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Case Report

Upper Limb Salvage Surgery Due to Explosion Using Vacuum-Assisted Closure: A Case Report

Yahye Abdulkadir Osman*, Engin Ilker Cicek

Department of Orthopedics and Traumatology, Somalia Turkiye Training and Research Hospital, Mogadishu-Somalia

***Corresponding author**: Yahye Abdulkadir Osman

Email: yahyez114@gmail.com

Abstract: High trauma injuries of the forearm frequently present with complex bone and soft tissue defects. Early repair is required to retrieve the extremity and restore its function. Surgical reconstruction can save limbs damaged by high-energy trauma that would have been amputated in the past. This is a case report of a 36-year-old man with a left upper limb injury after high-energy explosion trauma. He had a large soft tissue defect of the forearm with exposed vital structures, ulna, and radius fractures. Radius and ulna fractures were fixed with elastic nails to maintain alignment and length, and a cerclage was used to hold a radius fragment. A primary tendon reconstructed the large soft tissue and muscle repair, with vacuum-assisted closure followed by a split-thickness skin graft. At six weeks, physiotherapy was started with a dynamic hand splint by slightly flexing the fingers. Vacuum-assisted closure helps condition and close large upper-limb tissue defects.

Keywords: Upper limb salvage; Trauma; Vacuum-assisted closure

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Introduction

Hight trauma injuries of the forearm frequently present with complex bone and soft tissue defects. Early repair is required to retrieve the extremity and restore its function (1). With the advance of surgical repair and reconstruction technology, limbs damaged by high-energy trauma that might have needed to be amputated in the past can now be saved by surgical reconstruction; severe upper limb crush injuries differ from lower limbs, as upper limbs have fewer muscles, longer ischemic tolerance times, and complex functions that artificial limbs cannot replace compared to lower limbs. At this time, no proper criteria have been established to decide whether amputation or salvage is the most suitable therapy in cases of complex upper limb injury, and this remains a dilemma for both surgeons and patients (2).

Vacuum-assisted closure has provided a way to manage these wounds until definitive surgery can be achieved efficiently. Vacuum-assisted closure has simplified reconstruction in many patients with large injuries. Now, skin grafts are performed in many cases that would have otherwise required major rotational flaps or free flaps prior to the advent of vacuum-assisted closure therapy (3).

This is a case report of 36-year-old man with left upper limb injury after high trauma energy which is explosion where a large soft tissue defect of the forearm with exposure of the vital structures was reconstructed by a primary tendon and muscle repair, with vacuum-assisted closure followed by a split-thickness skin graft. This was an example of successful limb salvage with functional preservation after seven surgeries over two months period.

Case report

A 36-year-old man came to an emergency after an explosion, and his forearm was deformed with crushed flexor muscles and exposed fracture ends and musculature (Figure 1). At emergency, the wound was washed

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and covered with a dressing, and blood investigations and x-ray were sent. X-ray showed fractures of his left radius and ulna. Upon examination, he wasn't able to flex his wrist and fingers. After preparation, the patient was taken to the operating theatre. The ulnar artery and nerve were cut and repaired, radial artery, cephalic, and basilic veins were intact. The median nerve was only mildly contused and appeared to have good continuity, and the flexor mechanism from the 2nd to 5th fingers were cut (Figure 1).

After irrigation and debridement, the radius and ulna fractures were fixed by elastic nail to maintain their alignments and length, and put a cerclage on the fracture site of the radius to hold a fragment (Figure 2). Then started repairing the flexor tendons, repaired as tendon to tendon and tendon to muscle using a modified Kesler suture with proline 4-0, then closed the wound starting on the center; the laterodorsal aspect closed completely, but the medio-volar aspect, there was a large defect with muscle and skin loss cannot be repaired with primary closure then the wound was covered and drained using a vacuum-assisted closure and applied flexion cast on the dorsal aspect (Figure 3).

He underwent a debridement five times, at 1st after five days and others every week for debridement, re-approximating the wound, and closing with vacuum-assisted closure until granulation occurs. For the sixth time, the wound was covered with split-thickness skin graft. Every time the wound was debrided and closed as much as possible by suturing at the peripheries and putting vacuum-assisted closure (Figure 4).

After six weeks, the wound healed, granulated, and closed with split-thickness skin graft taken from lateral thigh and sutured it with staplers (Figure 4). Started physiotherapy after six weeks from the operation with slightly flexing and extending the fingers using dynamic hand splint. 7 days after graft the wound was opened and inspected, it was going well and healing (Figure 5). At 14 days after the graft, the sutures and staplers were removed (Figure 5).

