Pulmonary rehabilitation can be equally effective in hospital and home settings

Synopsis


**Question:** Is pulmonary rehabilitation with the exercise component performed at home as effective at reducing dyspnoea as outpatient pulmonary rehabilitation? **Design:** Randomised, controlled trial with concealed allocation. **Setting:** Ten centres in Canada. **Participants:** Adults with stable chronic obstructive pulmonary disease (COPD), aged at least 40 years, with an FEV₁ less than 70% of the predicted value, an FEV₁/FVC ratio of less than 0.70, and a Medical Research Council dyspnoea score of 2 or more. Previous pulmonary rehabilitation was an exclusion criterion. Randomisation of 252 participants allotted 126 to each group. **Interventions:** Both groups received the same eight educational lectures over 4 weeks as hospital outpatients. The outpatient group then commenced combined aerobic and strength training on an outpatient basis with supervision, attending three sessions per week for 8 weeks. Each session consisted of cycle ergometry for 30 minutes at 80% of peak work capacity and progressive resistance exercises for 30 minutes. Supplemental oxygen was provided as appropriate. The other group trained at home, also for three sessions per week over the same 8 weeks. The first session was supervised, followed by weekly phone contact. Cycle ergometers were loaned to participants for the aerobic training for the 8-week period. The target intensity was 60% of peak work capacity for 40 minutes per session. The resistance exercises and oxygen supplementation were the same as for the outpatient group. Thereafter, both groups were prescribed three home exercise sessions per week for another 9 months. **Outcome measures:** The primary outcome was the change in the dyspnoea domain of the Chronic Respiratory Questionnaire (CRQ) at 12 months. Secondary outcomes were other CRQ domains, the St George’s Respiratory Questionnaire (SGRQ), the 6-minute walk test, an endurance cycle test, and safety. **Results:** Follow-up was 92% at 3 months and 86% at one year. The CRQ dyspnoea scores differed by 0.05 (95% CI −0.21 to 0.29) at 3 months and by 0.16 (95% CI −0.08 to 0.40) at one year. This excluded the minimum clinically important difference of 0.5, confirming that the two rehabilitation strategies had very similar effects on dyspnoea. The home-based group showed significantly better improvement on the Symptoms domain of the SGRQ at 3 months, but this difference was no longer significant at one year. On the remaining secondary outcomes, the two rehabilitation strategies had similar effects. **Conclusion:** For adults with COPD, pulmonary rehabilitation with the exercise component performed at home can be as effective as outpatient pulmonary rehabilitation.

Commentary

Pulmonary rehabilitation (PR) is one of the few interventions that improves exercise capacity and health-related quality of life (HRQOL) in people with COPD. However, the lack of access to PR (approximately only 1–2%) limits the number of COPD patients that can benefit. Therefore, recent studies have focused on ways to improve access.

This large randomised, controlled, multi-centre study provides strong evidence that a home-based PR program is as effective as a hospital-based program in reducing dyspnoea and improving HRQOL, both immediately following completion of a 4-week education plus 8-week cycle and resistance training program and after a further 9 months maintenance program where encouragement to continue to exercise was provided by telephone contact every 2 months.

Clinicians should note that the home PR was provided by placing a cycle ergometer in the home for 8 weeks. This may not be a feasible option in many settings. For safety, the cycle training intensity was reduced in the home-based program to 60% peak work, from 80% in the hospital-based program. Previous studies in COPD cohorts with similar characteristics have shown that 60% of peak work capacity is effective in eliciting a training effect (Maltais et al 1996). Since no adverse events specifically related to the exercise training were evident, this intensity of training was considered safe for home-based training, even in those with co-morbid conditions, provided that patients were reviewed by a physician and successfully completed a maximum cycle exercise test prior to commencing training. Again, the feasibility of providing such tests may limit the applicability of this type of screening.

While improving HRQOL and dyspnoea, the chosen training mode (cycling) resulted in only a small, albeit significant, increase in functional exercise capacity as measured by six-minute walk distance, which was well below the minimum clinically important difference. It will be important to determine whether other modes of home-based exercise training, eg walking, can achieve more meaningful improvements in such an important daily activity.

