Patellar taping and bracing for the treatment of chronic knee pain: a systematic review and meta-analysis


CRD summary
The authors concluded that medially directed tape reduced chronic knee pain, but that there was limited evidence for patellar bracing. This was a generally well-conducted review. The authors' conclusions were appropriately cautious given the heterogeneity between studies and the presence of significant publication bias.

Authors' objectives
To determine the effectiveness of patellar taping and bracing in the treatment of chronic knee pain.

Searching
MEDLINE (1980-November 2006), CINAHL (1982-November 2006), ISI Web of Knowledge (1980-November 2006), SPORTDiscus (1980-November 2006), Evidence Based Medicine Reviews (to November 2006), Extended Academic ASAP (1980-November 2006) and PEDro (to November 2006) were searched for English language articles. Dissertations and conferences proceedings were excluded. Search terms were reported. Bibliographies of potentially eligible studies were searched.

Study selection
Randomised or quasi-randomised controlled trials of patellar taping or bracing for chronic knee pain were eligible for inclusion. Studies with co-interventions were permitted where it was possible to isolate the effects of the taping or bracing. Included studies were parallel and crossover design randomised controlled trials (RCTs) of medially directed tape, laterally directed tape and medially directed bracing. Control conditions were sham tape, no tape, sham brace or no brace. Some studies included co-interventions of physical therapy, education or exercise. Participants in included studies had a diagnosis of either anterior knee pain (AKP) or osteoarthritis (OA). Both mixed and single sex studies were included. Where reported, the mean age ranged from 20.1 to 35 years for participants with AKP and from 66.9 to 70.4 years for patients with OA. Visual analogue scales (VAS) were used in the majority of studies to measure pain during specific activities or overall pain. Other pain measures used were the Modified McGill Analog Scale, a four point category rating scale or an 11 point numerical rating scale. Follow up ranged from immediately after treatment to 12 weeks post-treatment.

Studies were selected for inclusion independently by two reviewers. Consensus was reached from disagreements through discussion with a third reviewer at both titles and abstracts and full text stages.

Assessment of study quality
Validity was assessed using the PEDro scale, an 11 item checklist assessing inclusion criteria, randomisation, allocation concealment, comparability of groups at baseline, blinding of participants, therapists and outcome assessors, loss-to-follow up, intention-to-treat analyses, statistical comparisons and reporting of point and variability measures. The scale yields a maximum score of 10. Only studies with a score of three or more out of 10 on the quality assessment were eligible for inclusion.

Methodological quality was assessed independently by two reviewers. Disagreements were resolved by discussion with a third reviewer.

Data extraction
Data were extracted by a single reviewer. Where more than one scale was used to assess the outcomes, the data extracted were selected according to the hierarchy of pain-related outcomes in OA. The hierarchy was detailed in the text. Pain scores were converted to a percentage of the maximum possible score and represented as millimetres (mm) on a 100mm analogue scale. The mean difference and standard error between intervention and comparison treatments.
were calculated. For the standard errors of difference in crossover studies, a correlation of 0.5 was assumed. Effect sizes were calculated by dividing the mean differences by the pooled standard deviation. Data were extracted for all time periods in the crossover trials.

Methods of synthesis
The data were combined using a random-effects model to calculate the weighted mean difference (WMD) and corresponding 95% confidence intervals (CI), weighted by the inverse of variance for each study. Heterogeneity was assessed using the $I^2$ statistic. Where significant heterogeneity was present, sensitivity analyses were conducted. Publication bias was determined by assessing funnel plot asymmetry using a linear regression approach.

Results of the review
Thirteen studies were included for review (n=580): five RCTs (n=386) and eight randomised crossover trials (n=194). Two studies scored eight out of 10 on the validity assessment, two studies scored seven out of 10, one scored five out of 10 and eight scored three or four out of 10. Methodological limitations evident in many studies included absence of subject or assessor blinding, lack of allocation concealment, high loss to follow up and failure to use intention-to-treat analyses. The overall methodological quality was judged by the reviewers to be moderate.

Effect of patellar taping on chronic knee pain
Medially directed tape was associated with a significant reduction in pain compared to no tape (eight studies n=288; WMD = 16.1, 95% CI: -22.2, -10.0, p<0.001) and sham tape (eight studies n=242; WMD = 10.9, 95% CI: -18.4, -3.4, p<0.001). There was evidence of significant heterogeneity for both these analyses ($I^2$ = 79% and $I^2$ = 87% respectively). Sensitivity analyses excluding two studies with outcomes opposing the pooled analyses or excluding studies with quality scores of less than five did not alter the results. Including studies of taping with other co-interventions did not alter the findings. There was evidence of significant publication bias (p<0.02). Subgroup analyses revealed that patients with AKP treated with medially directed tape had significantly less pain compared to patients with no tape (six studies n=212; WMD = 14.7, 95% CI: -22.8, -6.9, p<0.001) but not when compared to patients receiving sham tape. Patients with OA treated with medially directed tape showed significantly less pain compared to patients treated with no tape (two studies n=76; WMD = 20.1, 95% CI: -26.0, -14.3, p<0.001) or patients treated with sham tape (three studies n=90; WMD = 13.3, 95% CI: -18.1, -8.4, p<0.001). There was no significant difference between patients treated with laterally directed tape and medially directed tape (three studies n=100).

Effects of patellar bracing on anterior knee pain
The use of a medially directed brace was associated with a significant reduction in pain compared to no brace (three studies n=119; WMD = 14.6, 95% CI: -25.5, -3.8, p<0.01), but there was evidence of significant heterogeneity ($I^2$ = 76%). There was no significant difference in pain levels between patients treated with a medially directed brace and those treated with a sham brace (two studies n=94).

Authors' conclusions
Medially directed tape produced a clinically meaningful reduction in chronic knee pain, but there was limited evidence for the efficacy of patellar bracing. The results were limited by high heterogeneity between studies and the presence of significant publication bias.

CRD commentary
The review addressed a clear question with well-defined inclusion criteria. Several relevant databases were searched. The search was restricted to English language articles, so language bias cannot be ruled out. Attempts were not made to identify unpublished material. Dissertations and conference proceedings were excluded. Significant publication bias was found. The use of only one reviewer to extract data meant that reviewer error and bias in that step could not be ruled out. The study selection and validity assessment processes were carried out independently and in duplicate, thereby minimising the risk of reviewer error and bias. The methodological quality of included studies was assessed using an appropriate tool and used to inform the results. Given the presence of significant statistical and clinical heterogeneity between studies, the use of a narrative synthesis may have been more advisable. This was a generally well-conducted review. The authors' conclusions were appropriately cautious given the presence of publication bias and
statistical heterogeneity.

**Implications of the review for practice and research**

Practice: the authors did not state any implications for practice.

Research: the authors stated that further well-designed studies were needed on the effects of patellar bracing on chronic knee pain, particularly in knee OA.

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