



## Research

# No difference between two types of exercise after proximal phalangeal fracture fixation: a randomised trial

Lauren Miller<sup>a</sup>, Jack Crosbie<sup>b</sup>, Anne Wajon<sup>c</sup>, Louise Ada<sup>d</sup>

<sup>a</sup>Hand Therapy Unit Head, Sydney Hospital; <sup>b</sup>School of Physiotherapy, Western Sydney University; <sup>c</sup>The University of Sydney; <sup>d</sup>School of Physiotherapy, The University of Sydney, Australia

## KEY WORDS

Finger phalanges  
Internal fracture fixation  
Physical therapy  
Articular range of motion  
Hand strength



## ABSTRACT

**Question:** Are 6 weeks of synergistic wrist and finger exercises with the metacarpophalangeal joint constrained in an orthosis (constrained exercises) more effective than traditional finger exercises with the metacarpophalangeal joint unconstrained (unconstrained exercises) after open reduction and internal fixation of a proximal phalangeal fracture in terms of impairment, activity limitation and participation restriction at 6 and 12 weeks? **Design:** Randomised, parallel-group trial with concealed allocation, intention-to-treat analysis and blinded outcome assessors. **Participants:** Sixty-six participants within 1 week of open reduction and internal fixation of proximal phalangeal fractures. **Intervention:** The experimental group carried out 6 weeks of synergistic wrist and finger exercises with the metacarpophalangeal joint constrained, whilst the control group carried out finger exercises with the metacarpophalangeal joint unconstrained, as part of a comprehensive rehabilitation program. **Outcome measures:** The primary outcomes were: active proximal interphalangeal joint extension of the injured finger, total active range of motion, and strength. Secondary outcomes were: pain, difficulty with specific hand activity and difficulty with usual hand activity. A blinded assessor measured outcomes at Weeks 1, 6 and 12. **Results:** By Week 6, there were no significant between-group differences in improvement for: active proximal interphalangeal joint extension (MD 2 deg, 95% CI -3 to 7); total active finger range of motion (MD 0 deg, 95% CI -21 to 22); strength (MD -2 kg, 95% CI -8 to 4); pain (MD 1/50, 95% CI -3 to 5); difficulty with specific hand activity (MD 2/60, 95% CI -3 to 8); or difficulty with usual hand activity (MD 0/40, 95% CI -4 to 3). By Week 12, there were also no significant between-group differences in any outcome. **Conclusions:** Constrained and unconstrained exercises has similar effects after open reduction and internal fixation of proximal phalangeal fracture. **Registration:** Australian New Zealand Clinical Trials Registry (ACTRN12610000294055). [Miller L, Crosbie J, Wajon A, Ada L (2016) No difference between two types of exercise after proximal phalangeal fracture fixation: a randomised trial. *Journal of Physiotherapy* 62: 12–19]

© 2016 Australian Physiotherapy Association. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

A traumatic finger fracture is a common and often activity-limiting injury,<sup>1–4</sup> especially for unskilled workers and tradespeople who rely on good recovery to return to their employment. Surgical management of people with this injury consists of open reduction and internal fixation with plate and/or screw fixation. This is followed by rehabilitation designed to reduce swelling, minimise scarring and restore range of motion, especially finger extension.

Traditionally, exercise to restore finger range of motion following open reduction and internal fixation involves actively moving the fingers to five positions that combine the three finger joints in combinations of flexion and extension with the wrist in a neutral position. However, in the presence of post-surgical oedema around the proximal phalanx, attempts to extend the finger can result in hyperextension of the metacarpophalangeal joint (MCP), rather than movement across all three finger joints.<sup>5</sup> Over time,

this can lead to a flexion contracture at the proximal interphalangeal joint (PIP), known as a pseudo-claw deformity (Figure 1).<sup>6</sup> In two studies with long-term follow-up after open reduction and internal fixation of proximal phalangeal fractures, flexion contractures of the PIP were significant. Horton and colleagues<sup>7</sup> reported an average contracture of 27 deg (SD 15), while Page and Stern<sup>8</sup> reported a contracture > 35 deg or total active range of motion < 180 deg in 38% of injured fingers. This represents approximately one-quarter to one-third of the range of motion in a normal PIP, which is an appreciable limitation for grasping and manipulating objects.

Alternatively, moving the wrist and fingers synergistically may be beneficial.<sup>9</sup> For example, moving between two positions – one being wrist extension with finger flexion and the other being wrist flexion with finger extension – has been shown to produce greater tendon excursion than finger movement alone.<sup>10,11</sup> In addition, constraining joints that compensate for limitation elsewhere with orthoses has been suggested as a way to improve tendon gliding



**Figure 1.** Pseudo-claw deformity of the ring finger following proximal phalangeal open reduction and internal fixation.

across joints within the same limb.<sup>6,12,13</sup> The rationale for combining these two ideas – performing synergistic wrist and finger exercises while constraining the MCP in an orthosis – is that it should produce both maximum tendon excursion and maximum joint range in the PIP, thereby preventing flexion contractures.