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Figure 1. Ulna fracture ends exposed and intraoperative images

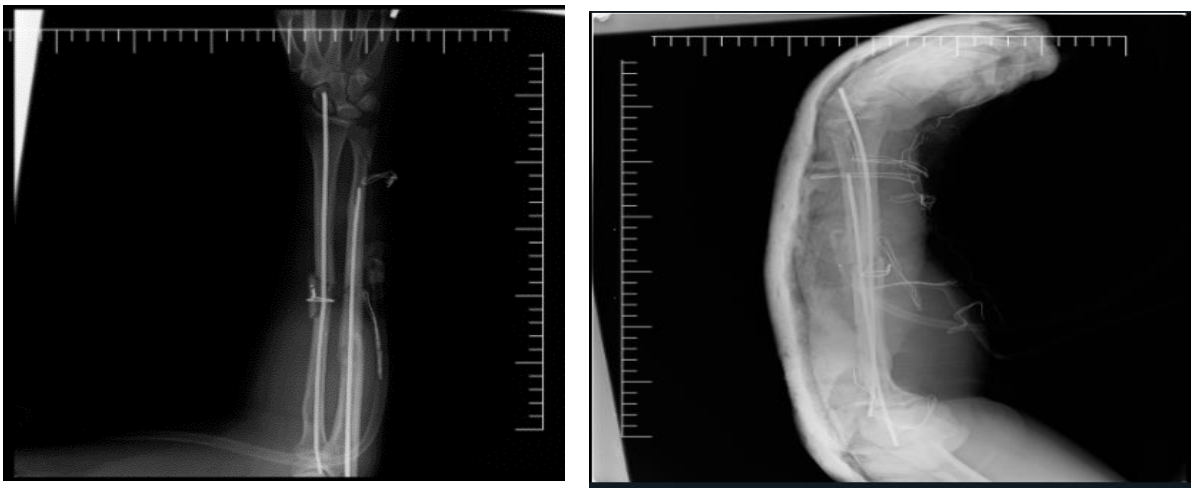

Figure 2. Post-operative x-ray

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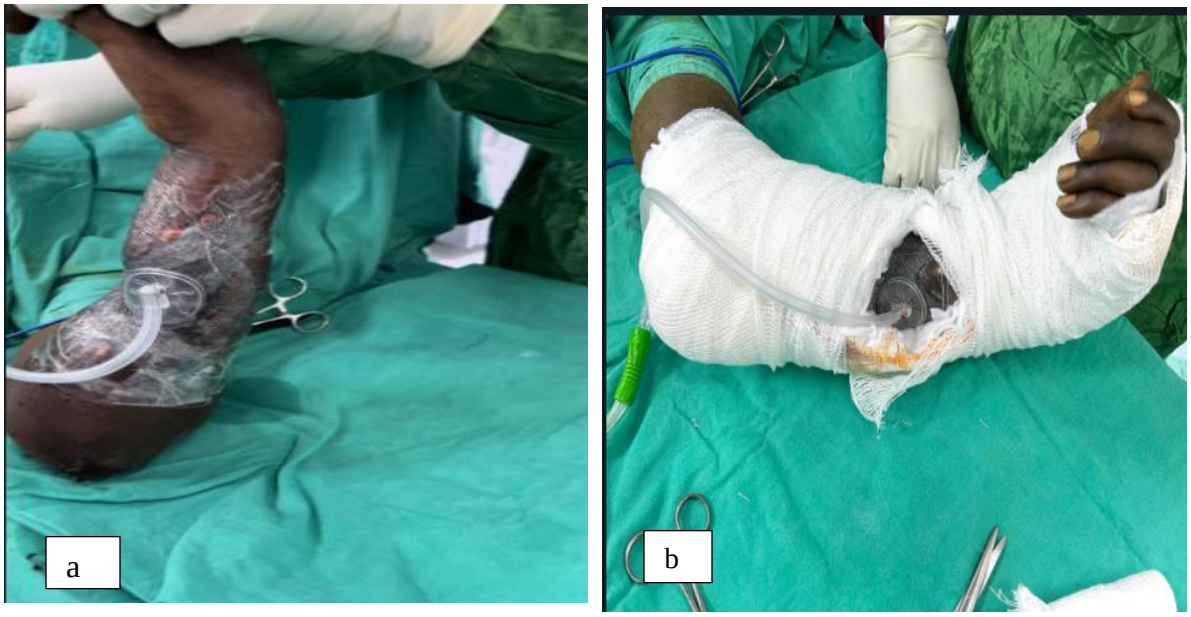

Figure 3. a- Showing wound closure with vacuum-assisted closure and **b**-vacuum-assisted closure with a splint