This study encourages clinicians to consider alternatives to hospital-based PR by adding to the growing body of literature that provides evidence that individually tailored, home-based PR programs are effective for people with COPD.

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References

Electrical stimulation is a useful adjunct in the management of urinary incontinence in people with multiple sclerosis

Synopsis


Question: Does neuromuscular electrical stimulation improve lower urinary tract dysfunction in people with multiple sclerosis (MS), when given in addition to pelvic floor exercises and electromyographic biofeedback?

Design: Randomised, controlled trial with concealed allocation and blinded assessment of some outcomes.

Setting: Twelve health-care facilities in Northern Ireland.

Participants: Adults with MS with no hospital admissions in the preceding 3 months. They were required to have lower urinary tract dysfunction (involuntary leakage, > 8 voids per day, nocturia, or voiding dysfunction) but not to score more than 7.5 on the Expanded Disability Status Scale (EDSS) from 0 (normal) to 10 (death due to MS). Symptomatic prolapse, prostatic hyperplasia, infection and contraindications to electrical stimulation were exclusion criteria. Randomisation of 74 participants allotted 37 to each of two groups. Interventions: Both groups were taught skills and strategies to prevent incontinence and trained in pelvic floor muscle exercises. Both groups were taught to perform the exercises with electrical stimulation via a hand-held unit with a vaginal or anal probe. The treatment group received active stimulation while the control group received sham stimulation. Both groups performed the exercises daily for 9 weeks. The exercises were reviewed with electromyographic biofeedback at a weekly clinic visit.

Outcome measures: The primary outcome was the number of leakage episodes per day as monitored by diary. Secondary outcome measures included gain in pad weight after use, voiding measures, symptom questionnaires, and assessment of pelvic floor muscle function using the Oxford classification and EMG. All outcomes were measured at 9, 16, and 24 weeks. Results: In each group, 36 participants completed the study. At 9 weeks, the treatment group had significantly less incontinence, with 0.8 fewer episodes per day (95% CI 0.1 to 1.4) and 89 g lighter pads (95% CI 8 to 171) than the control group. The treatment group also had significantly larger voids, by 47 ml (95% CI 1 to 93), and significantly smaller post-void residual volumes. Symptoms were also rated as significantly less bothersome. At 24 weeks, however, pad weight was the only objective outcome that remained statistically significant. Nevertheless, patients in the treatment group still rated their symptoms as significantly less bothersome on two questionnaires. Conclusion: For people with MS, the addition of electrical stimulation to a program of pelvic floor muscle training and EMG biofeedback induces several improvements in lower urinary tract dysfunction. Although some improvements were temporary, symptoms remained less bothersome for 24 weeks.

[95% CIs calculated by the CAP Co-ordinator using data in the tables or graphs.]

Commentary

Bladder dysfunction is common among people with MS (Hennessey 1999), increasing in prevalence with increasing severity of MS (Nortvedt 2001). Bladder dysfunction has widespread adverse impacts on quality of life in these patients, regardless of the severity of MS (Nortvedt 2001). Although there are methods to manage bladder dysfunction, such as absorbent pads or catheterisation, the ideal goal of treatment is to reduce or eliminate it. This trial is well designed and reported, satisfying the external validity criterion and nine of the ten internal validity criteria on the PEDro scale. These nine include two of the three blinding criteria – criteria that are rarely met in physiotherapy trials (Maher 2008).

The magnitude of the benefits immediately after treatment appears to be clinically worthwhile, given that quality of life improved. Not all of the benefits seen at the end of the therapy period persisted at follow-up. However, the beneficial treatment effect on 'pad weight after use' was still significant at that time. This was sufficient to also maintain a clear benefit in quality of life at this time point. This highlights the importance of advising patients about the correct continence products, so that the control of fluid is maximised and the impact on quality of life is minimised. The parameters of the electrical stimulation described have been shown to be effective in other populations. In patients with MS, however, fatigue may limit the duration of treatment that can be tolerated. Although the authors state that treatment duration was increased ‘up to 30 minutes’, it is not clear how many patients achieved this target. Therapists should be aware that some patients with MS may only tolerate a shorter treatment.

