

**Examine the effectiveness of rehabilitation programmes in primary flexor tendon repairs following surgical reconstruction at 12 weeks and 12 months in terms of pain, disability, function and return to work**

**Clinical Bottom Line**

“Early controlled mobilisation regimes are widely used in post-surgical rehabilitation of flexor tendon repairs to the hand however there is insufficient evidence to define the best mobilisation strategy. Current practice strives to gain a balance between mobilising the tendons without overloading them too soon after treatment.”

**Criteria for critically appraised topic**

<b>Population</b>	Primary flexor tendon rupture surgically repaired M/F 18-60 years
<b>Intervention</b>	Primary or secondary care setting, static versus dynamic splinting, mobilisation, resisted exercise and what point to commence rehabilitation programmes
<b>Outcome</b>	Pain, function, return to work, quality of life, re-rupture rate
<b>Exclude</b>	Children, inflammatory arthropathies, cancer

**Search terms used**

Primary flexor tendon rupture, static and or dynamic splinting, mobilisations, resisted exercises, passive exercises, rehabilitation, therapy, occupational therapy, physiotherapy, active exercise, systematic review, randomised controlled trial, pain, function, return to work, quality of life, re-rupture

**The following databases were searched**

Cochrane, Pedro, NHS Library for Health, Medline, Cinahl, Embase, PsycInfo, Clinical Evidence, Bandolier, NELH, Professional websites, Guidelines, NICE, HTA, OT Seeker, Rehab data, Professional interest groups

**The following types of study were used**

Systematic reviews, RCT'S (to exclude cross over studies unless they are the best available evidence)

**Key words searched**

Search for the past 10 years i.e. 1995-2005, followed by a review in March 2010 which searched from 2004 -2010.

## Available evidence

### **Search 1: 1995 - 2005**

<b>Database</b>	<b>Number of Relevant Abstracts</b>
Clinical evidence	
PsychInfo	
AMED/CINAHL/Embase	
PEDRO	
Medline	
Cochrane	
OT Seeker	
<b>Total</b>	<b>243</b>

### **Search 2: 2004 -2010**

<b>Database</b>	<b>Number of Abstracts</b>	<b>Number of relevant abstracts</b>
Clinical evidence	0	
Psych Info	0	
AMED/CINAHL/Embase	4/3/6	
PEDRO	0	
Medline	12	
Cochrane	1	1
OT Seeker	0	
Science Direct	1	1
<b>Total</b>	<b>27</b>	<b>2</b>

The updated review found 2 new relevant abstracts and an edited version of the 2004 Cochrane review (no change to 2004 recommendations):

### **New Relevant Abstracts:**

- 1. Braga-Silva, Kuyven CRM (2005) Early active mobilization after flexor tendon repairs in zone 2. Chirurgie de la Main 24: 165-168 (Available online at [www.sciencedirect.com](http://www.sciencedirect.com))**

A study of 136 flexor tendon repairs (82 patients) in zone 2. Patients were postoperatively managed by an early mobilisation programme incorporating active flexion and extension.

Mobilisation started 12 hours post-repair protected by a dorsal plaster (wrist approx 30 - 60° flexion, MCPJ in 90° flexion and IPJ's in neutral.) Patients completed 10 complete flexion/extension active mobs per hour during a 16 hour day. The plaster splint was removed after the third week and patients reassessed weekly for the first month following surgery.

Follow-up ranged from 12 – 36 months and results were measured at 12 months post-surgery. Those with less than 12 months follow-up were excluded from the study findings. Assessment was based on the IFSSH and Strickland systems of evaluation. The authors suggest that their results are comparable to other studies; that good functional results were obtained and the number of cases with adhesions requiring tenolysis was significantly reduced. The study confirms that postoperative programmes that use early active flexion can produce good results after repair in zone 2.

**2. Hung LK et al (2005) Active mobilisation after flexor tendon repair: comparison of results following injuries in zone 2 and other zones. Journal of Orthopaedic Surgery, Vol 13/2 (158-63).**

Study looking at role of active mobilisation involving 46 flexor tendon repairs using Kessler's technique and early active mobilisation on day 3 post-surgery. Study included males and females between 12 and 61 years (mean age 26 years). On third post-operative day, a thermoplastic dorsal splint in 40° of wrist flexion and 70° of PIP flexion was applied with a dorsal block for the fingers in neutral. The fingers were able to move freely. At night an extension platform support was provided to support and immobilise the IPJ's in extension.

The study suggests that active mobilisation following flexor tendon repair provides comparable clinical results and is as safe as conventional mobilisation programmes. However recovery in zone 2 patients was delayed.

The two new relevant abstracts do not provide any additional evidence to the Cochrane review

**A Cochrane review was highlighted as the best evidence available to date:**

**Thien TB, Becker JH, Theis J-C. Rehabilitation after surgery for flexor tendon injuries in the hand. The Cochrane Database of Systematic Reviews 2009, Issue 1.**

Six trials, including three reported only in abstracts, with a total of 464 participants were included. Data was not pooled. One trial compared continuous passive motion (CPM) with controlled intermittent passive motion (CIPM) and found a significant difference in mean active motion favouring CPM (WMD 19.00 degrees, 95% CI 15.11 to 22.89). One trial compared a shortened passive flexion/active extension programme with a normal passive flexion/active extension mobilisation programme, and reported (without data) a significant reduction in absence from work of 2.1 weeks in favour of the shortened programme. Other trials compared active flexion with rubber band traction, early controlled active passive mobilisation and dynamic splintage versus static splintage. No trials found significant differences in overall functioning or complication rate.

