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VAC (Vacuum assisted closure) Therapy with K wire fixation as management protocol in complex compound foot fractures with soft tissue defects

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Abstract
Many patients who sustain high energy compound fractures of lower extremities are riddled with severe contamination of wound with soft tissue loss. This results in deep infections, non unions and in few cases, amputations. We present a case series of 10 cases with compound fractures of foot with severe degloving injury and wound contamination. Treatment entailed through debridement and was with 5 litres of saline along with betadine. Fractures were fixed with K wires and wound was covered with primary VAC application. Male to female ratio was 8:2. Most of the cases were road traffic accidents. The average number of VACs applied were 2.3. 80% cases underwent split skin graft.
We conclude that VAC with K wire fixation is an effective and safe treatment in compound fractures of foot with degloving injuries.

Keywords: VAC, management protocol, complex compound, soft tissue

Introduction
High energy road traffic accidents are often associated with complex foot injuries. Such kind of degloving injuries are complicated with soft tissue loss, contamination and comminuted fractures [1]. The eventual outcome of such injuries depends on the extent of soft tissue damage [2]. Staged treatment respecting the traumatized soft tissue envelope is often advisable. Wound care is a prime importance. Vacuum-assisted closure dressing is a prime aspect of management in wound care [3]. Avascular bony fragments and damaged soft tissues provide help for bacterial growth. Healthy soft tissue around fractures helps in their healing [4]. VAC therapy can be implemented in various stages of healing of such soft tissue injuries like initial definitive surgery, intermediate debridement and definitive plastic surgery. Negative vacuum assisted closure technique improves blood flow to local tissue, promotes granulation tissue formation and impedes bacterial growth [5].

Material and Methods
We report a case series of 10 cases of compound foot fractures with degloving injuries. Maximum cases were due to road traffic accidents. Only one case was due to fall of heavy object on foot. The male to female ratio was 4:1. The average age of patients was 36.1 years (Range- 24- 52 years). All cases had unilateral limb involvement. After initial ATLS protocol management, the patients were taken for surgery with K wire fixation of foot bones. Metatarsals were fixed with K wires in retrograde fashion. The K wire ends were kept on the proximal plantar surface of foot. Debris and other contamination was scooped and washed with copious amounts of normal saline (10 litres). The wash was added with intermittent betadine and hydrogen peroxide wash. Later the wound was primarily covered with VAC dressing. Patient was started on 3 IV antibiotics namely ceftriaxone 1 gm BD, Metronidazole 400mg TDS and Amikacin 500mg BD. VAC dressings removed every 7 days and debridements were done if required before application of VAC dressing again. The patient was posted for split skin grafting after adequate bone covered with granulation tissue. Skin grafting dressing was done on 5th day and 10th day of grafting. Patients were followed upto 3 months.

Results

9 cases had good to excellent foot function at the end of 3 months with normal walking and full weight bearing function. All K wires were removed at 8 weeks from the date of surgery. The uptake of skin grafting was more than 90% in all cases. The few raw areas devoid of skin graft healed with regular aseptic dressings. No case showed any bacterial infection. One case which had lisfranc fracture associated with other metatarsal fractures had only satisfactory result, with the ability to walk with support at the end of 3 months. Due to severe extensor tendon injury, extension of the lateral 4 toes was not present.

Table 1: Type of injury mode and fracture

Sr No	Sex	Age	Injury Mode	Wound area cm^2	Fracture	Number of VAC	Grafting
1	M	32	RTA	60	Lisfranc with 5 metatarsal fractures	3	yes
2	M	24	RTA	45	4 metatarsal fractures	3	yes
3	M	26	RTA	50	3 metatarsal fractures	2	yes
4	M	40	Fall of heavy object	30	2 metatarsal fractures	2	yes
5	F	35	RTA	20	3 metatarsal fractures	2	No
6	M	52	RTA	40	3 Metatarsal fractures	3	Yes
7	F	41	RTA	10	Calcaneus fracture	1	No
8	M	36	RTA	20	2 metatarsal fractures	2	Yes
9	M	29	RTA	30	Navicular bone and medial cuneiform	3	Yes
10	M	46	RTA	15	1 metatarsal fractures and 1st toe proximal phalanx fracture	2	NO

Discussion

Degloving injury in foot are a challenging situation. They are actually avulsion of skin from a blunt tangible force [5]. There have been great strides in development of reconstructive options. There is lack of consensus in the principles and algorithm of treatment of such injuries. Most of these patients are young and active individuals. Their treatment needs to aim at limb salvage and return to normal activity as soon as possible. Such complex compound fractures need a tailor made planning for each case [5, 6] while planning such complex reconstructions, the extent and pattern of defect and fracture configurations need to be deeply assessed.

Fracture fixation is a major part of management. Dislocations of joints or cartilage damage ends up in bad functional outcome, unless fixed or fused appropriately. We managed these cases mainly with Krishner wires, so that those can be removed in later stages and prevent chances of delayed infection [7].

Soft tissue cover has different methods of treatment. Various flap coverage techniques like loco regional fascio cutaneous flaps [8], musculous flaps [9], free flaps [10] and cross leg flaps [11]. Plastic surgery procedures need infection free areas for flap to integrate. Also absence of nerve supply to flap can cause gait disturbances and pressure sores [12, 13].