Therefore, the aim of this study was to investigate whether constrained synergistic exercises were more effective than traditional unconstrained exercises as part of usual care after open reduction and internal fixation. The specific research question was:

Are 6 weeks of synergistic wrist and finger exercises with the MCP constrained in an orthosis (constrained exercises) more effective than traditional finger exercises with the MCP unconstrained (unconstrained exercises) after open reduction and internal fixation of a proximal phalangeal fracture in terms of impairment, activity limitation and participation restriction at 6 and 12 weeks?

## Method

### Design

A prospective, parallel-group, randomised clinical trial was conducted, with concealed allocation, intention-to-treat analysis, and blinded outcome assessors. People with proximal phalangeal fracture that required open reduction and internal fixation via plate and/or screw fixation were recruited from the outpatient Hand Clinic at Sydney Hospital following surgery by an independent recruiter not otherwise involved in the trial. The sequence of allocation was computer-generated and concealed in sealed, opaque envelopes by a member of the research team not involved in recruitment. Participants were stratified according to severity of injury. ‘Complex’ injuries were those fractures that required a dorsal extensor tendon splitting approach and/or were intra-articular fractures, whereas ‘simple’ injuries included all other fractures. Following baseline measurement, participants were randomly allocated from each stratum, via block randomisation, to

one of two groups: 6 weeks of constrained exercises (experimental group) or unconstrained exercises (control group). Participants were measured at baseline within 1 postoperative week (Week 1), after 6 weeks of intervention (Week 6), and 6 weeks beyond the intervention (Week 12). Trained assessors who were blinded to group allocation conducted the measurements at Weeks 1, 6, and 12. To maintain assessor blinding, participants were discouraged from communicating about any part of their intervention and orthoses were removed before measurement. Detailed study procedures are presented in Appendix 1 on the eAddenda.

### Participants and therapists

Patients were included if they: were 18 to 65 years of age; had a diagnosis of a finger proximal phalangeal fracture stabilised via open reduction and internal fixation (with plate and screw fixation or screw fixation alone); and gave written, informed consent. They were excluded if they had: co-morbidities including diabetes, active arthropathy, or enchondroma resulting in a pathological fracture; a concomitant tendon or nerve injury; another fracture; a vascular injury; an open fracture; a previous injury to the same finger with residual deformity; or an inability to understand the requirements of the study. Patients were also excluded if: the time between fracture and surgical fixation was > 2 weeks; the time between surgical fixation and initial hand therapy was > 1 week; or they were followed up in another city.

Therapists working at the Sydney Hospital Hand Unit were invited to be the treating therapists if they were working full time in the area of hand therapy at the time of involvement in the trial, and had previous experience in the management of proximal phalangeal fractures following open reduction and internal fixation.

### Intervention

All participants undertook up to 12 weeks of rehabilitation. For the first 6 weeks, this consisted of one 40-minute supervised session per week, augmented by a home program. Rehabilitation was aimed at increasing range of motion, decreasing oedema and pain, preventing scarring and preventing secondary harm (Table 1). After 6 weeks, one 30-minute supervised session per week was provided as needed until the participant was discharged or elected to discontinue. During this time, rehabilitation was aimed at increasing both strength and activity (Table 1).

The difference between the experimental group and control group was in the type of active exercises performed to increase joint range of motion during the first 6 weeks of intervention, although the dose was the same. The experimental group performed synergistic wrist and finger exercises with the MCP constrained in a removable orthosis (ie, constrained exercises) for 10 repetitions, six times a day. The orthosis was custom made and fabricated from 3.2 mm thermoplastic material<sup>9</sup>. The orthosis temporarily immobilised the MCP joints of all fingers of the injured hand in approximately 20 deg of flexion. With the orthosis in situ, the interphalangeal joints and wrist remained unimpeded, and the participants performed a sequence of active synergistic wrist and finger movements combining wrist flexion with finger interphalangeal extension and then wrist extension with finger interphalangeal flexion (Figure 2).

The control group performed finger exercises with the MCP unconstrained (ie, unconstrained exercises) for 10 repetitions, six times a day. With the wrist in a neutral posture, participants performed a sequence of active finger movements to five positions (combinations of flexion and extension) for the three finger joints (Figure 3).

All therapists delivering the interventions received training from an investigator (LM) prior to commencement of the trial, and booster sessions throughout the trial. A manual that included week-by-week guidelines was provided. The investigator also undertook in-therapy teaching sessions and case discussions to ensure that the intervention was delivered correctly. Several aspects of the intervention

Download English Version:

<https://daneshyari.com/en/article/2621973>

Download Persian Version:

<https://daneshyari.com/article/2621973>

[Daneshyari.com](https://daneshyari.com)