This Cochrane review included 2 relevant papers:-

**1. Aldofson L et al (1996) The effects of a shortened post operative mobilisation programme after flexor tendon repair in zone.**

**Participants**

A study of 96 patients in Sweden with flexor tendon injuries in zone 2 of the hand without fractures, joint injuries, soft tissue defects, extensor tendon lesions or vascular repairs. Number lost to follow up: 14. There were 82 patients (68 fingers and 23 thumbs) available for follow up at 6 months. Age: mean 37 years. (36 vs. 38 years). Male: 66% (74% vs. 59%)

**Interventions**

All patients were operated within 24 hours from the injury and all injured flexor tendons were repaired with a modified Kessler suture. At the end of the operation all patients were immobilised in a dorsal plaster splint from below elbow to the fingertips with the wrist in 30 degrees and the MCP joints in >70 degrees of flexion. Rubber bands were attached to all four fingers when the tendon repair had been performed in the fingers. Following FPL repairs a dorsal splint was from below elbow over the thumb with the wrist in 30 degrees of flexion. A rubber band was attached to the thumb only. A transverse palmar band was used in all patients. During the first 4 weeks passive flexion through traction on the rubber band and active extension exercises were performed with six repetitions ten times daily. During the 5th and 6th weeks after the repair, active flexion and extension without load were started, still keeping the dorsal splint between exercises. After the 6th week the patients were randomised into 2 groups:

(a) 38 patients with 45 injured digits were instructed in a programme with gradually increasing load on the involved hand, allowing unrestricted load activity 8 weeks after the tendon repair.

(b) 44 patients with 46 injured digits were instructed in another programme with slower gradual increase of load of the involved hand allowing unrestricted activity after 10 weeks.

**Outcomes**

Length to follow up: 6 months. Functional results (Louisville, Tsuge and Buck Gramcko), grip strength, subjective assessment of hand function (VAS) and absence from work.

**2. Gelberman RH et al (1991) Influences of the protected passive mobilisation interval on flexor tendon healing: a prospective randomised clinical study.**

**Methods**

Method of randomisation: by month of birth

### **Participants**

A study in America of 51 patients with a transection of the flexor digitorum profundus or the flexor digitorum superficialis tendon or both in zone 2 of the hand. Number lost to follow up: 1 (tendon rupture). Mean age: 29 years (26 versus 33 years). Male: not stated.

### **Interventions**

All tendons were repaired with a Kessler suture. After wound closure, bulky long-arm dressings with dorsal plaster splints were applied, with the wrist in 30 degrees flexion and the MCP joints in 70 degrees flexion. Postoperatively, patients were randomised to: (a) Greater intervals of passive-motion rehabilitation using a continuous passive motion (CPM) device. Participants used CPM devices for the first 4 weeks and a combination active-motion rehabilitation alternating with the CPM program for weeks 5 and 6.

(b) Traditional early passive motion protocol for tendon rehabilitation. Participants were treated with controlled intermittent passive motion for the first 4 weeks and alternating active-motion rehabilitation with controlled passive motion for weeks 5 and 6.

All participants began therapy on the first postoperative day. Digits were protected in dorsal blocking splints for a minimum of 6 weeks.

### **Outcomes**

Length to follow up: mean 10.8 months (range 6-38). Strickland and Glogovac formula (mean active motion) and total active motion (TAM). Separate analyses of digits with one tendon or two tendon injuries

### **Conclusion (from Cochrane Review)**

There is insufficient evidence from RCT's to define the best mobilisation strategy.

### **Implications for practice**

In programmes where unrestricted activity is allowed early (8 weeks), there is less absence from work. According to the available evidence there appears to be a good outcome in relation to range of motion irrespective of which controlled mobilisation regime is used.

Current clinical practice at UHNS involves an early mobilisation regime within a protected back slab for 6 weeks post operatively. This method of treatment is current in line with the best available evidence and no changes to clinical practice are required.

Other work carried out by **British association of Hand Therapy (BAHT)** has undertaken a larger review of flexor tendon injuries and have concluded the following:

- Evidence clearly indicates the effectiveness of early active motion and dynamic splint regimes for the treatment of flexor tendon injuries over immobilisation regimes.

- Recovery occurs over a long period and further surgical intervention might be delayed for 6-12 months with continued hand therapy.
- EAM and dynamic splinting appear to be equally effective in improving ROM and have a similar, but not statistically calculated risk of tendon rupture.
- Patient education and full co-operation with the treatment is essential to a good outcome and to reduce DNA rates.
- Outcome measures should be extended beyond those focussed on ROM to include fuller functional measures.
- The therapist needs to appreciate the risks of rupture and provide clear management guidelines or agree to the fitting of restraining splints to help the patient avoid ruptures during unavoidable risky activities.
- Therapists should estimate the cost implications for the service and the patient in terms of materials, time and travel of intensive hand rehabilitation programmes.

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### **References**

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