

## Serial casting versus positioning for the treatment of elbow contractures in adults with traumatic brain injury: a randomized controlled trial

Moseley AM, Hassett LM, Leung J, Clare JS, Herbert RD and Harvey LA (2008): Serial casting versus positioning for the treatment of elbow contractures in adults with traumatic brain injury: a randomized controlled trial. *Clinical Rehabilitation* 22: 406-417. (Abstract prepared by Bridget Dickson)

**Aim:** To compare the effectiveness of two stretching programmes for managing elbow flexion contractures following traumatic brain injury (TBI).

**Methods:** Pragmatic randomised controlled trial. Participants had sustained a TBI and subsequently developed an elbow flexion contracture. Participants were randomly allocated into either the serial casting (24 hour sustained stretch) or the positioning group (one hour per day stretch) for two weeks. Following the intervention, all participants continued to receive a stretch into elbow extension, one hour per day for four weeks. The primary outcome of passive elbow extension was measured at baseline, post-intervention, post-intervention plus one day and at follow-up (four weeks post-intervention). Blinding of assessors was attempted.

**Results:** Twenty-six participants were included. After the intervention phase, the serial casting group demonstrated a statistically significant average increase in elbow extension of 22° (95% confidence interval 13-31°;  $P < 0.001$ ) when compared to the positioning group. This improvement reduced to 11° (95% confidence interval 0-21°;  $P = 0.052$ ) one day post-intervention, and was marginally significant. At the four week follow-up, the statistical and clinically significant improvement had not been maintained and reduced on average to 2° (95% confidence interval 13-17°;  $P = 0.782$ ).

**Conclusion:** Serial casting demonstrated a short-term benefit of increasing elbow extension compared to a positioning programme but this positive effect was not maintained.

### Commentary

Development of elbow contractures following TBI is a significant management issue facing physiotherapists in inpatient rehabilitation settings, and stretching the elbow joint is a common conservative management option considered in this situation. There are a number of ways that this stretch can be delivered: hands-on stretch; splinting; positioning; or serial casting. Of these options there is little evidence to suggest that a short duration stretch of 30 to 60 minutes is effective in increasing range of movement in neurological populations. For example, two randomised controlled trials involving spinal cord injury patients were unable to demonstrate that application of a short stretch had any sustained effect on joint mobility (Harvey et al 2000, Harvey et al 2003). A systematic review of

serial casting suggested that these treatments have the potential to reduce joint contractures in people with acquired brain injury (Mortenson and Eng 2003). However, the quality of the included studies was poor. In justifying the choice of serial casting versus positioning, the authors of this appraised paper explained that comparing these two treatments was important because clinicians often had to decide between them when determining a management plan for patients with elbow joint contracture.

There were a number of aspects of the study design that were of high quality, including the randomisation procedure, the clear description of the interventions and outcome measures, and the decision to use an intention to treat analysis. When interpreting the results it was useful to see that both intervention groups were similar at baseline and there was no loss to follow-up. However, there were also some issues of concern with the study design. Firstly, a power calculation was performed prior to beginning the project, indicating that a sample of 60 participants was required to detect a difference between the groups. However, following difficulties with recruitment, a second power calculation was completed, resulting in a sample of 26 participants (13 in each group). This was the sample size used in the research project. While the authors did give a clear description of the reasons behind these changes, the sample size was possibly not large enough to show a significant difference at follow-up, if one did exist. Another potential issue was the multiple types of interventions (sandbags, slings or splints) used in the positioning group to complete the short duration stretch. From a clinical perspective, the use of sandbags to position a limb allows the patient to move out of the stretch, as compared to splints which are attached to the patient's limb. Therefore, participants who had their stretch applied via sandbags may not have received as strong a, or sustained, stretch as those wearing splints. Another issue that the authors alluded to was their attempt at blinding. They acknowledge that neither the participants nor the treating physiotherapists were able to be blinded and that assessor blinding was not always successful. However, they reasoned that the issue with some assessors not being blinded was not overly important because the main outcome of passive elbow extension was measured using a standardised torque instrument.

Generally, this trial was of high quality and the primary conclusion that serial casting can improve elbow flexion contractures following TBI is clinically important. The observation that gains in range of movement were only short lived could possibly be avoided by applying a splint for a significant amount of time during the day following removal of the serial cast. Also, it would be beneficial to determine the treatment effect of using serial casting following Botox injections, administered by physicians, for patients with spasticity of their elbow flexors.

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## REFERENCES

- Harvey LA, Batty J, Crosbie J, Poulter S and Herbert RD (2000): A randomized controlled trial assessing the effects of 4 weeks of daily stretching on ankle mobility in patients with spinal cord injuries. *Archives of Physical Medicine and Rehabilitation* 81: 1340-1347.
- Harvey LA, Byak AJ, Ostrovskaya M, Glinsky J, Katte L and Herbert RD (2003): Randomised trial of the effects of four weeks of daily stretch on extensibility of hamstring muscles in people with spinal cord injuries. *Australian Journal of Physiotherapy* 49: 176-181.
- Mortenson PA and Eng JJ (2003): The use of casts in the management of joint mobility and hypertonia following brain injury in adults: a systematic review. *Physical Therapy* 83: 648-658.

