

# Stump Closure using Kirschner Wire – A Novel Technique

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## Abstract

We report the case of a 14 year old patient who underwent below knee amputation following rail accident. She was referred to our centre for wound care but there was gaping of stump which was not amenable to simple suturing. We used two K wires and stainless steel wires to apply traction to the wound. After serial tightening, once the edges were approximated it was sutured. Sutures were retained for three weeks and following suture removal the patient had a cosmetic and sensate stump. To the best of our knowledge the principle of skin traction using K wires has not been reported for stump closure.

**Keywords:** Tissue traction, Stump closure, Wound gaping.

## Introduction

Soft tissue defects due to infection, high velocity missile injuries, tumours, burns and osteotomies can cause both psychological and physical handicap to patients [1-4]. Reconstruction of these defects are usually done using split skin grafting or flaps. These methods of reconstruction can lead to secondary complications such as contraction at donor site [5]. Problems associated with soft tissue loss are common, many being complicated by bone exposure and infection thus making it unsuitable for coverage by grafting or flap [3]. We present a case of soft tissue loss following amputation in which wound closure was attained using skin traction with the help of Kirschner (K) wires.

## Case Report

A 14 year old female child met with a rail accident and sustained crush injury of her right lower limb. As the Mangled extremity severity score (MESS) was more than seven, she underwent below

knee amputation. She also sustained a left humerus fracture for which open reduction and internal fixation was done. Patient was then referred to our centre for wound care one month following the injury. On examination the stump was unhealthy with gaping ends which could not be approximated by suturing (Fig.1). We were left with options of secondary closure following approximation of edges, split skin grafting or a revision amputation. However, we decided to perform wound closure using the principle of tissue traction. Under aseptic precautions and local anaesthesia, two K wires (2mm each) were inserted into the skin along the entire length on either ends of the wound at a distance of two centimetres from the margin. In case the K wires were placed more close to the margins, there was a higher chance of cut through. Stainless steel wires (18 gauge) were then passed beneath the skin just beyond the K wires in a posterior to anterior direction through a 16 gauge cannula (Fig. 2). Finally the steel wires were tightened to bring the edges of the wound closer (Fig. 3). Alternate day tightening of the steel wires were done. After two such sittings the wound edges were approximated. The edges were then freshened and wound closure was done using ethilon 2-0 (Fig. 4). The

steel wires were maintained for two weeks following suturing after which they were removed. Suture removal was done at the end of three weeks. A cosmetic stump closure was obtained following this procedure (Fig.5).

## Discussion

The concept of tissue expansion was initially practiced by Neuman [6] in 1956, wherein he used a round inflatable expander in the retro auricular region. He carried out intermittent expansion over a period of two months thereby enabling skin gain. Tissue traction as a method of tissue expansion was described by Gibson [7] who described the viscoelastic properties of the viable skin in 1977. There are two such properties, creep and stress relaxation. Creep occurs when a piece of skin is stretched and when the stretching force is kept constant. The skin will continue to expand depending on the forces involved. Stress relaxation, the corollary of creep, occurs when a piece of skin is stretched for a given distance and when that distance is held constant. The force required to keep it stretched is gradually decreased [7,8]. Vascularity is the limiting factor to skin traction, the viability of the tegument may be severely affected if the force is excessive [9]. The technique of local

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**Figure 1:** Stump at the time of presentation **Figure 2:** Passage of K wires and 18G steel wires through 16G cannula **Figure 3:** Stump at the end of primary tightening **Figure 4:** Wound edges sutured after approximation



**Figure 5:** Cosmetic stump following suture removal

tissue traction preserves sensation and function [5]. Moreover, the remaining muscle tissue is helpful in functional rehabilitation [2].

### Conclusion

Skin traction using K wires is a simple, inexpensive technique which does not require general anaesthesia. Daily tightening of wires can be performed on an outpatient basis. This technique does

not require any donor area for flap or graft. Tissue traction using K wires provide a good cosmetic and functional outcome. However this technique cannot be used for closure of very large wounds but can be used to reduce their size and this technique is not indicated for elderly patients with poor nutritional status and/or delicate skin because of the risk of laceration or total dehiscence due to inadequate healing capacity.

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