Patients apply excessive weight when instructed to partially weight-bear but with biofeedback can learn to correct this

Synopsis


Question: Does pressure biofeedback improve the ability of patients to achieve their prescribed weight-bearing status? Design: Randomised controlled trial. Setting: A rehabilitation centre in Israel. Participants: Adults with medical instruction to partially weight-bear after fracture or surgery affecting a single lower limb. Major cognitive impairment and neurologic disease were exclusion criteria. Randomisation of 33 participants allotted 15 to the biofeedback group and 18 to a control group. Interventions: Both groups received physiotherapy for 45 minutes for 10 days. The intervention group practised appropriate weight bearing through the affected leg for 20 minutes in standing with audiovisual biofeedback. The feedback was from an insole linked to a portable auditory unit and to a stationary computer screen for visual feedback. This was followed by 15 minutes of walking training with audio feedback and a 5-minute review of the participant’s weight-bearing that day. The control group practised appropriate weight bearing through the affected leg for 20 minutes in standing followed by 20 minutes of walking training, all with the biofeedback unit taking measurements but providing no feedback. However, a physiotherapist supervised the treatment and gave verbal summary feedback. Both groups concluded with 10 minutes of transfer practice and instructions in strengthening exercises for the injured limb. To test retention of any treatment effect, all auditory and visual feedback was switched off in the intervention group after the first 5 days. Outcome measures: The primary outcome was the percentage of body weight borne through the affected leg as measured by the biofeedback unit. The target for toe-touch (TT) weight bearing was ≤20% of body weight and the target for partial weight bearing (PWB) was 21–50% of body weight. Secondary outcomes included the Timed Up and Go test and pain rating using a visual analogue scale. Results: At baseline, most TT participants exceeded their weight-bearing target: 49 ± 14% in the treatment group and 51 ± 21% in the control group. Similarly, most PWB participants exceeded their target at baseline: 63 ± 14% in the treatment group and 59 ± 12% in the control group. Most TT and all PWB participants in the study group met their target weight-bearing status, with or without feedback, at Day 5. This treatment effect was preserved after 5 further days of training without the biofeedback. Among the TT subjects at Day 10, weight bearing was 21 ± 9% of body weight in the treatment group, significantly lower than in the control group (49 ± 26%). Among the PWB subjects at Day 10, weight bearing was 49 ± 9% of body weight in the treatment group, significantly lower than in the control group (64 ± 16%). The groups did not differ significantly on the secondary outcomes at any time. Conclusion: Biofeedback enhances the ability of patients to meet their prescribed amount of partial weight bearing.

Commentary

The prescription of weight-bearing restrictions is a common aspect of the management of many orthopaedic patients. A patient’s ability to adhere to such prescriptions may be influenced by the therapist’s ability to teach weight-bearing status and by the patient’s understanding and ability to self-monitor. This study shows that the use of biofeedback is clinically worthwhile in that it brings patients well within the recommended weight-bearing limits. More importantly the retention of the treatment effect five days after the period of biofeedback is very encouraging. Unfortunately this study did not follow the participants beyond 10 days. The treatment effect may be influenced by ongoing recovery – for example, patients may again exceed the prescribed weight bearing as pain reduces.

The baseline data show that most patients underestimate the amount of weight they take through their leg when instructed to partially weight-bear. This raises the issue of the importance of weight-bearing restrictions, which seem to be based largely on histopathological principles related to bone-healing after fracture or surgery. If restrictions are important, then correcting excessive weight-bearing should reduce poor or delayed healing. Healing was not measured in this study, but it would be an appropriate avenue for further research. If the control group did have worse healing, it was not severe enough to have reduced their improvement on the Timed Up and Go test in the first 10 days. Conversely, some authors have theorised that restriction of weight-bearing could reduce recovery of functional ability and therefore delay rehabilitation (Andersson et al 2001). This study confirmed that the rate of improvement, as reflected in the Timed Up and Go test, was not significantly reduced by rigorous application of the prescribed weight-bearing status via the use of biofeedback in the treatment group.

