



## Gross deformity of thumb and finger corrected by combined ilizarov and jess external fixators

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### Abstract

Postburn contractures are very common and severe in developing countries. The hand is a frequently encountered site. Postburn contractures of the hand and wrist can range from a minor cosmetic problem to a crippling condition. The standard treatment for these deformities has been by way of surgical release of the contractures, skin cover with split skin grafting or full thickness grafts followed by prolonged immobilization and splintage. However, these techniques are associated with numerous complications. The Ilizarov and JESS external fixator systems provide a versatile method of correcting postburn contracture by closed technique employing differential distraction, thereby avoiding the pitfalls of open surgery. We provide a unique case report of the combined use of Ilizarov and JESS in correcting a complex postburn thumb deformity in a young unmarried girl.

**Abbreviations :** JESS - Joshi's External Stabilization System; IEF - Ilizarov External Fixator; PP: Proximal Phalanx, MP- Metacarp - phalangeal, POP: Plaster of Paris

**Keywords:** thumb deformity, Ilizarov, JESS, hand postburn contracture

### 1. Introduction

One of the major determinants of the quality of life in burns survivors is the functionality of the hands. Overall, hand burns are very commonly encountered in clinical practice. In patients with a mean total body surface area burn of 15% or more, 54% of the patients sustain burns to the hand and upper extremity (Tredget, 2000). Consequently, the chances of occurrence of a deformity in the hand are high. The hand is ranked as one of the three most frequent sites of burn scar contracture deformity (Sabapathy SR *et al.*, 2010).

Patients who do not receive care shortly after sustaining burns are more likely to develop contractures. If there is little resistance to the shrinkage effect of wound contraction, it is easy for a contracture to form.

Correction of burns contracture is a challenge. While reconstructing a burnt hand, the burn surgeon must concentrate on restoring function than just on increasing the range of movement of individual joints

(Sabapathy SR *et al.*, 2010). Among the various operative interventions include:

- Release and skin grafting
- Local flaps
- Regional flaps
- Distant flaps
- *The Ilizarov technique*

The Ilizarov technique is very versatile. Professor GA Ilizarov's principle of distraction histiogenesis has found many applications in limb surgery, including complex fracture fixation, management of osteomyelitis and soft tissue infection, fracture non-union, mal-union, limb lengthening, and importantly, multi-planar deformity correction.

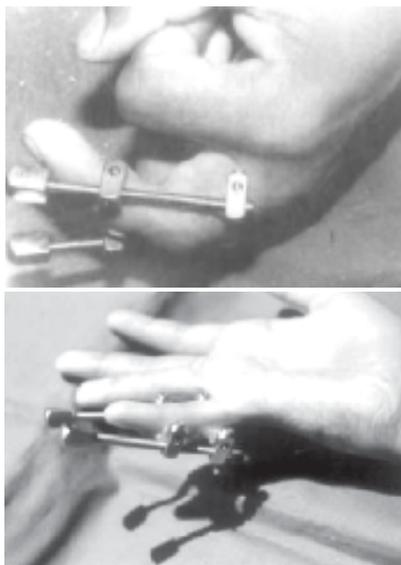
Gradual distraction of a contracted joint also can be used to restore a joint to its normal position. The Ilizarov technique has the advantage of stretching the underlying soft tissues and joint capsule at the same time (Schwarz RJ, 2007). By distraction straightening the principles of a gradual dynamic lengthening of the

skin and soft tissues are applied. All tissues get stretched out thus maintaining a sensate pliable skin cover.



**Fig 1:** Use of Ilizarov technique of differential distraction in correcting club foot (Patel M, 2013)

Importantly, it provides an option of a closed technique thereby avoiding the various complications associated with open surgery, including lack of donor sites for grafting especially in patients with widespread burns, damage to the neurovascular bundles during surgery; finger tip ischaemia when a chronically contracted finger is acutely straightened out putting stretch on the neurovascular bundles; a contracted but uninjured tendon preventing the full straightening of the finger; graft loss and wound infections, among others (Ravishanker R, 2003).



**Fig 2:** An example of a simple JESS construct in finger contracture (Ravishanker R, 2003).

The Joshi External Stabilizing System (JESS) is a versatile, lightweight external fixator consisting of K wires, distractors and connecting rods (both hinged and non-hinged) along with various link joints. JESS is a dynamic system that uses the Ilizarov principle of allowing the lengthening of the contracted tissues via slow distraction, causing minimal surgical insult. (Gulati S *et al.*, 2004)

These external fixator systems provide a very versatile treatment option for several complex and difficult deformities. We present one such case of the combined use of Ilizarov and JESS external fixators in the correction of gross deformity of thumb resulting from a burn injury.