Lui *et al* in their study of 129 patients have shown good results in cases of tibia and fibula open fractures in earthquake victims, using external fixators and VAC therapy [14]. Penn-Barwell *et al.* showed that VAC therapy provides good healing, lower infection and favourable atmosphere for definitive wound healing. VAC therapy doesn't substitute for through debridement and fixation of fractures, but helps to buy time for definitive wound management till patient is physiologically stabilised [15, 12].

Our findings that VAC therapy with K wire fixation is a viable, easy and result oriented option of treating complex traumatic foot degloving injuries is revalidated by case reports of Boernert *et al.* [6]. Studies have shown that even such kind of open wounds may develop compartment syndrome in deep muscle compartments. Surgeons should keep a vigil and high degree of suspicion for such incidents [16]. However, we found that patients who are on VAC therapy may need prolonged hospitalization based on the severity of injury patterns. But, hemodynamically stable patients with second round of VAC therapy can be discharged home, with regular follow-ups at OPDs. Patient education regarding the working of VAC machine and precautions of non weight bearing need to be emphasized before discharge.

There are a few drawbacks of our study. This is a retrospective interventional study with a small sample size of 10 cases. A prospective randomized trial would be able to compare and give definitive treatment algorithms for such injuries.

Fig 1: Preoperative Degloving Injury

Fig 2: preoperative Xray.

Fig 3: Postoperative Xray

Fig 4: Post operative VAC application

Fig 5: Post skin grafting photo.

Conclusion

In conclusion, we recommend the use of VAC therapy with k wire fixation for treatment of complex compound foot fractures. VAC therapy is better in terms of patient convenience compared to other major plastic surgery procedures. It also helps in temporary and definitive management of wounds, causing decreased infection rates and better granulation growth.

References

1. Musharrafieh R, Osmani O, Saghieh S, Elhassan B, Atiyeh B. Microvascular composite tissue transfer for the management of type IIIB and IIIC fractures of the distal leg and compound foot fractures. J. Reconstr. Microsurg. 1999; 15:501-507
2. Byrd HS, Cierny G, 3rd & Tebbetts JB. The management of open tibial fractures with associated soft-tissue loss: external pin fixation with early flap coverage. Plast. Reconstr. Surg. 1981; 68:73-82
3. Tarkin IS, Sop A, Pape HC. High-Energy Foot and Ankle Trauma: Principles for Formulating an Individualized Care Plan. Foot and Ankle Clinics. 2008; 13:705-723
4. Evans RP, Nelson CL, Harrison BH. THE CLASSIC: the effect of wound environment on the incidence of acute osteomyelitis. Clin. Orthop. Relat. Res. 1993, 2005; 439:4-9
5. Andres T, von Lübken F, Friemert B, Achatz G. Vacuum-Assisted Closure in the Management of Degloving Soft Tissue Injury: A Case Report. J. Foot Ankle Surg. 2016; 55:852-856
6. Boernert K, Ganot G, Ulrich MK, Iselin LD. Preserving the lower extremity after severe devolving injuries to meet the patient's demand in two cases. Trauma Case Reports. 2018; 5:8-15
7. Largey A, Faline A, Hebrard W, Hamoui M, Canovas F. Management of massive traumatic compound defects of the foot. Orthopaedics & Traumatology: Surgery & Research. 2009; 95:301-304
8. Jeng SF, Wei FC. Distally Based Sural Island Flap for Foot and Ankle Reconstruction. Plastic and Reconstructive Surgery. 1997; 99:744-750
9. Martinet X, Forli A, Guinard D, Corcella D, Moutet F. [Extensor digitorum muscle flap: its position in ankle and foot coverage. Report of 15 cases]. Ann. Chir. Plast. Esthet. 2003; 48:159-166
10. Ulusal BG, Lin YT, Ulusal AE, Lin CH, Yen JT. Reconstruction of foot defects with free lateral arm fasciocutaneous flaps: analysis of fifty patients. Microsurgery. 2005; 25:581-588
11. Agarwal P, Raza H. Cross-leg flap: Its role in limb salvage. Indian J. Orthop. 2008; 42:439-443
12. Leininger BE, Rasmussen TE, Smith DL, Jenkins DH, Coppola C. Experience with wound VAC and delayed primary closure of contaminated soft tissue injuries in Iraq. J Trauma 2006; 61:1207-1211
13. Damert HG, Altmann S, Schneider W. [Soft-tissue defects following olecranon bursitis. Treatment options for closure]. Chirurg. 2009; 80(4):448-450
14. Liu L *et al.* The use of external fixation combined with vacuum sealing drainage to treat open comminuted fractures of tibia in the Wenchuan earthquake. Int. Orthop. 2012; 36:1441-1447
15. Penn-Barwell JG, Fries CA, Street L, Jeffery S. Use of topical negative pressure in British servicemen with combat wounds. Eplasty. 2011; 11:e35

16. Freundlich BD, Dashiff JE. Avulsion of tibialis anticus and peronei muscles resulting in acute anterior and lateral compartment syndrome. J. Trauma. 1987; 27:453-454.