Until we have further data about the effects of weight-bearing on healing, it is reasonable to try to apply the prescribed weight-bearing status accurately. Biofeedback will assist physiotherapists both to achieve this and to confirm that they have achieved this.

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References

Neuromuscular training reduces the risk of leg injuries in female floorball players

Synopsis


Question: Is a neuromuscular training program useful in preventing non-contact leg injuries in female floorball players? Design: Cluster randomised controlled trial. Setting: Twenty-eight elite level female floorball (indoor hockey) teams in Finland. Participants: 457 players (mean age: 24 years) without major injury at commencement of the study. Players in both groups were comparable at baseline with respect to age, body mass index, playing experience and number of previous injuries, operations or pre-season training volume. Interventions: The neuromuscular training program aimed to enhance players’ sports-specific motor skills and body control, and consisted of four components: running techniques, balance and body control, plyometrics, and strengthening exercises. In addition, players who had difficulties with control of the lower back or limited flexibility did stretching exercises. Training was provided by the team’s coach, physiotherapist, or a player who had been educated in the intervention. Equipment included balance boards, balance pads, medicine balls, exercise diaries, and instruction booklets. Training sessions of 20-30 minutes were carried out throughout the 6-month floorball season. Training was divided into four periods during the floorball season: two intensive periods, training 2–3 times per week at the start of the season and during the mid-season break, and two maintenance periods, training once per week during the competitive season. The control group participated in their usual training program. Outcomes: The primary outcome was the incidence of acute non-contact injuries of the legs. An acute injury was defined as an injury occurring during practice or competition, preventing the player from participating in a game or practice session for 24 hours. Results: During the season, 72 acute non-contact injuries occurred, 20 in the intervention group and 52 in the control group. The risk of injury was 66% lower in the intervention group (adjusted incidence rate ratio: 0.34; 95% CI 0.20 to 0.57). The greatest effect was on ankle ligament injuries: 27 ankle ligament injuries occurred in the control group and only 8 in the intervention group (adjusted incidence rate ratio: 0.28; 95% CI 0.12 to 0.67). Teams with high compliance and adherence to the neuromuscular training program had a greater reduction in overall injury risk, compared with the control group (adjusted incidence rate ratio: 0.19; 95% CI 0.06 to 0.64). Conclusion: Neuromuscular training in female floorball players has a large effect in reducing the incidence of acute non-contact leg injuries, which are common in this sport.

Commentary

Primary prevention of sports injury is important to reduce immediate and long-term morbidity and maximise team performance. Physiotherapists need to play a greater role in primary prevention. This trial, showing that a neuromuscular training program lowered the risk of acute leg injuries, provides useful information for the clinician. It also confirms the results of previous studies (Renstrom et al 2008).

The program, comprising balance, strengthening, stretching, and body control components, was relatively standardised and delivered to all players by the coach, physiotherapist, or trained player. Whilst this might facilitate practical application of the program, benefits may be greater if individualised programs could be applied to those identified as being at greatest risk of injury (Myer et al 2007). Further research is needed to better define those ‘at risk’ and to establish reliable and valid screening tools suitable for the field setting.

There are several factors that could influence the injury prevention effects of the training program. First is the type of sport. The study was conducted in high-level female floorball (indoor hockey) players in Finland. It is not known whether the results can be generalised to other floorball players or to other sports with high rates of acute leg injuries such as netball, soccer, basketball and Australian Rules football. Second, benefits of this program are likely to depend on the extent to which the components of the neuromuscular program are already part of the players’ usual training. The benefits are likely to be attenuated if usual training already addresses these to some extent. Third, as highlighted in the study, and as to be expected, greater compliance to the program is associated with greater effects. This has implications for practical implementation and stresses the importance of incorporating strategies to maximise compliance.

Overall, the study provides details of a neuromuscular training program that could be incorporated into a team’s training regimen. Further research is needed to confirm the benefits in sport settings other than floorball.

