective in the management of grade IIIA and IIIB Tibial fractures with no significant difference.

Key Words: Vacuum Assisted Therapy, Standard Normal Saline Dressing, Fractures, Tibia, Wound Infection

INTORODUCTION:

Tibial fractures may result from high energy traumas, such as motor vehicle, winter sports, cycling accidents etc and from low energy trauma, like falls, distance running and sports. High energy trauma commonly results complex injuries like open tibia fractures. On the other hand low energy trauma result into relatively simple tibia fractures. More complications are associated with open fractures involving from pain to limitations of movements [1,2]. Among the long bones Tibia fractures are most common involving more than 70,000 annual hospitalizations in USA. In open Tibial fractures the soft tissues are injured so there is communication between the fractured bone and the external environment so such fractures are prone to wound contamination by microorganisms and the foreign bodies [3]. The classification of Tibial fractures is based on Gustilo and Anderson that is as Type I, II and III. Type III is again divided into sub-types as III-A and III-B if the wounds size is above 10 cm and there is extensive damage to soft-tissue with contamination but still there is adequate tissue available as flap to cover the wound the fracture is termed as Gustilo and Anderson type IIIA. But in case of Gustilo Anderson IIIB Fractures soft-tissue is damaged extensively with massive contamination along with periosteal stripping exposing the fractured ends [4]. There are multiple treatment options based on the severity and site of the fracture along with availability of resources, these include long leg casting, open reduction, intramedullary nailing, internal and external fixation. There is different outcomes for different procedures in terms of complications and back to active life [5,6]**.** There are many dressing techniques used after surgery one of these dressing techniques is vacuum assisted closure also known as negative pressure wound therapy . This therapy aims at applying sub atmospheric pressure continuously by means of specified pump connected to the resilient, foam-surfaced dressing to collect the exudate from the wound [7]. The pressure created at the wound surface is a negative pressure which reduces the wound size, brings the wound margin closer together deforming the wound and enhances the granulation tissue by increasing the capillary flow by increasing the tissue tension, that helps early wound healing [8,9]. Fractures affect the individuals, families and communities directly as well as indirectly making 10%-20% of the affected population vulnerable for mental stress due to loss of job and financial issues [10].

METHADOLOGY:

It was a Randomized Control Trial study conducted at Department of Orthopaedics, Pakistan Institute of Medical Sciences(PIMS), Islamabad from 20th March 2020 to19th Sep 2020 according to previously published guidelines [14]Sample size (n)=51 in each group. Total Sample size: 51+51=102 selected through Non-Probability, Consecutive Sampling with clear inclusion criteria of adult male and female patients open tibial fractures Gustilo and Anderson type IIIA and IIIB with an age range from 20 to 55 years. The exclusion criteria was all other Fractures, Chronic osteomyelitis, Diabetic, Dermatological disease like psoriasis and other Immune diseases were excluded. Patients were randomly divided into Group A patients which were treated with vacuum assisted dressing after thorough debridement and infusion of prophylactic antibiotics and tetanus toxoid and Group B patients which were treated with conventional normal saline dressings. All the data was collected on study Performa. All the vacuum suction dressings were done consultant orthopaedic surgeon and patients were examined in ward on daily basis. The study outcome was measured in terms of length of hospital stay and wound infection rate during one month follow up.

Data analysis was carried out using SPSS version 20 using independent sample t-test and Chi-square test at a P-value <0.05 as Level of significance, mean and SD were calculated for quantitative variables and results were presented in tables, figures and graphs.

RESULTS:

There were 102 patients 51 in each group, the mean±SD of age in vacuum assisted therapy was 35.6±9.8 and conventional dressing group was 33.7±8.4 years. The mean±SD of length of hospital stay in vacuum assisted therapy and conventional dressing group was 13.1±5.6 and 12.4±5 days respectively with non-significant difference (p-0.510) [Table-1]. Gender distribution was 35 (68.6%) male and 16 (31.4%) females in vacuum assisted therapy group whereas 33(64.7%) male and 18 (35.3%) females in conventional dressing group .Right side was affected in 30 (58.8%), 28 (54.9%) vacuum assisted therapy and conventional dressing groups respectively while the left side was involved as 21 (41.2%) and 23 (45.1%) patients respectively .In group wise distribution of mechanism of injury, 17 (33.4%), 15(29.4%) patients had injury by falling 9(17.6%) and 7 (13.7%)patients had sports injury, 21 (41.2%) and 26 (51%) patients had injury due to traffic accident while 4 (7.8%) and 3 (5.9%) patients had other type of injury in vacuum assisted therapy and conventional dressing groups, respectively as shown in [TABLE 2].Wound infection was noted in 10 (19.6%) patients in vacuum assisted therapy group while 6 (11.8%) patients in conventional dressing group and P value found to be non-significant i.e. (P=0.207) as shown in[Table-1].

