Tai Chi training is effective in reducing balance impairments and falls in patients with Parkinson’s disease

Synopsis


Question: Does Tai Chi improve postural control in patients with Parkinson’s disease? Design: Randomised, controlled trial and blinded outcome assessment. Setting: University clinic in USA. Participants: Individuals with Parkinson’s disease (Hoehn and Yahr Stage 1–4) between the age of 40 and 85 years, and ability to walk with or without an assistive device were key inclusion criteria. Mini-Mental State examination score < 24 and concurrent participation in other instructor-led exercise programs were key exclusion criteria. Randomisation of 195 participants allocated 65 to each of the Tai Chi, resistance, and stretching groups. Interventions: The Tai Chi group underwent a Tai Chi program, the resistance group 8 to 10 leg muscle strengthening exercises, while the stretching group performed stretching exercises involving the upper body and lower extremities. All three groups trained for 24 weeks (60 minutes per session, two sessions per week). Outcome measures: The primary outcomes were two indicators of postural stability – maximum excursion and directional control derived from dynamic posturography. The secondary outcomes were stride length, gait velocity, knee flexion and extension peak torque, functional reach, timed-up-and-go test, and motor section of the Unified Parkinson’s Disease Rating Scale (UPDRS III). The outcomes were measured at baseline, at 12 and 24 weeks, and 3 months after termination of the intervention. Results: 185 participants completed the study. At the end of the 24-week training period, the change in maximum excursion in the Tai Chi group was significantly more than that in the resistance group (by 5%, 95% CI 1.1 to 10.0) and the stretching group (by 12%, 95% CI 7.2 to 16.7). Direction control improved significantly more in the Tai Chi group compared with the resistance group (by 11%. 95% CI 3.9 to 17.0) and the control group (by 11%, 95% CI 5.5 to 17.3). The Tai Chi group also had significantly more improvement in stride length and functional reach than the other two groups. The change in knee flexion and extension peak torque, timed-up-and-go test, and UPDRS III score in the Tai Chi group was only significantly more than that in the stretching group, but not the resistance group. The falls incidence was also lower in the Tai Chi group than the stretching group during the 6-month training period (incidence-rate ratio: 0.33, 95% CI 0.16 to 0.71). Conclusion: Tai Chi training is effective in reducing balance impairments in patients with mild to moderate Parkinson’s disease.

Commentary

Li et al report a well-conducted randomised clinical trial using Tai Chi as an intervention among patients with Parkinson’s disease. The Li study builds on previous research which has shown that limits of stability are better in community-dwelling older Tai Chi practitioners in both maximum excursion and directional control (Tsang and Hui-Chan 2003, Gyllensten et al 2010). The findings reflect the training specificity of Tai Chi in which the practitioners are required to shift their body weight to different positions as far as possible in a smooth and co-ordinated manner, whereas the other two exercise groups (resistance training group and stretching group) did not have such features. This is also the first study investigating whether Tai Chi has any positive impact on fall incidence in patients with Parkinson’s disease. Recurrent fallers in patients with Parkinson’s disease demonstrate poorer functional leg muscle strength than non-fallers (Mak and Pang 2010). Improving muscle strength may thus be an important intervention strategy in reducing falls. The study showed that the fall incidence in the Tai Chi group was lower than in the stretching group, but was similar to the resistance training group. Although improvement in postural control may explain the reduction in fall rate, the muscle strengthening effect of Tai Chi may also contribute, as the Tai Chi training induced gain in knee muscle strength that is comparable to resistance exercise training. In this study, all patients with a Mini-Mental State examination score < 24 were excluded, but a proportion of patients with Parkinson’s disease suffer from mild cognitive impairment and dementia. Tai Chi is a mind-body exercise and the practice of Tai Chi may enhance cognition and dual-task performance (Tsang et al 2012). Future study should address the effect of Tai Chi on these important outcomes, and their relationships with fall incidence in patients with Parkinson’s disease, including those with cognitive impairment.