**2. Materials and methods**

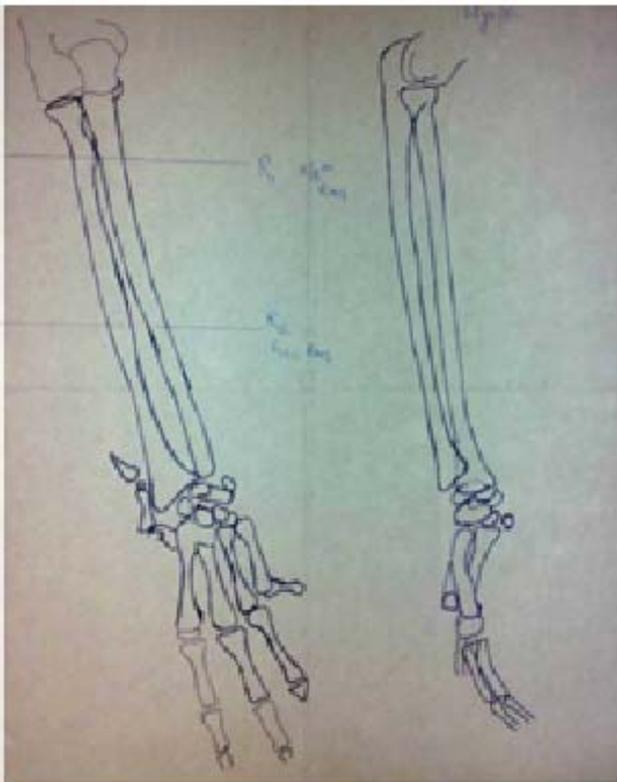
A 17 yr old girl had sustained burns on her right hand when she was just a 20 days old baby. Her thumb instead of facing the other fingers was placed 180 degrees opposite to the palm, parallel to the radius. It was buried in the contracture and only the distal phalanx was visible. Her little finger was fixed at 90 degrees to the dorsum of hand, with the distal phalanx having undergone auto amputation. Ring finger distal phalanx had also been auto amputated. IP joints of all fingers were in fixed flexion deformity. The thumb web space was markedly increased. The patient came for deformity correction for cosmetic reasons as she wanted to get married soon.



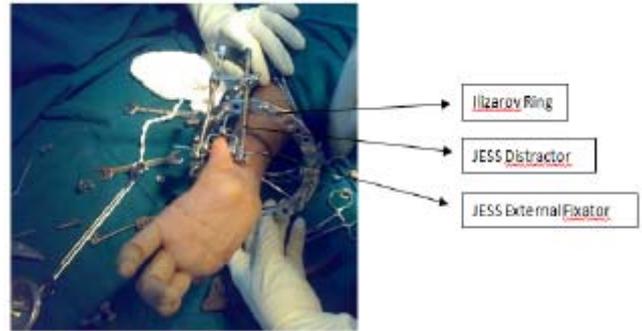
**Fig. 3 :** Old burns Contracture of the thumb: Observe the thumb is parallel to the radius, metacarpal of thumb is turned 180\* with respect to the other metacarpals, buried into the skin and only the distal phalanx is seen (arrows).

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On 25 July, 2009 surgery was performed with IEF (3 rings) and JESS application. The IEF rings were applied on the forearm and hand with JESS fixator attached to wires into the deformed thumb and ring finger. It was connected to the IEF to correct the deformity by gradual differential distraction.

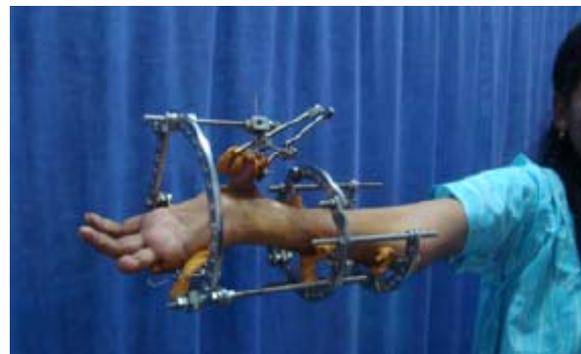
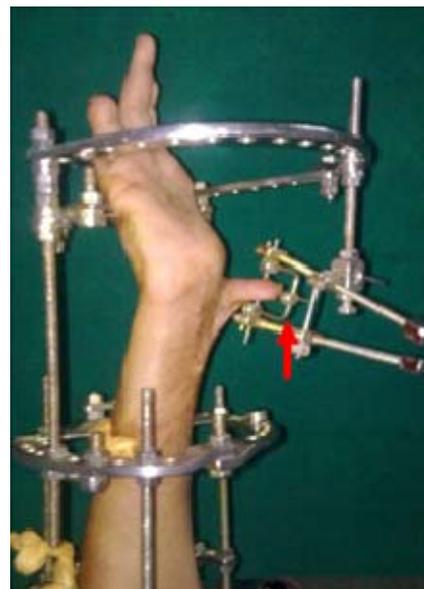


**Fig. 4:** Pre Operative Radiograph & Tracings. Note tracing of thumb is parallel to the radius (arrow).



**Fig 5:** Surgery in progress. Ilizarov Fixation for forearm and JESS fixation for the thumb.

Over the course of the next six months, the patient remained under follow-up and evaluation to note progress of deformity correction. Radiological evaluation was carried out through hand X-rays. External fixator readjustment was carried out twice during this period to enable deformity correction in all planes. The attachment of the JESS apparatus to



**Fig 6:** Forearm & Hand on both Ilizarov & JESS External Fixators, showing deformity correction in progress (arrows).

the half ring construct over the hand allowed simultaneous correction of thumb abduction as well as rotational malalignment. On 04 Feb, 2010, after 6 months and 10 days of External fixator period, the apparatus was removed. The patient underwent a



**Fig 7:** Final outcome, one year and four Months after fixator removal

period of rest with a dorsal POP slab protecting the limb, after which gradual mobilization was started.

### 3. Results

The final outcome was very gratifying. Almost 90 degrees of deformity correction was obtained in abduction. The thumb was now in near anatomical position with restoration of some degree of pinch and grasp. Although she could not perform all the functions of a normal hand, she was still able to hold a pen or a spoon. More importantly, cosmetic correction was achieved removing her social stigma concerning her deformed hand to a large extent. Upto present day follow up, the deformities have not recurred.

### 4. Conclusion

We report the successful use of Ilizarov and JESS external fixators in conjunction in the treatment of gross deformities of the hand in this case. The use of a closed technique can reduce the number of open reconstructive surgeries and further scars and contractures. Further, with proper follow-up care and rehabilitation, the recurrence rate of such deformities is expected to be negligible.

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