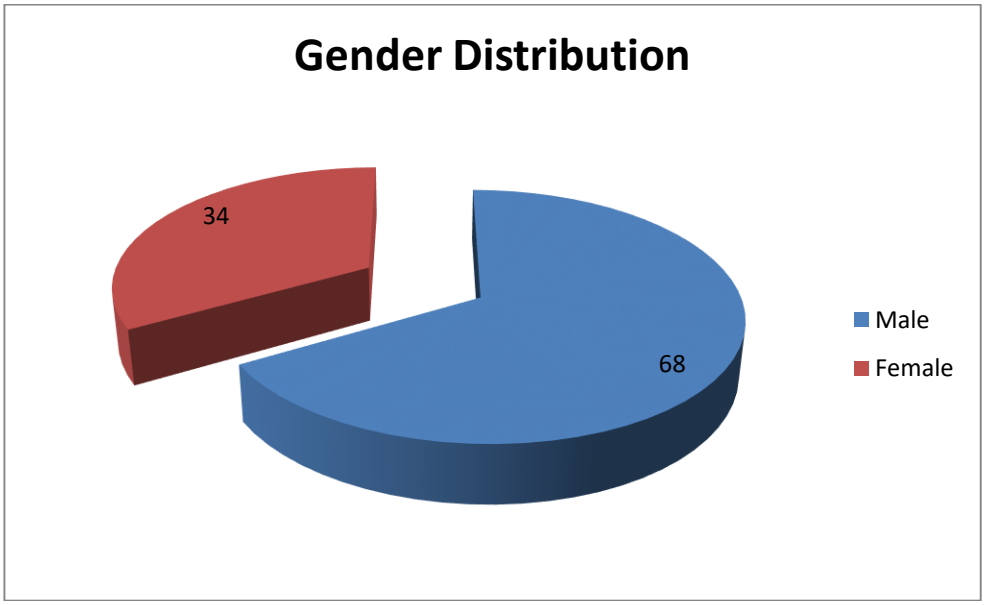

Fig-1. Gender distribution of study participants

Table-1: Outcome comparison between the two techniques

Parameter	Group-A (Conventional)	Group-B (Vacuum assisted)	P-Value
Hospital Stay(Days)	13.1±5.6	12.4±5	0.510
Wound Infection	6 (11.8%)	10 (19.6%)	0.207

Table-2: Mechanism of injuries in study groups

Mechanism of injury	Group-A (Conventional)	Group-B (Vacuum assisted)
Falls	15(29.4%)	17 (33.4%)
Sports Injuries	07 (13.7%)	09(17.6%)
Road Traffic Accidents	26 (51%)	21 (41.2%)
Others	03 (5.9%)	04 (7.8%)
Total	51(100%)	51(100%)

DISCUSSION:

It is evident from several studies that vacuum assisted therapy plays an amazing role in healing the traumatic wounds and it also reduces the cost of therapy [11-13]. Study results Kaushik D et al 2017 reported a significant difference for duration of hospital stay 17.3 and 23.8 days vacuum assisted therapy and normal dressing respectively ($p<0.05$) which is in agreement with our findings[11]. Other study by Krticka M et al 2016 proved that the application of NPWT on injured soft tissue in grade III open fractures reduces the chances of infectious complications significantly which is consistent with our findings [12]. The mean age in vacuum assisted therapy was 35.6±9.8 and conventional dressing group was 33.7±8.4 years. Studies by Arti HR et al 2016 [14] and Borkar S, et al 2019 [15] are also consistent with our results in terms of mean age 31.86±9.7 years 30.33±12.27 years respectively as well as in terms of duration of hospital stay 10.5 days and 24.3 days respectively [14,15].

The gender distribution in our study was as 68 (67.33%) male and 34 (32.67%) females which was consistent with Arti HR, et al [14] reporting a male dominant figures in their study with 68(75.6%) males and 22 (24.4%) females.

The rate of wound infection was noted to be higher 10 (19.6%) in patients of group A (vacuum assisted therapy) in comparison to group B patients (conventional dressing group) 6 (11.8%) in our study while similar observations were reported by Arti HR, et al reporting wound infection rate as 19% [14]. Borkar S, et al also reported the infection rates as 26.67% in their study population there may be associated factors that may need to be addressed separately among different studies. However the infection rate was not found to be statistically significant among the two different techniques of dressing. Various chemicals mixed in food are affecting the bone health resulting into weaker bones due to calcium and vitamin-D deficiencies so prone to get fractured on milder trauma, lack of awareness in the general population about the bone health and traditional methods for improving the overall health status is a matter of concern in the modern age [16, 17]. Studies should be aimed to sort out substances such as vitamin-D, Calcium, phosphate, BMD and hormonal alteration etc. in Pakistani population we could not include such parameters in our study due to financial limitations.

CONCLUSION: vacuum assisted therapy was found more effective than conventional dressing in Grade III A and B Tibial fractures

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