William WN Tsang
Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong, China

References

Long-term aerobic exercise maintains peak VO$_2$, improves quality of life, and reduces hospitalisations and mortality in patients with heart failure

Synopsis


**Question:** Does aerobic exercise improve peak VO$_2$, quality of life, all-cause mortality, and cardiovascular morbidity in patients with chronic heart failure with mild to moderate symptoms? **Design:** Randomised, controlled trial with blinded outcome assessment. **Setting:** Hospital and community settings in Italy. **Participants:** Patients with chronic heart failure who were clinically stable, had a left ventricular ejection fraction < 40%, and the ability to exercise. Haemodynamically significant valvular heart disease, uncontrolled diabetes or hypertension, and renal insufficiency were exclusion criteria. One hundred and thirty-five patients enrolled in the study and 123 completed the protocol. Randomisation of 123 participants (78% male) allotted 63 to the exercise group and 60 to a usual care group. **Interventions:** Both groups received counselling on smoking cessation, stress reduction and diet. In addition, the intervention group participated in an exercise training program for 10 years. The program consisted of 3 x 1-hour sessions per week of aerobic exercise at 60% peak VO$_2$ at a hospital for 2 months under the supervision of a cardiologist and an exercise therapist, and 2 supervised 1-hour sessions at 70% peak VO$_2$ the rest of the year in a community setting. Patients were also encouraged to exercise at home at least once a week. Each exercise session included 40 minutes of aerobic activity (cycling and treadmill). The control group received usual care and were advised to continue their usual physical activities for no longer than 30 minutes each session. **Outcome measures:** The primary outcomes were functional capacity, measured by peak VO$_2$, as a percentage of predicted maximum VO$_2$, and quality of life over 10 years. Quality of life was measured using the 21-item Minnesota living with heart failure questionnaire (maximum score 105 points). Secondary outcomes were hospitalisations and cardiac mortality. **Results:** At 10-years, the exercise group had maintained a higher peak VO$_2$, as a percentage of predicted maximum VO$_2$, compared with the control group (mean difference 13%, 95% CI 11 to 15). Quality of life was significantly better in the exercise group than the control group at 12 months (by 15 points (95% CI 10 to 20) and this was sustained throughout the 10 year study period. The groups differed significantly on the relative risk (hazard ratios) of hospital readmission (0.6, 95% CI 0.3 to 0.8) and cardiac death (0.6, 95% CI 0.3 to 0.8) in favour of the exercise training group. **Conclusion:** Moderate intensity supervised aerobic exercise for patients with chronic heart failure performed at least twice-weekly for 10 years maintains functional capacity at more than 60% predicted maximum VO$_2$. It also offers a sustained improvement in quality of life and a reduction in hospitalisations and cardiac mortality.

[95% CIs calculated by the CAP Editor.]

Commentary

Chronic heart failure (CHF) is a major public health problem with high mortality rates, and the number of hospitalisations for CHF has tripled over the past 30 years (Fida and Pina 2012). CHF is also very costly; in the USA it is the most frequent diagnosis on 30 day readmissions at a cost exceeding 18 billion dollars (Fida and Pina 2012). Thus, interventions aimed at reducing morbidity and mortality in this population of patients are a high priority. The study by Belardinelli et al shows that exercise training may be a very effective intervention, improving functional capacity, quality of life, mortality, and re-hospitalisation rate over a 10 year period.

A very striking result was the improvement in VO$_2$ peak which was maintained above 16 ml/kg/min over the 10 year period. This level of cardiorespiratory fitness is associated with improved survival in CHF patients (Myers et al 2002). Interestingly, ejection fraction also improved five years after initiation of the program. Thus, long term, supervised exercise training improved two important prognostic markers as well as mortality and morbidity. However, given the relatively small number of patients in the study, these outcome data need to be viewed with caution.

