Foot orthoses can reduce lower limb overuse injury rate

Synopsis


**Question:** Does the use of foot orthoses reduce injury rates in an at-risk military population? **Design:** Randomised, controlled trial. **Setting:** A naval college in the United Kingdom. **Participants:** New-entry officer cadets assessed as having medium to high risk according to plantar pressure deviations assessed during a walking task. Key exclusion criteria were pre-existing orthotic use, and lower limb injury within the last 6 months. Randomisation of 400 participants allocated 200 to the intervention group and 200 to a control group. **Interventions:** Both groups completed a progressive gym and running program, which included a minimum of 2 or 3 periods of physical training each day over a 7 week period. In addition, the intervention group received customised foot orthoses. The control group received neither a shoe insert nor an orthosis. **Outcome measures:**

The primary outcome was lower limb overuse injury requiring removal from physical training for 2 or more days. Secondary outcome was the number of other adverse events. **Results:** 400 participants completed the study; 219 potential participants were excluded because they were assessed as having a low risk from the biomechanical plantar pressure assessment. After 7 weeks training, there were 21 injuries in the intervention (orthosis) group and 61 injuries in the control group resulting in an absolute risk reduction of 0.20 (95% CI 0.10 to 0.28) and a number needed to treat of 5 (95% CI 4 to 8). A similar number of minor adverse events of foot blisters were reported by both groups (intervention n = 12, control n = 16) **Conclusion:** The use of customised foot orthoses during military training for those assessed as being at-risk resulted in a 20% reduction in lower limb overuse injury rate.

[Absolute risk reduction, number needed to treat and 95% CIs re-calculated by the CAP Co-ordinator.]

Commentary

A recent Cochrane systematic review found that foot orthoses are effective for the treatment of foot pain (Hawke et al 2008). The question of whether orthoses are effective for the prevention of injuries has also received investigation, including two systematic reviews (Collins et al 2007, Landorf & Keenan 2007). Both reviews found that orthoses prevent injuries in certain populations (mainly military recruits). Whether the orthoses used are prefabricated or customised does not appear to matter (Collins et al 2007, Landorf & Keenan 2007). What does matter is that they are appropriately contoured to the foot and they are not just shock-absorbing insoles, which do not prevent injury (Landorf & Keenan 2007).

Although this is not the first randomised trial to identify a positive preventive role of orthoses – as Franklyn-Miller and colleagues claim – it adds to the evidence base that appropriately contoured foot orthoses are beneficial for preventing injuries. It is generally well conducted; however it does have some limitations, some of which were acknowledged by the authors. This trial would have been strengthened with a control group that received some form of sham treatment. It also appears that the authors may have overestimated the treatment effect with their calculation of the absolute risk reduction, although the re-calculated absolute risk reduction and number needed to treat presented in the synopsis still suggests that the intervention was very beneficial.

A final issue, and one that is arguably more important, is whether a cheaper prefabricated orthosis could provide similar benefit compared to the semi-customised orthosis used in this trial. The prescription technique, while novel, is not commonly used in clinical practice, raising an issue about generalisability of the findings and whether more mass-produced and, as a consequence, cheaper orthoses may be as effective or better. A similar trial found a simpler orthosis to be effective for preventing shin splints (Larsen and Keenan 2002). With this in mind, future trials need to focus not so much on whether contoured orthoses prevent injury, there is now a substantial body of evidence to suggest that they do, but which type of orthosis prevents injuries at the least cost. In the meantime, clinicians should, if they choose to attempt to prevent injury with orthoses, keep cost in mind.

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References

Resistance training preserves skeletal muscle function in patients with COPD who are hospitalised with an acute exacerbation

Synopsis


Question: In patients with chronic obstructive pulmonary disease (COPD), hospitalised with an acute exacerbation, does resistance training preserve quadriceps muscle force or change markers of systemic inflammation or muscle metabolism? Design: Randomised controlled trial with concealed allocation. Neither the investigators nor the participants were blinded to group allocation. Setting: Tertiary hospital in Leuven, Belgium. Participants: Key inclusion criteria were: people with COPD, hospitalised with an acute exacerbation, aged < 85 years, not hospitalised in the previous 14 days, not participating in a rehabilitation program, and no co-morbid conditions precluding participation in resistance training. Randomisation of 40 patients allocated equal numbers to the intervention and groups. Interventions: Both groups received standard doses of oral corticosteroids and physiotherapy limited to airway clearance techniques and breathing exercises. In addition, each day, the intervention group performed three sets of eight repetitions of quadriceps resistance exercise, at a load set at 70% of the one repetition maximum. The load was progressed according to symptoms of dyspnoea and fatigue. Training sessions were supervised by physiotherapists. Outcome measures: The primary outcome was maximum isometric quadriceps force. Secondary outcomes included six-minute walk distance (6MWD) and serum concentrations of C-reactive protein, testosterone and insulin-like growth factor-1. In a sub-group of patients (n = 20), gene expression for anabolism and catabolism were obtained via biopsy of vastus lateralis. Results: Data were available on 36 patients at the time of hospital discharge. At discharge, the mean difference in the magnitude of change in quadriceps force in the intervention group relative to the control group was 10.7% (95% CI 0.9 to 20.7%). The intervention group demonstrated a predominant expression of anabolic markers, whereas the control group tended to demonstrate a predominance of catabolic markers. There were no other significant between-group differences. Conclusion: Resistance training for patients with COPD who were hospitalised for an exacerbation preserved quadriceps force without increasing biomarkers of systemic inflammation.

