VOLUME - 9, ISSUE - 7, JULY - 2020 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Orthopaedics

TO EVALUATE THE OUTCOME OF VACUUM ASSISTED CLOSURE IN STABILIZED OPEN FRACTURES OF LONG BONE

Dr. Saurabh Dwivedi*

Junior Resident, Dept. of Orthopaedics, SN Medical College, Agra 282002.
*Corresponding Author

ABSTRACT

INTRODUCTION Despite numerous advances, compound fractures of long bones continue to be a challenge for the treating surgeons.Standard wound dressing requires prolonged period, repeated debridement, causes more trauma to granulation tissue and has poor patient compliance. Vacuum-assisted closure(VAC) is an extremely promising therapy for treating chronic and non-healing complex wounds.The aim of our study is monitor the treatment outcome in cases of compound both bone leg fractures treated by VAC following primary stabilization of fracture. **Material and Methods** An interventional study was conducted, studying 60 cases of open both-bone leg fractures who were fitting in the inclusion criteria. It followed Gustillo- Anderson classification to classify cases and then mapped out various conclusions on the aim of study whilst also charting the effect of the treatment in different circumstances, demographics and like. **Result** Amongst the 60 cases studied,all patients were evaluated clinically after the primary fixation and following VAC application, for an average period of follow up of 12 months. Majority of patients required 4-5 VAC dressings. The mean decrease in wound size was 9.97 cm2 [21.22%]. Out of 60 patients, 8 patients had excellent, 32 patients had good, 16 patients had fair and 4 patients had poor result. **Conclusion** In this study, 60 patients were included with open fractures of both-bone leg after primary fixation with VAC application. The greatest advantage of VAC was found to facilitate rapid formation of granulation tissue on wounds with exposed tissue and implants hence shorten healing time and minimize secondary soft tissue defect coverage procedures. This technique has indeed resulted in the effective decrease in wound size, and decrease in hospital stay and given a better functional outcome.

KEYWORDS : Vac dressing , Open fracture , Wound assessment.

INTRODUCTION

Complex musculoskeletal wounds occurring secondary to high energy trauma pose challenge to the treating surgeons in terms of wound healing, coverage and reconstruction. Fracture secondary to such trauma produce significant soft tissue defects precluding healing through primary closures and ultimately leading to healing by secondary intention. Treatment of these complex open fracture wounds presents dilemma to the surgeon despite availability of multiple treatment regimens in form of various types of dressings, advanced therapies as hyperbaric oxygen therapy (HBOT) and skin grafts or local flaps[1]. Standard wound dressing requires prolonged period, repeated debridement, causes more trauma to granulation tissue and has poor patient compliance[1-3]. The concept of using negative pressure to create a suction force, enabling the drainage of surgical wounds in order to promote wound healing, is well documented in the literature[2-9].Vacuum Assisted Closure (VAC) therapy provides a sterile, controlled environment that combines the benefit of both open and closed treatment and wound healing take place under moist, clean and sterile conditions[8-9].The aim of our study is monitor the treatment outcome in cases of compound both bone leg fractures treated by VAC following primary stabilization of fracture.

MATERIAL AND METHODS

This prospective study was conducted at our deparment of Orthopaedics over a period of 18 months from March 2018 to July 2019after getting approval from our ethical committee.Inclusion criteria included all hemodynamically stable patientsabove 18years of age who presented to our department with open musculoskeletal injuries in leg corresponding to Gustillo Anderson types 2 /3A/3B. Cases having neurovascular deficit/pre-existing osteomyelitis in the injured limb, known cases of diabetes mellitus/ peripheral vascular disease/malignancy and cases on anti-coagulants/chemotherapy/corticosteroids were excluded from our study.

Patients with complex open fractures of leg who presented to our department were attended and their hemodynamic status was assessed. Fractures of hemodynamically stable patients were graded using 'Gustilo Anderson classification' for open fractures. Intravenous antibiotics (Injection cefriaxone 1-gram twice daily/ injectionAmikacin 500mg twice daily) were started immediately in all our patients and asingle dose of tetanus toxoid was also given. After obtaining the necessary radiographs, fractures were treated by cleaning of the wound with copious amount of normal saline, and Hydrogen peroxide, followed by painting of the skin around the wound with povidone iodine and surgical spirit. This was followed by primary wound closure if required. The injured limb was then immobilized in an above knee Plaster of Paris (POP) slab till definite fixation was done. Operated intervention was done after obtaining opinion from anaesthesistsonce the general condition of the patients was stable and there was subsidation of swelling as assessed by presence of skin wrinkles.

Standard wound preparation was done. Sterile, open-pore foam dressing with pore sizes 400-600 microns was gently placed into the wound cavity. The site was then sealed with an adhesive drape covering the foam and tubing and at least three to five centimeters of surrounding healthy tissue to ensure a seal. Controlled pressure was uniformly applied to all tissues on the inner surface of the wound. The pump delivered an intermittent negative pressure of−125 mmHg. The total cycle duration was of seven minutes in which pump was on for five minutes and off for two minutes. The dressings were changed on the fourth day. The presence of drainage, edema, erythema, exposed bone/tendon was documented. Any complications associated with VAC therapy were also documented.

After few days of VAC therapy, the residual wound was managed by skin graft or flap rotation grafting according to condition of wound needed for wound closure.Wound was assessed using wound bed score (Table-1) and functional outcome of limb was assessed using Modified Johner and Wruh's (1983) criteria (Table-2).

