Patellofemoral pain syndrome: a review on the associated neuromuscular deficits and current treatment options
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CRD summary
The authors concluded that physiotherapy appeared to improve quadriceps muscle imbalance in patients with patellofemoral pain syndrome. Both open and closed kinetic chain exercises were beneficial. Lack of reporting of review methods made it difficult to assess the reliability of the conclusions and reliance upon a few generally small short-term studies suggested that any conclusions should be interpreted with caution.

Authors' objectives
To evaluate the effects of hip strengthening exercises, quadriceps muscle balance restoration exercises, patellar taping and open versus closed kinetic chain exercises in patients with patello-femoral pain syndrome.

Searching
MEDLINE and PEDro were searched from 1998 to January 2006 for studies published in English. Search terms were reported. Reference lists of identified studies were searched.

Study selection
Randomised controlled trials (RCTs) and intervention studies that evaluated the following interventions in patients with patello-femoral pain syndrome were eligible for inclusion: hip strengthening exercises; physiotherapy treatments aimed at restoring the muscle balance between the vastus medialis oblique and vastus lateralis; open versus closed kinetic chain exercises; and the effect of patellar taping on electromyogram muscle onset timing or electromyogram muscle amplitude.

Where reported, the mean age of participants ranged from 27 to 35 years (three studies). The duration of exercise programmes ranged from six to 14 weeks. All of the taping interventions appeared to be based on a once-only application of tape interventions. These studies compared changes in patello-femoral pain syndrome patients under different tape conditions (therapeutic tape, placebo tape and no tape) with asymptomatic or healthy controls under similar conditions. The included exercise studies assessed a variety of outcomes including functional status, strength of various muscles, gait, pain, pain during various activities, stair stepping and electromyogram measures.

The authors stated neither how papers were selected for the review nor how many reviewers performed the selection.

Assessment of study quality
The validity of RCTs was assessed using the PEDro scale. The maximum possible score was 10 points. RCTs that scored 5 or more were classified as high quality.

The authors did not state how the validity assessment was performed.

Data extraction
The authors stated neither how data were extracted for the review nor how many reviewers performed the data extraction.

Methods of synthesis
The studies were grouped by type of intervention and combined in a narrative synthesis. The level of evidence for each intervention was graded using a hierarchy of evidence described by Van Tulder et al.

Results of the review
Details of seven RCTs (n=289), one before/after study (n=28), one cohort study (n=35) and one case report (n=2) were presented in tables. An additional four intervention studies were mentioned in the text, but no details were reported.
Hip strengthening exercises (one before/after study, one cohort study and one case report): No RCTs were identified so there was no evidence that these exercises improved symptoms in patients with patello-femoral pain syndrome.

Physiotherapy treatment aimed at restoring the muscle balance between vastus medialis oblique and vastus lateralis (two RCTs that compared interventions with placebo): Pedro scores were 5 and 6. Studies reported that the intervention was associated with reduced symptoms (one study), and simultaneous electromyogram onset of vastus medialis oblique and vastus lateralis (two studies) with no changes in placebo groups. There was strong evidence that interventions improved quadriceps muscle imbalances in patients with patello-femoral pain syndrome.

Effects of taping on quadriceps muscle activation (three RCTs plus four intervention studies): PEDro scores were 3, 4 and 5. Two of the three RCTs reported a change in activation with taping; one RCT reported no change. Intervention studies apparently reported inconsistent results. There was inconclusive evidence on the effect of taping on quadriceps muscle activation.

Open versus closed kinetic chain exercises (two RCTs plus a five-year follow-up of one study): PEDro scores were 6 for both original studies and 7 for the follow-up study. One study reported significant reductions in pain and increased function in both the closed and open exercise groups at three months with maintenance of improvements at five years. The other study reported significant reductions in pain and increased function in closed and open exercise groups at six weeks compared to a no-treatment control group. Neither study reported any significant differences between open and closed exercise groups. There was strong evidence that both open and closed chain exercises were beneficial.

Authors’ conclusions
Physiotherapy treatment programmes appeared to be effective at improving quadriceps muscle imbalance. Both open and closed kinetic chain exercises were appropriate for patients with patello-femoral pain syndrome. More research was required to evaluate therapeutic patellar taping.

CRD commentary
The review addressed a clear research question that was supported by detailed inclusion criteria. Limiting the search to English-language published studies identified in two databases plus references may have resulted in the omission of other relevant studies and raised the potential for publication and language biases. The validity of RCTs was assessed, but only aggregate scores were presented, which made it difficult to independently comment on the reliability of the evidence presented. Methods used to select studies, assess validity and extract data were not described, so it was unknown whether efforts were made to reduce reviewer errors and bias. In view of the diversity among studies, a narrative synthesis was appropriate. Studies often reported multiple outcomes and it was unclear whether the reported outcomes included all outcomes evaluated in individual studies. Findings for individual studies were reported without supporting data, which meant that it was not possible to verify the reported findings. There were inconsistencies in the numbering of references in tables compared to the text and the reference list. It was unclear whether correction of muscle imbalances translated into positive clinical outcomes. The authors’ conclusions appeared to reflect the evidence, but lack of reporting of review methods made it difficult to assess the reliability of the conclusions and reliance upon a few generally small short-term studies suggested that any conclusions should be interpreted with caution.

Implications of the review for practice and research
Practice: The authors recommended quadriceps retraining exercises and both open and closed kinetic chain exercises for patients with patello-femoral pain syndrome. They recommended combinations of interventions based on the specific cause of the patients’ symptoms.

Research: The authors stated that further research was required to evaluate the long-term effects of open and closed kinetic chain exercises, multiple applications of tape over a longer time and long-term effects of quadriceps re-training on pain measures and strengthening of hip joint muscles in patients with patello-femoral pain syndrome.

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