Commentary

Atrophy and skeletal muscle dysfunction are usual consequences in chronic obstructive pulmonary disease (COPD), which jeopardize both exercise tolerance and survival (Maltais et al 2000). A sedentary lifestyle and repetitive exacerbations contribute to skeletal muscle dysfunction and to the dyspnoea/inactivity downward spiral in which COPD patients are engaged. After an acute exacerbation, muscle force and daily life activities are markedly reduced and functional recovery to previous levels may be long and difficult to achieve (Pitta et al 2006).

In this study from Troosters et al (2010), the authors show that resistance muscle training during exacerbation in COPD patients is feasible, prevents deterioration of skeletal muscle function, and may optimise exercise capacity without increasing harmful systemic inflammation. However, as no formal exercise therapy was offered to the control group, it is difficult to know whether resistance training offers additional benefit over and above usual clinical management, which includes early mobilisation. Nevertheless, early resistance training could be considered as a strategy to prevent muscle function deterioration, a major target for physiotherapists dealing with patients hospitalised for exacerbation of COPD.

Keeping a similar goal in mind, other strategies like neuromuscular electrical stimulation (Vivodtzev et al 2006) or bedside cycle ergometry (Burtin et al 2009) are also interventions likely to prevent or attenuate the decrease of muscle function in severe patients. This study provides physiotherapists with an additional strategy, which could be incorporated with interventions such as early mobilisation, to treat COPD patients’ hospitalised with an exacerbation. Whether resistance muscle training during acute exacerbation translates into maintenance of physical activity levels, long-term preservation of muscle function, exercise tolerance, and/or reduced readmission rates needs to be determined.

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References

Lateral wedge insoles worn for 12 months provided no symptomatic or structural benefit for people with medial knee osteoarthritis

Synopsis


Question: Do lateral wedge insoles or flat control insoles improve symptoms and slow structural disease progression in medial knee osteoarthritis? Design: A double blind randomised, controlled trial with stratification by disease severity (Kellgren and Lawrence Grades 2 and 3) and sex. Group allocation was carried out in permuted blocks of 6 to 12 using an independent researcher. Setting: Community setting in Melbourne, Australia. Participants: Men and women of 50 years or more with average knee pain on walking of more than 3 on an 11-point numerical rating scale (0 = no pain, 10 = worst pain possible) at telephone screening, pain located over the medial knee compartment, evidence of osteophytes in the medial compartment or medial joint space narrowing on an X-ray film, and radiological knee alignment of 185 deg or less indicating neutral to varus (bow leg) knee alignment. Key exclusion criteria included questionable or advanced radiographic knee osteoarthritis (Kellgren and Lawrence Grades 1 and 4), predominant patellofemoral joint symptoms on clinical examination, knee surgery or intra-articular corticosteroid injection within six months, and regular use of a gait aid. Randomisation of 200 participants allocated 103 to wear wedged insoles and 97 to wear flat control insoles. Interventions: Participants wore the insoles bilaterally in their own shoes every day. They were provided with two pairs of insoles, which were replaced every four months. The lateral wedge (5 degrees) insoles were made of high density ethyl vinyl acetate (similar to the midsole in a running shoe) and were wedged along the lateral border of the foot. The control insoles were made of easily compressible low density ethyl vinyl acetate but with no wedging. Outcome measures: Primary symptomatic outcome was change in overall average knee pain (past week). Primary structural outcome was change in volume of medial tibial cartilage from magnetic resonance imaging scans. Secondary symptomatic measures included changes of pain, function, stiffness, and health-related quality-of-life. Secondary structural outcome included progression of medial cartilage defects and bone marrow lesions. Results: 179 (89 lateral wedge insoles, 90 control insoles) out of 200 participants completed the trial. After 12 months between-group differences did not differ significantly for the primary outcomes of change in overall pain (−0.3 points, 95% CI −1.0 to 0.3) and change in medial tibial cartilage volume (−0.4 mm³, 95% CI −15.4 to 14.6), and confidence intervals did not include minimal clinically important differences. None of the changes in secondary outcomes showed differences between groups. Conclusion: Lateral wedge insoles worn for 12 months provided no symptomatic or structural benefits compared with flat control insoles.

Commentary

Weak recommendations based on low level evidence preceded the publication of a previous randomised controlled trial comparing the ideal condition of custom lateral wedged insoles to neutral insoles in the same walking shoes that found no difference at one year (Barrios et al 2009). The American Academy of Orthopaedic Surgeons Guideline on the Treatment of Knee Osteoarthritis guideline, published in 2009, consequently stated ‘We suggest lateral heel wedges not be prescribed for patients with symptomatic medial compartmental OA of the knee. Level of Evidence: II, Grade of Recommendation: B’ (Richmond et al 2010). This well-designed and executed study by Professor Bennell and colleagues demonstrates that in the most common prescription of these orthoses (off-the-shelf orthoses in the patient’s own shoes), there is no benefit in symptoms or progression of disease. ‘First, do no harm’ is the maxim from which the principal precepts of medical ethics, nonmaleficence, is derived. Nearly half of the participants complained that the lateral wedge insole caused discomfort; in 10% of these individuals the discomfort was severe. While 30% of participants in the neutral orthoses group had some discomfort, only 1% was rated as severe. While prescription of insoles is inexpensive and simple, it is now clear that lateral insoles provide no therapeutic or disease modifying benefit and cause discomfort in a large percentage of patients. This study should sound the death knell for the use of lateral wedged insoles for the treatment of medial compartment knee osteoarthritis.

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References