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References

Physiotherapy reduces the risk of deformational plagiocephaly in infants who have a preferred head position when lying supine

Synopsis


Question: Does physiotherapy reduce the risk of severe deformational plagiocephaly in infants who exhibit a preferred head position while in supine lying? Design: Randomised controlled trial with concealed allocation and blinded assessors. Setting: General hospital in the Netherlands. Participants: Infants at 7 weeks post-gestational age who exhibited head rotation to either the right or the left side when in the supine position for approximately three-quarters of the time of observation, without active rotation of the head over the full range of 180 deg (minimal time of observation, 15 minutes). Torticollis, dysmorphisms and syndromes were exclusion criteria. Randomisation of 65 infants allotted 33 to the physiotherapy group and 32 to a control group. Interventions: Parents of the infants in both groups received a leaflet describing basic preventive measures for plagiocephaly and advice from health care providers at well-child clinics. The control group did not receive any further intervention. The physiotherapy group also received up to eight sessions of physiotherapy at least a week apart before babies reached the age of 6 months. These sessions included exercises to reduce positional preference and to stimulate motor development, parental counselling about counterpositioning, handling, nursing, and the causes of positional preference. Greater playing time in the prone position when awake was encouraged. Sessions were ceased when positional preference disappeared, parents had incorporated the advice about handling and there were no signs of motor developmental delay or asymmetry. Outcome measures: The primary outcome was severe deformational plagioccephaly, defined as a ratio of the longest:shortest oblique diameter of the head of 1.04 or greater. Secondary outcomes included symmetry in posture and active movements, motor development, and passive range of motion of the cervical spine. All outcomes were measured at 6 and 12 months of age. Results: All infants completed the 6-month assessment and data were carried forward for three (5%) who then deviated from their allocated treatment. Physiotherapy significantly reduced the risk of severe deformational plagiocephaly at 6 months (Relative Risk (RR) 0.54, 95% CI 0.30 to 0.98) and at 12 months (RR 0.43, 95% CI 0.22 to 0.85). This indicates that for every 3 infants with positional preference treated with physiotherapy, one case of severe deformational plagioccephaly at 12 months will be prevented (95% CI 2 to 12). The groups did not differ significantly on the secondary outcomes. Conclusion: In infants with positional preference, physiotherapy intervention in addition to usual care reduced the risk of severe deformational plagiocephaly at one year.

[95% CI for the number needed to treat calculated by the CAP Co-ordinator.]

Commentary

Deformational plagiocephaly (DP), a frequently occurring pediatric condition, is characterised by changes in skull shape in the absence of craniosynostosis. The cranial sutures are open and normal, therefore conservative management, such as physiotherapy and helmet therapy, is frequently used to treat this condition. Despite anecdotal evidence that suggests that these forms of management are effective in reducing DP, there is a paucity of high quality evidence that underpins these two treatment methods (Bialocerkowski et al 2005). Therefore, this high quality randomised controlled trial makes a welcome addition to the evidence regarding the effectiveness of treatments for DP. It provides strong evidence that physiotherapy with advice to parents is more effective than advice alone in reducing DP. Moreover, these effects are maintained for at least six months following physiotherapy.

From a clinical standpoint, the physiotherapy delivered seems intuitive, as it addressed asymmetries associated with infant handling using counterpositioning and parental education as well as stimulating motor development. This program appears to be relatively easy to replicate in the clinical setting, as it does not require costly equipment or advanced pediatric physiotherapy skills. Potentially, this physiotherapy program could be delivered in hospital and community-based settings. This study, however, does not provide evidence regarding the effectiveness of each type of physiotherapy technique. Thus clinicians should use all of these techniques as a package of care.

Although it appears that physiotherapy tends to decrease DP, cost-benefit analyses should be undertaken to determine the economic as well as physical benefit of treating infants with physiotherapy compared to advice and other forms of conservative management. Moreover DP is not only a cosmetic disorder, as DP has been found to be associated with developmental difficulties (Miller and Claren 2000). Because its secondary effects may be long lasting and costly to treat, consideration needs to be given to programs that prevent this disorder from occurring.

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References