MS is characterised by periods of relapse and remission. It is unclear whether the treatment benefits of the 9-week intervention used in this study would persist across these periods. Future research could investigate whether this intervention should be applied as an ongoing or repeated strategy along with pelvic floor muscle training.

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References

Endurance and strength training have different benefits for people with peripheral arterial disease, but both improve quality of life

Synopsis


Question: Do treadmill training and resistance training improve the functional performance of patients with peripheral arterial disease (PAD)? Design: Randomised, controlled trial with blinded outcome assessment and stratification for symptoms of intermittent claudication (IC). Setting: Tertiary hospital in the USA. Participants: Participants with an ankle brachial index of 0.95 or less were recruited from vascular clinics and the community. Key exclusion criteria were critical limb ischaemia, foot ulcers, amputation, inability to attend or perform the interventions, and usual exercise comparable to the study regimens. Randomisation of 156 participants allotted 51 to treadmill training, 52 to resistance training and 53 to a control group. Interventions: The treadmill group performed supervised treadmill exercise 3 times per week for 6 months. Participants aimed to increase to 40 minutes by week 8, after which the speed or grade of the treadmill was progressed. Participants with IC were encouraged to exercise to near maximal leg symptoms. Asymptomatic participants exercised at a perceived exertion of 12 to 14 on the Borg scale. The resistance group also performed supervised exercise 3 times per week for 6 months, including 3 sets of 8 repetitions of resisted lower limb exercises. External resistance was maintained above 50% of 1 repetition maximum and perceived exertion at 12 to 14. The control group attended 11 sessions that were designed to provide contact with a health professional but not to change behaviour. Outcome measures: The primary outcomes were the change in the six-minute walk test (6MWT) and the short physical performance battery (SPPB) at 6 months. The SPPB assesses walking speed, balance, and sit-to-stand performance. Secondary outcome measures were treadmill endurance, lower limb strength, endothelial function measured non-invasively at the brachial artery, habitual physical activity measured over 7 days via an accelerometer, a walking impairment questionnaire (WIQ), and the SF-36 quality of life questionnaire. Results: Compared to control, treadmill training significantly improved 6MW distance (by 36 m, 95% CI 15 to 57), total treadmill time (by 3.4 min, 95% CI 2 to 4.8), pain-free treadmill time (by 1.6 min, 95% CI 0.3 to 2.9), endothelial function, and the Distance domain of the WIQ. Compared to control, resistance training significantly improved total treadmill time (by 1.9 min, 95% CI 0.5 to 3.3), knee extension strength (by 80 N, 95% CI 37 to 124), and the Distance and Stair Climbing domains of the WIQ. Both regimens produced significant, 7.5-point improvements in the Physical Functioning domain of the SF-36. Conclusion: Treadmill and resistance training have different benefits for people with peripheral arterial disease, but both improve quality of life.

Commentary

Previous studies of exercise for PAD have focused on patients with IC. In this study, patients without IC were also included and randomisation was stratified to ensure an even proportion was allocated to each treatment group. This strongly suggests that one premise of this study was to compare the effect of training on PAD patients with IC versus those without IC. The authors report only that these groups had ‘reasonably similar’ outcomes, stating that the trial was underpowered for this comparison to be made statistically. This may be because fewer than 20% of the participants had IC. Nevertheless, the high proportion of participants without IC provides welcome data about this under-investigated group.

Follow-up for the primary analysis was excellent at 92%. Some secondary outcomes had substantially lower follow-up, ranging from 56% to 88%. Although this creates a source of error in the results, sensitivity analyses suggest that the missing data were not grossly atypical.

Specificity of training was clearly evident. Treadmill training significantly improved walk-based outcomes, whereas the effects of resistance training were non-significant or lesser. Conversely, only resistance training significantly improved strength-based outcomes. Despite these differences, the size of the effect on quality of life related to physical function was the same for the two regimens.

Clinically worthwhile improvements in six-minute walk distance have not been established in patients with PAD, unlike chronic obstructive pulmonary disease (COPD). The improvement in the treadmill training group of this cohort (20 m), while statistically significant, is less than the improvement considered clinically worthwhile in moderate to severe COPD patients (35 m) (Puhan et al 2008). As a result, it is difficult to state that the improvement in six-minute walk distance was clinically significant in PAD patients.