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## Hip strength and hip and knee kinematics during stair descent in females with and without patellofemoral pain syndrome.

Bolgla LA, Malone TR, Umberger BR and Uhl TL (2008): Hip strength and hip and knee kinematics during stair descent in females with and without patellofemoral pain syndrome. *Journal of Orthopaedic and Sports Physical Therapy* 38: 12-18. (Abstract prepared by Stephanie Woodley)

**Purpose:** To examine hip muscle strength and hip and knee kinematics in subjects with patellofemoral pain syndrome (PFPS).

**Methods:** Cross-sectional study. Thirty-six female subjects were recruited: eighteen patients who had been diagnosed with PFPS due to overuse comprised the experimental group (mean duration of symptoms 14.4 months, SD 12.8 months) and 18 asymptomatic volunteers (matched for age, height and body mass) formed the control group. To be eligible for the experimental group subjects had to report (a) anterior knee pain during stair descent (b) pain for a minimum of one month (c) pain during at least two of the following activities: stair ascent, squatting, kneeling or prolonged sitting, and (d) a minimum of 3 on a 10 cm visual analogue pain scale. Isometric strength of the hip abductor and external rotator muscles was measured using a handheld dynamometer, and hip and knee kinematics were obtained via a video-based motion capture system during a stair descent task. Independent t tests were used to determine group differences for the outcome measurements.

**Results:** Subjects with PFPS had significantly lower hip abductor ( $P = 0.006$ ) and hip external rotator ( $P = 0.002$ ) strength. No differences were detected in hip adduction or internal rotation angles or knee valgus during stair descent.

**Conclusion:** There is significant weakness of the hip abductor and external rotator muscles, but no alteration in lower extremity kinematics in subjects with PFPS.

### Commentary

PFPS is a common musculoskeletal disorder encountered by physiotherapists, yet its aetiology remains contentious and treatment of this complaint is often challenging. Addressing abnormal patellofemoral joint stresses, which are thought to be due to lateral tracking of the patella, is usually an integral part of any treatment strategy, with methods such as patella taping and quadriceps strengthening typically used. In recent years there has been interest in the role that the hip muscles, specifically the abductors and external rotators, may play in the rehabilitation of patients with PFPS. The premise underlying this interest is that weakness of the aforementioned hip musculature may lead to an increase in hip adduction and internal rotation and excessive knee valgus, hence altering the forces acting upon the patellofemoral joint.

The main finding of this research was that the hip muscles were significantly weaker in subjects with chronic PFPS compared to those in the control group, supporting previous evidence of this association (Ireland et al 2003, Robinson and Nee 2007). However, the authors were not able to demonstrate that hip weakness resulted in altered hip and knee kinematics (ie, excessive hip adduction and internal rotation and knee valgus) making their results less conclusive. Interestingly, there was a trend towards maintaining greater knee varus in the experimental group compared to the control group. A suggested reason for the lack of association was that the stair descent task may not have been challenging enough, meaning that the subjects with PFPS were able to maintain lower limb alignment. It could also be possible that the sample size was not large enough to detect a difference. Further investigation is required to confirm or negate these findings.

The methodology of the appraised paper is well described and there are few issues related to study design. The main limitation, which is acknowledged by the authors, is that the primary investigator who undertook the data collection and analysis was not blinded to group allocation, which could have introduced bias. There was also high variability in the data particularly with respect to the hip transverse plane motion, which is attributed to difficulties in obtaining these measurements, but could also possibly be a reflection of the sample size. In addition, it is important to note that the subjects taking part in this study had longstanding pain and it is likely that different outcomes would result if people with acute rather than chronic symptoms were examined.

Clinically, this study is useful because it confirms that patients with PFPS are likely to present with weakness of the hip muscles, reminding physiotherapists of the importance of considering the whole lower kinetic chain when assessing the knee region. However, evidence is needed to determine whether strengthening the hip musculature is an effective means of improving patient outcomes. Interestingly, research along similar lines is currently being undertaken in patients with osteoarthritis of the knee joint (Bennell et al 2007) and if hip strengthening exercises are beneficial this will provide an inexpensive evidence-based treatment option. Finally, this research also raises an interesting question regarding cause-effect relationships, that is, do alterations in hip muscle strength occur prior to the onset of PFPS or does hip weakness develop as a consequence of PFPS? These issues are not well understood and warrant further investigation.

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### REFERENCES

- Bennell KL, Hunt MA, Wrigley TV, Hunter DJ and Hinman RS (2007): The effects of hip muscle strengthening on knee load, pain, and function in people with knee osteoarthritis: a protocol for a randomised, single-blind controlled trial. *BMC Musculoskeletal Disorders* 8: 121.

- Ireland ML, Willson JD, Ballantyne BT and Davis IM (2003): Hip strength in females with and without patellofemoral pain. *Journal of Orthopaedic and Sports Physical Therapy* 33: 671-676.
- Robinson RL and Nee RJ (2007): Analysis of hip strength in females seeking physical therapy treatment for unilateral patellofemoral pain syndrome. *Journal of Orthopaedic and Sports Physical Therapy* 37: 232-238.

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