A NEW DYNAMIC ABDUCTION AND EXTENSION SPLINT

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SUMMARY

A new ingenious innovation to maintain abduction of the 1st web space in adduction contractures of the thumb and to maintain extension and abduction of the fingers in treating flexion contractures and syndactyly has been developed at the Postgraduate Department of Plastic Surgery, King George’s Medical College, Lucknow. Their ability to prevent adduction contractures of the thumb and flexion contractures of the fingers respectively have been evaluated. These are noninvasive and fairly inexpensive devices which can be easily fabricated and have been found to be perfectly acceptable.

Introduction

Proper functioning of the thumb is essential for the two important functions of the hand i.e. Pinch mechanism and Opposition. A patient with an adduction contracture looses both these functions which substantially affects his performance and work output in his sphere of activity. On the other hand a patient with a flexion contracture of the finger is incapacitated to a lesser extent because the function assigned to the fingers is 20% or less as compared to the thumb which performs 40% of the functions in a hand. Various methods to maintain abduction of the thumb and extension of the fingers have been tried e.g. use of K-wires, stent mould casts, repeated plasters and P.O.P. spacers, static and dynamic splints etc. but have not been found to be ideal for managing these patients in the post-operative period.

Hence, a new dynamic abduction and a new dynamic extension splint has been developed and evaluated in our department in view of the need for a suitable device during the course of an M.Ch. thesis on adduction contractures of the thumb.

Designing of the splint

Abduction

An impression of the thumb and the index finger in the region of the distal phalanx is taken with zelgan. A positive cast of the index finger and the thumb is obtained in plaster. Two circular cylindrical acrylic rings are fabricated around the plaster models of the thumb and the index fingers. A cycle spoke or a 3 mm thick stainless steel wire of suitable length is bent either in the form of a ‘U’ or ‘V’. If a spring effect is desired the wire is twisted spirally two or three times in the region of the apex of ‘V’. The two limbs of the ‘U’ or ‘V’ shaped bent wire are then joined to the two circular cylindrical acrylic rings (Fig. 1). The joint is made at 11 O’ clock and 1 O’ clock positions so that the device when used has a continuous spreading force. Every time the thumb tries to go into its original deformed position of abduction the device prevents it from doing so by kinetically abducting it. The device can be sterilised by boiling or autoclaving and so can be used even during operations. The limbs of the ‘U’ or ‘V’ can be directed either proximally, distally or in any other direction as required. The device can be used without its coming in the way of a flap for the web space and allows post-operative dressing with ease.

Extension

Extension splints for the fingers are similarly designed. The wire ends are attached to the acrylic rings at 12 O’ clock position (Fig. 2). The splints are maintained in position for a period of 4-6 weeks or more as necessary and changed.
Fig. 1. Showing the V-shaped and U-shaped Abduction and Extension splints.

Fig. 2. Extension splint which can be used after operation on finger contractures or following operation for syndactyly.

Fig. 3. Right hand following electric burn. The eschar is extending into the first web space.

Fig. 4. The same patient being nursed with a V-shaped dynamic abduction splint with helices directed towards the dorsum of the hand.
if so required. The fabrication cost of the abduction or the extension splint is Rs. 10-15 only.

Strength of the splint

Certain points are of interest when a helical spring is used as an abduction or extension splint. The abduction/extension force of the splint is dependent upon the length of the wire and diameter of the helices. The longer the wire or greater the number of helical twists the softer is the spring action and lesser are the chances of the splint to break after repeated use. With other variables remaining constant a thinner wire is weaker as is a larger helix. These parameters were kept in mind while designing the splints.

Material and Methods

12 operated patients of 1st web space contracture and 10 patients of various hand injuries e.g., crush, burn, cut wrist and avulsion injuries etc. who were being either conservatively managed or post-operatively followed up were given this dynamic abduction splint.

10 patients of finger contractures and 4 cases of syndactyly have been provided with an extension/abduction splint in the immediate post-operative period.

Discussion

Physiotherapy, passive stretching of thumb into normal range of motion, elastic traction for abduction and moulded serial plasters have all been tried in the past, (Littler, J.W., 1959) but they involve lot of resources and personnel care. The dynamic splint described by Leung and Hai (1981) is an invasive type of splint requiring skeletal fixation. The patient has to be constantly supervised.

The hand spreading splint devised by Bunnell (1970) made of moulded metal sheets and diverging metal rods with shallow metal gutters for fingers is a very elaborate assembly but it engages the entire hand. The use of polythene tubes and aluminium strips in the
form of web splints as designed by Joshi (1977) are inexpensive and easily made but remain in contact with the web skin and grafted area all throughout its length and hence cannot be used soon after the surgery. Post-operative dressing would require removal and reapplication of these splints. If however a flap is to be fed into the web space, these splints would cause pressure and obscure the view.

The new dynamic abduction and extension splints devised by the authors are inexpensive and have perfect patient acceptance. They are effective in maintaining the width of the web space in cases where there is minimal soft tissue scarring (Fig. 3 and 4) and thus prevent recurrence of the contractures. The splint is light and can be applied at a very early stage and changed as required. Since it is a surface splint the patient himself can remove it and reapply it and do most of his day to day work with the splint on. The autoclaved splint can be applied per-operatively after releasing the first web space contracture and a flap can be fed into the defect without its pedicle being obscured or pressed by the splint. It also prevents infolding of the insetted flap at the recipient site in the web space (Fig. 5 & 6).

Conclusion

The new dynamic abduction and extension splints designed and developed by us have been tried on the group of cases undergoing treatment for adduction and flexion contractures of the thumb and fingers respectively. We feel that the device deserves wider clinical trials and usage.

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REFERENCES


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