Distraction correction for flexion contractures of the fingers: A minimally invasive technique

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ABSTRACT

Burns injuries account for over 2 million cases in our country. With over 75% of the patients sustaining injuries to the hands, post burn contractures of the fingers are a very common condition presenting for treatment. Similarly trauma to the upper limbs, accounting for about a third of all injuries to the body also result in flexion deformities of the fingers. Standard treatment for these deformities is by way of surgical release of the contractures, skin cover with split skin grafting or full thickness grafts followed by prolonged immobilization and splintage. The relatively minimally invasive technique of distraction has been used in this small but representative series to correct flexion deformities caused by burns and other injuries. Results have been very gratifying.

KEY WORDS

Common deformity, Minimally invasive technique, Good results and patient satisfaction.

INTRODUCTION

About 75% of burn patients sustain burns of the hands and 80% of these are bilateral [1]. Often due to other more extensive injuries the hand injuries get neglected resulting in an enormous spectrum of deformities ranging from the unaesthetic to the complete loss of the part. In a vast majority of cases the thermal injury is limited to the skin alone-underlying tendons and joints being spared. Prolonged wound healing with its attendant oedema, infection, fibrosis and immobilization can lead to secondary joint contractures.

The standard treatment for these contractures is by release followed by skin cover with split skin graft/full thickness grafts, prolonged immobilization and splintage.

Correction of these deformities, including those caused by injuries other than burns, by distraction without open surgery and grafting has been done effectively in this study.

MATERIAL AND METHODS

15 cases of post burn contractures and 2 cases of a post-traumatic contracture were treated by the distraction technique. Involvement was in 13 males and 4 females. Only 2 patients were under 10 years; 6 were between 10-20 years; 8 between 20-40 years and one patient was 52 years old. As can be seen, other than two children of 8 years and 9 years respectively all patients were adults.

The proximal interphalangeal joint was involved in 11 cases; the proximal and distal interphalangeal joints
in 4 (Figures 1a & 1b); and the distal interphalangeal joint alone in 2 cases.

The index finger was affected in 8 cases; the middle finger in 4 and the little finger in 5 cases.

In all cases other than in the children the distractors were applied under regional anaesthesia (digital/wrist blocks), in the minor operation theatre.

**INDICATIONS FOR TREATMENT**

The indication for treatment was mainly functional in the adult males. 8 patients were serving soldiers- one was a computer operator with a bilateral involvement; one a telephone exchange operator (Figure 1c); 2 were clerks and 4 were infantry soldiers who had to handle guns and salute. Bilateral or more than one finger involvement was present in 4 patients. The degree of contracture was 45 degrees in 2 cases; 60 degrees in 4 cases; 75 degrees in 2 case; 90 degrees in 6 cases and 120 degrees in 3 cases. Contractures of over 120 degrees were not considered for distraction as the gap between the K-wires was not adequate to permit the distractor to be fitted.

Two young girls wanted straightening for cosmetic reasons. In the children the indication was both functional and cosmetic.

**OPERATIVE PROCEDURE**

Two pin distractors were used for all adults; only in the children were one-pin distractors used for the little fingers. Single pin distraction was also done for the solitary distal interphalangeal contracture. K-wires used were 1 mm and 1.2 mm in thickness. They were passed transversely through the phalanges on either side of the contracted interphalangeal joint maintaining adequate distance from the joint to ensure that the distraction forces applied straightened the joint and did not subluxate it.

Up to 15% - 25% straightening of the joint could be achieved in most cases with the application and opening of the distractor on the operating table itself. Distraction was then done at the rate of 0.5 mm twice (Figure 1d) daily till the fingers got straightened out in 2-4 weeks time (more time being needed for more severe deformities). Initial
distraction was done by the operating surgeon. Patients were then trained to do the distraction by themselves at home, coming only for weekly reviews in the outpatient department. Once the fingers were straight (Figure 2a) distractors were kept in place for 4 weeks before removal; splintage with the finger in extension was maintained for 4 weeks; night splintage with active mobilization in the daytime was then carried out for 4 weeks.

RESULTS

The longest follow up has been for 2 years and 7 months since the first case was done. Regular follow has been possible only in the serving soldiers who return for regular six monthly reviews and recategorisation. A longer follow up of cases treated at Delhi could not be done subsequent to the move on

posting of the operating surgeon.

The results in the adults who had presented for treatment for functional purposes were excellent. All went back to their jobs with an improvement in function and were very happy as not only did the finger become straight (Figures 2a & 2b), active function also returned (Figures 2c). Soldiers were returned to active duties.

The results in the children were as good and active function returned earlier than in the adults.

The two young girls who got their fingers straightened for aesthetic reasons got married soon after. Earlier suitors had rejected both because of their deformity.

There was partial recurrence in two of the earlier cases

Figure 1d: Distraction in progress

Figure 2a: Straightened with distraction

Figure 2b: End result after distraction

Figure 2c: Retention of function - flexion at the pip joint and dip joint
The standard treatment for these contractures has been surgical release and skin cover with a full thickness grafts.4-6 Other authors have found no significant differences between a thick split skin graft and a full thickness graft.2 Though most authors say thin split skin grafts should be avoided,4-7 some say that split skin grafts from the non-weight bearing plantar aspect of the foot give the best cosmetic results.8

However all methods involve open surgery under anaesthesia, usually general anaesthesia, with harvesting of full thickness grafts, which in a patient with extensive burns may occasionally be a problem due to lack of donor sites. There are inherent complications of surgery viz damage to the neorovascular 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; wound infections etc. Another important practical factor is the immobilization of the hand in bandages and splints, and multiple dressings when grafting has been done.

Though some authors have mentioned the use of distraction for the treatment of contractures9,10 there are no well-documented series reported on the use of distraction for post burn contractures of fingers.

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.

The procedure can be easily carried out in adults as an outpatient procedure the requirement being of only regional anaesthesia which is given by the surgeon himself. No hospitalization is required and the patient is trained to open the distractor by himself at home. The distractors are re-utilisable as only the K-wires are expendable.

CONCLUSION

Though this series is a small one it is a representative
one in the use of the minimally invasive technique of
distraction in treating post burn and post traumatic
flexion contractures of the fingers which is a relatively
common condition. The functional and aesthetic results
of this simple procedure are excellent. In addition this
procedure can be adopted as an outpatient procedure
for adults, as the majority of cases can be performed
under regional anaesthesia. There is thus a tremendous
saving of hospital resources by way of operation theatre
time, general anaesthesia and hospital bed occupancy.
The distractor can be re-utilised; the procedure being
simple, intelligent patients can be easily trained to do
the distraction at home and come only for outpatient
follow up.

Complications of general anaesthesia are eliminated
as adults can be operated upon with digital blocks;
the complications of open surgery such as injury to
the neuro-vascular bundles, tendons, wound infections,
graft loss etc are minimized.

The functional and cosmetic results of this procedure
are highly satisfactory.

The aim of this paper is to offer distraction as an easy,
economical and minimally invasive technique for
treating post burn/traumatic contractures of the fingers.

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