The practicality of these findings could be questioned. Clearly, a 10-year medically supervised cardiac rehabilitation program is not feasible or cost effective in most clinical settings. However, considering the relative safety of exercise training, professionally supervised group based exercise training programs conducted in a health club setting as applied in the Belardinelli et al study is a potential avenue that deserves further consideration. It should also be recognized that these findings apply only to CHF with reduced ejection fraction, and it is still unknown if exercise has a positive impact on CHF patients with normal ejection fraction. Finally, given the small number of women in the study, it is unclear if these findings apply equally to men and women.

**Bo Fernhall**

*College of Applied Health Sciences, University of Illinois at Chicago, USA*

References


Exercise programs for patients with cancer improve physical functioning and quality of life

Synopsis


Objective: To review the evidence about whether physical activity exercise programs improve health indicators in adult patients after they have completed their main treatment related to cancer. Data sources: PubMed, CINAHL and Google Scholar were searched up to September, 2011. This search was supplemented by searching the Cochrane Library for systematic reviews and examining the reference lists of all selected studies. Study selection: Randomised controlled trials involving adult patients who had completed their main treatment for cancer but who might still be receiving hormonal therapy. The effect of an exercise program was assessed on physical functions, physiological parameters, psychosocial outcomes, and quality of life compared with sedentary or no-exercise control groups. Data extraction: Two reviewers independently extracted data and discrepancies were resolved by consensus. Risk of bias in selected studies was assessed using a checklist developed by the Scottish Inter-Collegiate Guidelines Network. Data synthesis: Of 1505 studies initially identified by the search and 387 studies identified from additional sources, 34 studies were included for review and meta-analysis. Most studies focused on patients with breast cancer (65%) and investigated aerobic exercise programs (86%), while a smaller number investigated resistance training interventions (14%). The median duration of the exercise programs was 13 weeks. Based on quantitative pooling of available data there were statistically significant improvement in insulin-like growth factor-I, muscle strength, fatigue, depression, and quality of life in favour of exercise for patients with breast cancer. Based on quantitative pooling of data from studies of different types of cancer, there were improvements in favour of exercise in body mass index, body weight, peak oxygen consumption, distance walked in 6 minutes, handgrip strength and quality of life. For example, there was a weighted mean difference of 29 m (95% CI 4 to 55) for the 6 minute walk distance in favour of exercise. Significant differences were not found on the remaining outcomes, including lean mass and flexibility. Conclusion: Exercise programs for patients who have completed their treatment for cancer result in positive effects in a range of health indicators including physical functioning and quality of life.

Commentary

With advances in detection, diagnosis, and treatment, cancer is now recognised as a chronic disease (McCorkle et al 2011). The need for exercise has been identified as an unmet need in cancer survivors (Thorsen et al 2011). Fong et al reviewed the effects of exercise on cancer survivors after completion of treatment. Survivors who participated in exercise had significant improvements across a variety of domains. Improvements were seen in commonly used clinical outcome measures such as 6 minute walk test, handgrip strength, and SF36.

Although 65% of the meta-analyses reviewed focused on breast cancer, Fong et al provide evidence that physical activity is beneficial across a variety of tumour streams after completion of treatment. However, cancer patients can also benefit from physical activity during treatment for their cancer (Knols et al 2005). Patients often have greater access to allied health services such as physiotherapy during active treatment compared to post treatment. Additionally, there is not always a clear point in time when treatment is completed. Ideally physiotherapists should establish an appropriate exercise program whilst the patient is undergoing active treatment, with a plan in place for ongoing exercise post treatment. Fong et al found that incorporating resistance training significantly improved outcomes, most likely due to the increased intensity of exercises. Although further research is required into the intensity of exercise, the meta-analysis suggests that moderate intensity exercise is recommended for cancer survivors.

It is currently not standard practice for cancer survivors to be prescribed exercises post treatment, despite evidence by Fong et al that exercise improves physical function and quality of life. Exercise for cancer survivors should be the norm, rather than the exception. Further research on type and intensity of exercise across a variety of tumour streams will assist clinicians in appropriate exercise prescription.

