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Role of Upper Limb Elevation in the Management of Hand Edema in a Patient with External Fixator Our Experience

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Abstract

Upper limb edema after any trauma or after any surgical procedure is very common. The edema of the hands can cause many complications including the stiffness of the joints. So, the edema of the hands should be managed promptly to get optimal results. There are many methods to reduce hand edema. Hand elevation is one of the time-tested methods to deal with hand edema. Hand elevation can be done by various methods. But in a certain number of patients who are on skeletal stabilization with an external fixator can find it difficult to elevate using a conventional cuff and collar or pillow. In such a patient we tried hand elevation using cloth and IV stand. The hand circumference of the patient was measured daily using a fabric tape and the findings were noted serially for two weeks results showed that edema reduced considerably following and elevation. The method is easy, safe, reproducible, and less costly.

Keywords: Upper limb Oedema; Hand Elevation; External Fixator; Necrotizing Soft Tissue Injury.

INTRODUCTION

Any trauma can induce inflammation, the cardinal signs of inflammation are swelling, redness, heat, and pain. Edema can cause pain, discomfort and later if persistent can cause many complications. Edema can be reduced using many methods like hand elevation, compression dressings, etc.

Hand elevation is one of the commonly followed methods to decrease hand edema, Hand elevation can be done using Cuff and collar, pillow, etc. But in a certain number of patients who have External fixators for skeletal stabilization may find it difficult to elevate the limb due to the position of the external fixator and its weight The elevation can impart stress on the joints and the ones which are available in the market are usually costly and may not be affordable for all. The patient may become non – compliant with the whole process due to all these. Thus, the ideal method for upper limb elevation for hand edema should be; effective, adjustable according to the requirements of the patient, easy to apply, should not impart stress on the nearby joints

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and should support the upper limb, and should not cause any injury or side effects and affordable.

In this article, we are sharing our experience of using a simple, cost-effective, and effective method to elevate an upper limb for hand edema.

MATERIALS AND METHODS

This is a prospective, non-randomized, non-comparative study conducted in the Department of Plastic Surgery in a tertiary care center in South India. Department scientific and ethical permission was sought. Written informed consent was taken from the subject under study.

A 63-year-old lady with necrotizing soft tissue injury of the right forearm extending to arm with involvement of elbow joint. she was managed with extensive debridement, antibiotics, and skeletal stabilization withan elbow spanning external fixator (Fig. 1 and 2).



Fig. 1: The upper limb with external fixator and raw area



Fig. 2: Extensive raw area of the upper limb with near circumferential involvement

The patient developed extensive edema over the dorsum of the hand. The patient was advised right upper limb elevation but due to the external fixator,the patient was finding it difficult to keep the upper limb elevated with a Cuff and collar or pillow. The upper limb elevation slings available in the market were not affordable for the patient, hence the patient was given hand elevation using a triangular cloth, gauze and IV stand already available in the ward (Fig. 3). The two ends of the cloth were tied together using gauze to make the cloth appear like a bag and the other end of the gauze was tied to an IV stand. The length of the Gauze string was kept long so that the length can be adjusted to suit the patient's requirements while the patient was sitting or lying down.



Fig. 3: The Patient's Right Upper Limb with External fixator Elevated

The hand circumference of the hand was measured daily using a fabric measuring tape and findings were noted for consecutive 14 days. (Table 1)

Table 1: The hand Circumference

Days	Circumference in Centimeter
1	17.5
2	17.2
3	17.0
4	16.8
5	16.5

6	16.1
7	15.8
8	15.6
9	15.4
10	15.4
11	15.3
12	15.3
13	15.3
14	15.4

RESULTS

The upper limb with External Fixator can be elevated safely and effectively using a triangular-shaped cloth, a gauze, and an IV stand. The upper elevation showed a decrease in edema, decrease in pain, and without any complications. (Fig. 4)

