

A Three Piece Plastic Tenodesis Splint For Quadriplegic Patient

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Abstract

Cervical spine injuries at C6 level results in tenodesis hand. In these hands the grasp is very poor so patients are unable to perform various A.D.L. activities. But when, three piece plastic tenodesis splint is applied it provides power to the thumb finger prehension and helps the patient to carry out various A.D.L. activities. This paper describes the results of 12 such splints fitted to quadriplegic patients in Rehabilitation Research Centre, Jaipur. A proportion of tetraplegic patients found such splints helpful in carrying out various A.D.L. activities.

Introduction

Injuries to the cervical region with spinal cord damage and consequent Tetraplegia are a not infrequent cause of chronic disability in young people. With efficient initial management many survive and have a reasonable life expectancy. Such people have a varying degree of upper limb involvement depending upon the level and completeness of the lesion. Their residual function ranges from very high lesion with limited shoulder movement only to lower cervical lesions where only intrinsic hand function is impaired. In order to carry out the basic function of eating, toilet and communication, and simple additional functions such as writing, washing and shaving, it is necessary to have some sort of prehension and movement of elbow.

In spinal cord lesion at C6 level, shoulder and elbow motions are stronger, and there is more co-ordinated extremity positioning, but active elbow extension is absent. The important wrist extensors are spared, permitting a tenodesis hand. Early use of appropriate splints benefits the quadriplegic patient in providing muscle exercise,

mechanical function for purposeful activity and the assurance that the patient is capable of accomplishing tasks.

In tenodesis hand grasp is achieved through an active wrist extension-passive finger flexion pattern. Although the patient may be able to effect this function voluntarily with efficient wrist extension without splint but the grip sufficient for strong grasp and fine prehension may be lacking in thumb finger prehension. The splint is applied to give power for functional needs of prehension (See Fig. 2). These tenodesis hands can be maximally developed, through carefully supervised exercise and splinting programme.

A Three Piece Plastic Tenodesis Splint :

The tenodesis splint uses the natural function of finger flexor tendons to tighten in wrist hyper extension and to relax in wrist flexion. It works on flexor hinge hand principle. This principle permits only metacarpophalangeal motion, stabilises the interphalangeal joints of digits 2nd and 3rd and both the interphalangeal and metacarpophalangeal joints of thumb, creates a three jaw chuck prehension between thumb and the index and middle finger. It allows hinge movement at the etacarpophalangeal joints of these two fingers. The thumb is stabilised in a position of Palmar abduction. The index and middle fingers are held together in a finger case

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which allows movements at the MCP joints but no movement at IP joints. The two fingers move in flexion to meet the fixed thumb.

The splint consist of three parts (See Fig. 1)



1. A one piece moulded dorsal cover for the three phalanges, each of the 2nd and 3rd digits which is adjustably attached by a cord to a wrist cuff.
2. A hand orthosis with a thumb post which holds the thumb in a stable position.
3. Wrist cuff.

Prerequisite :

1. There should be active wrist extension.
2. Good free range of movement at M.C.P. joints of index and middle fingers and a wide supple thumb web.
3. Active pronation also need to be as full as possible.
4. Elbow flexion should be present.
5. There should be no spasticity or spasticity should be minimum.
6. Training in use of splint should be intensive.

Rehabilitation

The splints are usually fitted as part of the initial hospitalisation and subsequent rehabilitation programme. Acceptance and continual use appear to be related to many factors. The design of splint, its efficiency and reliability, the amount of training and indoctrination in splint usage; motivation and the ultimate resettlement of the patient, are important factors.

Material and Methods

Between the year 1991 and 1995 12 tetraplegic patients were fitted with tenodesis

splint which was made of polypropylene sheet (alkathene granules) after taking the initial mould, in Research & Rehabilitation Centre, Jaipur and training was given to them in various A.D.L. activities.

Results

The age of patient at the time of fitting splint is given in Table No. 1.

Table-1

Age of patient at the time of fitting splint

0-19 Yrs	20-29	30 +	Total
-	4	8	12

The level of lesion of quadriplegic patient using tenodesis splints are shown in Table No. 2 and activities for which tenodesis splin is used by tetraplegic patients are shown in Table No. 3.

Table-2

Use of tenodesis splint by patient with tetraplegia

Level of S.C.I. patient	No. of patients
C6	6
C6/7	4
C7	2
Total	12

Discussion

The tenodesis splint has a functional value for a proportion of patient with tetraplegia. The tenodesis splint is simpler, lighter less expensive and less bulky. Its patient acceptance is good. In our series most of the patient used their splints for grooming, feeding and writing activities. No patient used the splint for work.

Table-3

Activities for which tenodesis splint is most used by tetraplegic patients

Patient activities	No. of patients
Job	-
Study	1
Hobbies	1
Writing	12
Feeding	12
Grooming	12



Fig. 2b Patient with Splint



Fig. 2a Patient with Splint

Conclusion

This paper is in part an appeal for the inclusion of tenodesis splint in lower cervical lesion tetraplegics rehabilitation routinely, when they achieve active dorsiflexion of wrist so that they can be made more independent in their ADL activities.

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