Table 1: Wound Bed Score

	Wound Bed Score		
	Scores of 0	Scores of 1	Scores of 2

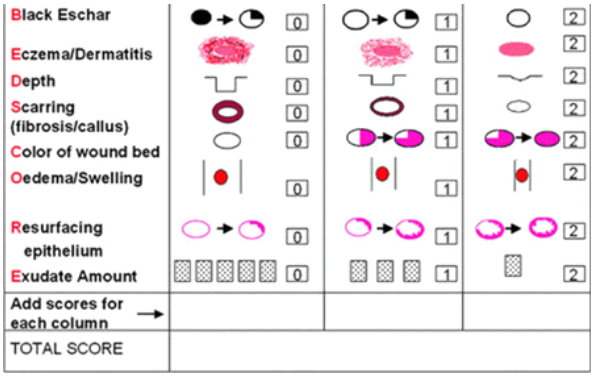


Table 2: Modified Johner And Wruh's Criteria

Criteria	Excellent (%)	Good (%)	Fair (%)	Poor (%
Nonunion/infection	None	None	None	Yes
Neurovascularinjury	None	Minimal	Moderate	Severe
Deformity				
Varus/valgus	None	2-5	6-10	>10
Pro/recurvatum	0-5	6-10	11-20	>20
Rotation	0-5	6-10	11-20	>20
Shortening	0-5mm	6-10mm	11-20mm	>20mm
Mobility				
Knee	Full	>80	>75	<75
Ankle	Full	>75	>50	<50
Subtalar	>75%	>50	<50	
Pain	None	Occasional	Moderate	Severe
Gait	Normal	Normal	Mild limp	Significant
Activities				
Strenous	Possible	Limited	Severely limited	Impossible

RESULTS

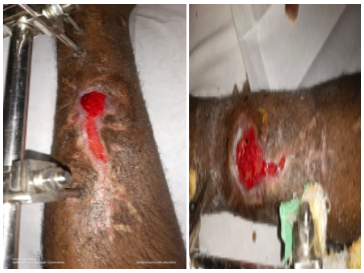
In our study, a total of 60 patients with open fractures of both bone leg had undergone primary internal fixation and VAC application. Their surgical management was done by closed reduction and internal fixation (CRIF) using tibia interlocking nail and external fixator in 52 patients and 8patients respectively. All the patients were evaluated clinically after the primary fixation and following VAC application, average period of follow up being 12 months. The age of the patients in this study ranged from 18 years to 65 years (mean 36.15 years). 48 subjects were males and 12 subjects were females. 40 patients had open fractures of right both bones leg and 20 patients had open fracture of left both bones leg. 46 cases sustained fracture following road traffic accident (high energy trauma) whereas 14 cases sustained fracture following fall from height. (low energy trauma). In our study, 10 patients had G.A type 2 fracture ,34 patients had G.A type 3A fracture and 16 patients had G.A type 3B fracture. VAC dressing application was done from second post-operative day and frequency of VAC application varied from 4 to >5 dressings per day (24 patients had 4 times ,24 patients had 5 times and 12 patient had >5 times application).The frequency of dressing change varied from patient to patient depending on the extent of the wound, wound healing duration, presence of infection and the number of hospitalization days. The days in hospital stay ranged from 14 to 42 days.There was no need of repeated surgical debridement in our 52 patients during the course of VAC therapy, however in 8 patients repeated surgical debridement was done owing to presence of infection . 54 subjects showed decrease in wound size which ranged from 2.8 to 25cm2, with an average reduction of9.97 [21.22%]. Wound size increased in 6 subjects. Out of 60 patients, 8 patients had excellent, 32 patients had good, 16 patients had fair and 4 patients had poor results. During the treatment 8 patients had debridement and then secondary closure, 4 had tissue transfer, 40 had split skin-graft, 6 patients were directly closed and 2patient was healed by secondary intention. During the follow up period 53 cases had no complications whereas 3 subjects developed implant related infections and 4 subjects had implant exposition.

DISCUSSION

Complex both bone fractures are amongst the most difficult fractures to treat effectively[10]. The status of the soft tissues and the degree of communition sustained at the time of injury affect the long-term clinical results[1]. VAC has been advocated as a novel therapy used in the healing of complex wound. This therapy stimulates the wound environment in such a way that bacterial burden and interstitial wound fluid are reduced. It also increases vascularity and locoregional cytokine expression and affects viscoelasticity of peri-wound tissues ultimately leading to better outcomes as compared to its traditional counterparts[2-9]. VAC is generally well tolerated with has few contraindications or complications. It is ultimately becoming a mainstay of current wound care[11-14]. Hence, we planned to use VAC therapy for the treatment and fast healing of wound in open both bone leg fractures.

This technique has resulted in the effective decrease in wound size, decrease in infection rates, decrease in days of hospital stay and given a better functional outcome. The greatest advantage of VAC was found to facilitate rapid formation of granulation tissue in wounds with exposed tendons, bones, raw area wounds and exposed implants hence shortening healing time and minimizing secondary soft tissue defect coverage procedures.

Although, a larger sample of patients and longer follow up periods are required to fully evaluate this method of treatment, we strongly encourage its consideration in the treatment of such complex fractures.



A COMPLEX WOUND BEFORE VAC THERAPY

A COMPLEX WOUND AFTER SECOND VAC DRESSING

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