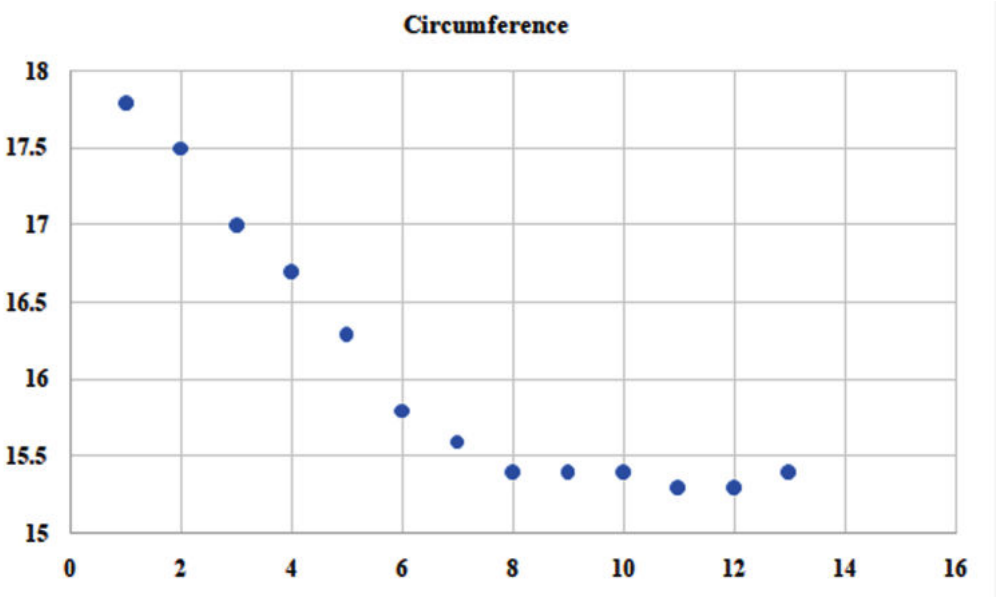


Fig. 4: Hand Circumference Plotted Against the Days (Circumference in centimeters)

DISCUSSION

The inflammationhas four cardinal signs. Swelling, redness, heat, and pain1can be seen after any trauma or surgery. Edema can be defined as abnormal accumulation of fluid in the interstitium, which are located beneath the skin or in one or more body cavities.[2,3] The amount of post-operative edema depends on body response to the injury, extend of tissue injury, or extent of the procedure. The increased vascular permeability leads to the extravasation of fluid into the extracellular space. While increased permeability is a result of histamine and histamine like factors that are released as a result of an insult like trauma or surgery. Increased vascular permeability can also be due to direct vascular or cellular injury. Endothelial cell destruction occurs by extensive surgical dissection. The more damage the cells sustain, the more severe will be the oedema. Lymphatic vessels play a key role in removing the protein rich fluid from the extracellular spaces and lymphatic vessels rapidly dilate to several times their normal caliber early in the inflammatory phase, but in conditions where extensive soft tissue loss, the lymphatic drainage may be slow.

Edema increases tissue pressure, which may causean increase in pain. When pain is severe it inhibits the patient's ability to use the limb. the natural pumping action of the muscles is decreased, which further increases edema and leads to tissue fibrosis. Increased capillary filtration causing edema and an increased endo neural fluid pressure may lead to decreased nerve blood flow and tissue oxygen tension causing nerve ischemia. This may be a reason why the pain decreases with decreasing edema.

The patient was complaining of pain and discomfort, decreased ability to use the hands, and edema. Kawasaki et al. found that the circulation of lower limbs is better in hanged positions (in a

lower level than heart), but staying for a long time in this position causes venous congestion, edema, and delayed wound healing 4 hence the decision of keeping the upper limb elevated was taken. *Boland RA and et al*. compared three methods of hand elevation on reduction of hand edema, 30 degree angle, horizontal elevation, and 30 degree head of the bed elevation. they found that 30 degree elevation of the upper limb is more e-ective than the other two methods.[5] The weight of the metallic external fixator and the projecting rods were limiting the patient from being compliant to the hand elevation using cuff and collar as well the pillow so it was difficult to maintain the required angle of elevation. Another option to reduce edema was compression bandages, this option was also considered because one study conducted by Fagan et al. on the e-ects of upper limb elevation onhand edema after carpal tunnel syndrome surgery and showed that limb elevation has no e-ects on reducing the hand oedema.[6] But since the patient was on the external fixator the effective application of the compression bandage was difficult, hence this option was dropped after discussion. We found that the 30 degrees of hand elevation was beneficial for our patient and there was a considerable decrease in edema and throughout hand elevation, there was no recurrence of edema

The limitation of the study is that this was conducted only on a single patient and we suggest a randomized controlled study with a large number of subjects.

CONCLUSION

Hand elevation is an effective method to decrease the post-operative edema and the upper limb with External fixation can be elevated using a cloth and IV stand, this method is simple, easy to apply, cost-effective and the compliance to this method is also good moreover no complications were noted.

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