The results of this study suggest that clinicians can train patients with PAD and physical limitation, regardless of the presence or absence of symptoms of IC. Furthermore, due to specificity of training, clinicians can prescribe the modality of exercise that more closely targets the specific problems of the individual patient, rather than a ‘one modality fits all’ approach.

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References

Restriction of the range of arm elevation exercises for one week after surgery for breast cancer can reduce the incidence of lymphoedema

Synopsis


Question: Does restriction of full shoulder mobilisation for one week reduce the incidence and severity of lymphoedema in women after axillary lymph node dissection (ALND) for breast cancer? Design: Randomised, controlled trial with concealed allocation and blinded assessment of some outcomes. Setting: Two hospitals in the United Kingdom. Participants: Adult women with early breast cancer admitted for surgery that included axillary lymph node dissection. Previous breast cancer, axillary surgery and local radiotherapy were exclusion criteria. Randomisation of 116 participants allotted 58 to a standard exercise regimen and 58 to the same regimen with restricted arm and shoulder movement for the first week. Interventions: All participants were prescribed four 10-minute exercise sessions per day, in which individual exercises were repeated slowly and rhythmically 3 to 4 times. The exercises included unresisted shoulder and elbow range-of-motion exercises while upright. The early mobilisation group commenced full shoulder mobilisation within two days after surgery. The exercises were modified for the delayed mobilisation group so that the arm was not elevated above horizontal for the first 7 days after surgery. Exercises encouraging full range of shoulder movement were introduced in the second week. The exercises were supervised during the hospital admission and were prescribed to continue for one year at home. Outcome measures: The primary outcome was the incidence of lymphoedema, defined as a 200 ml or greater difference in arm volume compared to the unoperated arm. Secondary outcome measures were the severity of lymphoedema again determined by volume, wound drainage volumes, range of shoulder motion, grip strength, and quality of life scores related to shoulder disability and breast cancer therapy. Results: 109 participants completed the study. After one year, 16 women in the early mobilisation group but only 6 women in the delayed mobilisation group had developed lymphoedema. Thus one case of lymphoedema was prevented for every 6 women managed with the exercise regimen that delayed shoulder mobilisation (95% CI 3 to 35). Lymphoedema severity and wound drainage were both significantly greater in the early mobilisation group. The groups did not differ significantly on the remaining secondary outcomes. Conclusion: The incidence of lymphoedema can be reduced by restricting exercises so that the arm is not elevated above horizontal for one week after ALND.

Commentary

Lymphoedema and shoulder dysfunction are sequelae following breast cancer management. Postoperative exercise following ALND has traditionally focussed on early shoulder movement recovery despite growing evidence that delaying shoulder movement to < 90° in the early postoperative period may reduce the incidence and severity of lymphoedema (Kärki et al 2001, Box et al 2002a, 2002b, 2003, McNeely 2007).

This study has demonstrated a significant reduction in the incidence of lymphoedema at one year postoperatively, further supporting this approach to physiotherapy following ALND. The small NNT is consistent with previous authors, indicating that this is a very cost-effective approach to reducing lymphoedema when compared to the cost of treating one patient with lymphoedema. Longer term follow-up is required as lymphoedema remains a lifetime risk following ALND.

Volume difference of > 200 ml was used to exclude ‘pre-existing lymphoedema’ preoperatively and diagnose lymphoedema at one year. The severity of change from preoperative baseline volume measurements was significantly greater in the early movement group at one year. It is not clear why this was not used as the primary outcome measure. Preoperative measurement of arm size is gaining international preference to facilitate the early detection and management of lymphoedema following ALND.

The clinical protocol (www.lymphoedemaleeds.co.uk) is limited in the progression of shoulder exercises and stretches following the introduction of > 90° shoulder movements for both groups and may account for the shoulder dysfunction reported. Previous studies with follow-up and exercise progression by clinicians rather than phone contact as used in this study demonstrate less shoulder dysfunction. Physiotherapy interventions following ALND that delay proximal regional movement must be balanced with exercise progression to optimise movement and function while reducing Lymphoedema as either may compromise quality of life.

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References