Figure 4. Wound healing after serial vacuum-assisted closure and Skin graft surgery

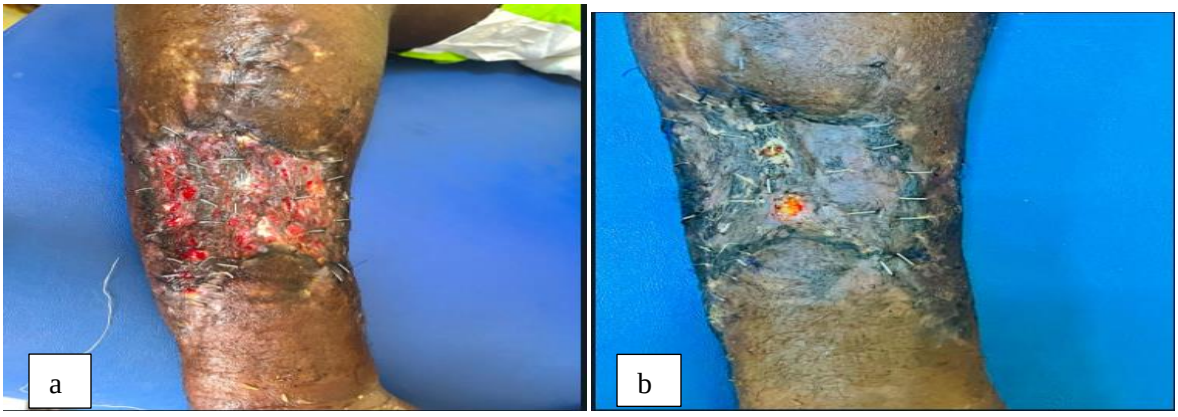

Figure 5. a-Skin graft after one week, **b-** skin graft after two weeks

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Discussion

Severe limb injuries are emergency events that require clinicians to decide whether to amputate or salvage the limb within a short time. Treatment option selection needs to evaluate the extent of the injury (2).
At Wang C and Hayashida K used a perforator-based sural neurocutaneous flap for the reconstruction of complex forearm injuries. However, due to the lack of availability of microsurgery and when raising a flap needs to be well vascularised to avoid pedicle torsion or compression (1,5), this technique could not be performed in a country with low healthy infrastructure, like Somalia.

Zeng Q and Yao YZ cooperated with multiple vacuum-assisted closures dressing up to five times to prevent infection and promote the growth of granulation tissue. Followed by autologous skin grafting OR secondary suturing or local flap and then open reduction and internal fixation of the fracture (2,6).

Using vacuum-assisted closure facilitates decreasing wound edema and can drain the wound surface completely. Reduces bacterial colonization, increases hemoperfusion, promotes vascularization, decreases wound fibrosis, as well as improves the survival rate of skin grafting (4).

So, we preferred vacuum-assisted closure because it is a simple and effective method of treating traumatic soft tissue defects instead of doing free flap transplantation, which is unavailable due to the inaccessibility of microsurgery. At the same time, vacuum-assisted closure is part of daily routine procedures.

Conclusion

High-energy trauma causing severe soft tissue injuries requires multiple operative debridements to avoid high morbidity and mortality rates. The application of vacuum-assisted closure as temporary coverage of significant tissue defects in upper limbs supports wound conditioning and facilitates definitive wound closure.

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

References

1. Wang C, Xu J, Wen G, Chai Y. Reconstruction of complex tissue defect of forearm with a chimeric flap composed of a sural neurocutaneous flap and a vascularized fibular graft: A case report. Microsurgery. 2018 38(7):790-4.
2. Zeng Q, Cai G, Liu D, Wang K, Zhang X. Successful salvage of the upper limb after crush injury requiring nine operations: A case report. Int Surg. 2015 100(3):540-6.
3. Defranzo A, Argenta L. Vacuum-assisted closure in extremity trauma. Musculoskeletal Key, 2009:49-60.
4. Buttenschoen K, Fleischmann W, Haupt U, Kinzl L, Buttenschoen DC. The influence of vacuum-assisted closure on inflammatory tissue reactions in the postoperative course of ankle fractures. Foot Ankle Surg. 2001 1;7(3):165-73.
5. Hayashida K, Saijo H, Fujioka M. Peroneal perforator-based peroneus longus tendon and sural neurofasciocutaneous composite flap transfer for a large soft-tissue defect of the forearm: A case report. Microsurgery. 2018 38(1):85-8.
6. Yao YZ, Huang XK, Ma XL. Treatment of traumatic soft tissue defect by vacuum sealing. Chin J Reparative Reconstr surg. 2002 1;16(6):388-90.

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