Rebekah McClellan
Ambulatory Oncology Rehabilitation Program, Health Independence Program, Eastern Health, Melbourne, Australia

References

Exercise training following lung transplant is now evidence-based practice

Synopsis


Question: In patients immediately following lung transplant, does three months of supervised exercise training confer changes in physical activity during daily life, functional exercise capacity, muscle force, health-related quality of life (HRQL), or forced expiratory volume in one second (FEV<sub>1</sub>)? Design: Randomised, controlled trial with concealed allocation in which investigators responsible for collecting the outcome measures were blinded to group allocation. Setting: Out-patient department of a hospital in Leuven, Belgium. Participants: Patients aged between 40 and 65 years who had an uncomplicated single or double lung transplant. Randomisation of 40 participants allocated 21 to the intervention group and 19 to the control group. Interventions: Participants in both groups received six individual counselling sessions of 15–30 minutes in duration, during which they were instructed to increase participation in daily physical activity. In addition, the intervention group attended supervised exercise training sessions three times a week for 3 months following discharge. Each training session was approximately 90 minutes and comprised cycle ergometry, walking, stair climbing, and leg press resistance exercises. Training was prescribed at moderate to high intensity and progressed according to symptoms. Outcome measures: The primary outcome was time spent walking each day. Secondary outcomes included the six-minute walk distance (6MWD), peripheral muscle force, HRQL, and FEV<sub>1</sub>. Results: Data were available on 18 and 16 patients in the intervention and control groups, respectively. On completion of the intervention, between-group differences in favour of the intervention group were demonstrated in the average time spent walking each day (difference in means 14 min, 95% CI 4 to 24), 6MWD (differences in means 9% predicted, 95% CI 3 to 15) and quadriceps force (difference in means 17% predicted, 95% CI 9 to 24), but not HRQL or FEV<sub>1</sub>. These between-group differences were maintained 12 months following discharge from hospital. At the 12 month assessment, between-group differences in favour of the intervention group were also demonstrated in two components of HRQL related to physical function. Conclusion: In patients following lung transplant, exercise training conferred immediate and sustained gains in physical activity during daily life and exercise capacity. Gains in HRQL also appear to be evident, but took longer to be realised.

Commentary

Although functional capacity improves following lung transplantation, persistent limitations primarily attributed to skeletal muscle dysfunction have been observed (Mathur et al 2004). Several studies have examined the effects of exercise training following lung transplantation, including two randomised controlled trials targeting lumbar bone-mineral density (Wickerson et al 2010). This study by Langer et al (2012) is the first randomised trial of exercise training on endurance capacity, quadriceps force, and physical activity. This research design allows the effects of the exercise training to be separated from spontaneous functional recovery.

In interpreting the study findings, it is important to recognize that more than 70% of lung transplant recipients at this single centre were excluded. The study participants are not fully representative of the lung transplant population as they were between 40 and 65 years of age, experienced an uncomplicated post-operative course, and 85% had a pre-transplant diagnosis of COPD. Although this study was not powered to detect differences in cardiovascular morbidity, the finding of lower average 24 hour ambulatory blood pressure and lower incidence of treatment of diabetes in the intervention group one year after hospital discharge, and more hypertensive medication prescribed in the control group is clinically relevant. It extends the benefits of exercise training beyond functional measures to broader health outcomes and highlights a potential preventive role of exercise in a population that experiences significant long-term morbidity. This study strengthens the existing evidence of the beneficial effects of exercise training post-lung transplantation. Physiotherapists should target peripheral muscle strength in the early post-transplant period. Further study could focus on the role of pre-transplant exercise, the effects of longer exercise training post-transplant, the needs of recipients with a complicated post-operative course, and exercise in recipients over 65 years. Home-based exercise training could be studied as large travel distances to specialised centres appear to be a barrier to rehabilitation post-transplantation.

Lisa Wickerson
Toronto General Hospital, Toronto, Canada

References