Kidney transplantation: a systematic review of interventional and observational studies of physical activity on intermediate outcomes

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CRD summary
This review concluded that some types of exercise improved physical functioning, muscle strength, aerobic fitness and/or quality of life in kidney transplant patients. The authors acknowledged that some interventions were poor quality and the included studies were potentially biased and underpowered. Given the paucity of good-quality evidence and the potential for missed studies, the conclusions should be interpreted with caution.

Authors' objectives
To evaluate the effect of physical activity on intermediate outcomes in kidney transplant patients.

Searching
PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), PEDro and SPORTDiscus, were searched for studies published in English. Search terms were reported. Bibliographies of retrieved articles and relevant reviews were searched.

Study selection
Studies with physical activity as an independent variable and that evaluated quality of life, physical functioning, cardiovascular disease risk factors, immune function, diabetes, bone disease or kidney function in participants aged 18 years or older who had a functioning kidney graft were eligible for inclusion. Studies on joint kidney pancreas transplants or that reported only acute effects were excluded.

Retrospective studies assessed habitual physical activity using a range of questionnaires. Prospective studies evaluated a range of interventions, including: walking/cycling; calisthenics/ball games; isokinetics; and breathing strength and flexibility exercises, with or without isometrics and relaxation.

Comparative studies used control groups of healthy individuals, those with other diseases or routine care. Intervention duration ranged from one month to two years and frequency ranged from one to seven sessions per week. Mean age of participants ranged from 27 to 56 years. Time with kidney transplant ranged from two days to nine years. Mean duration of pre-transplant dialysis ranged from three to 54 months. Some studies excluded participants with contraindications to exercise testing; others included participants that had not had a kidney transplant.

Two reviewers performed the selection; discrepancies were resolved by discussion.

Assessment of study quality
The quality of all studies was assessed by two reviewers independently in terms of selection, performance, attrition and detection bias. Further criteria were assessed that related to outcomes and their measurement; these varied according to study design. Each criterion was scored as 1 (none/unclear/high risk of bias), 2 (inadequate/medium risk of bias) or 3 (adequate/low risk of bias). Overall composite scores were calculated and a rating of A (low risk) to C (high risk) was given for overall quality and risk of bias.

Data extraction
Data was extracted by two reviewers and included: Pearson correlation coefficients; regression coefficients; Cohen's d effect sizes; changes from baseline; and Bausell and Li interaction effect sizes. These depended on study design and outcome data reported.

Methods of synthesis
A narrative synthesis was provided. Differences between studies were discussed in the text and study details tabulated.
Results of the review
Twenty one studies (n=1,323, range 10 to 155) and 11 case studies met the inclusion criteria. Five studies had no comparator group, four had non-comparable controls and six had comparable controls. Six studies were retrospective. Overall study quality was rated: C for retrospective studies; 3As, 3Bs and 3Cs for before-after studies; and 2As and 2Cs for controlled trials. The risk of bias was usually C regardless of study design.

Quality of life was significantly increased with exercise in two poor quality studies, but not in a good-quality RCT. Upper and lower body strength was significantly increased with exercise in 10 controlled studies; effect sizes were smaller where comparable controls were used (three studies). Habitual activity and/or exercise significantly increased maximum oxygen intake (10 studies), aerobic capacity (three studies) and maximum metabolic equivalents (seven studies).

Patients in the exercise groups showed: lower incidence of metabolic syndrome (one study); greater incidence of glucose tolerance (one study), but higher fasting glucose (one RCT) and lower postprandial glucose (one study); no difference in blood pressure (three studies) or hypertensive medication use (two RCTs); and increased muscle parameters (three studies), bone gain (one study) and serum alkaline phosphatase (one study).

Results for blood lipid measures (six studies), body fat (five studies), immune function (two studies) and adverse events (two studies) were inconsistent. Four out of five studies reported no positive effect of exercise on kidney function.

Results of the case studies were summarised in an online supplementary file.

Authors' conclusions
Physical activity intervention was warranted in kidney transplant patients to enhance physical functioning.

CRD commentary
The review addressed a well-defined question in terms of participants, interventions and study design; criteria for outcomes were broad. Relevant databases were searched, but there was no specific search for unpublished studies and only studies published in English were included; therefore, relevant studies may have been missed. Publication bias was not assessed. Study quality was assessed with suitable criteria, but reporting as composite scores resulted in a loss of information. Efforts were made to reduce error and bias during study selection and data extraction; it was unclear whether this process applied to quality assessment. Relevant study details were reported, but no details of the participants’ gender were provided. Use of a narrative synthesis was appropriate given clinical and methodological heterogeneity across studies. Some participants in the non-intervention studies had not had a kidney transplant. The authors rightly acknowledged the poor quality of some interventions, biased study designs, underpowered studies and the possibility of confounding related to the transplant itself. Therefore, their conclusions should be interpreted with caution.

Implications of the review for practice and research
Practice: The authors stated that exercise prescriptions for kidney transplant patients should be based on guidelines related to other specific comorbidities of the individual patient. Unsupervised home-based exercise programmes may be as effective as and cost less than supervised inpatient programmes. Duration of exercise programmes should be at least six months, with regular follow-up for increased compliance.

Research: The authors recommended better quality interventions and study design to enable a more detailed evaluation of outcomes. They also recommended measurement of compliance, adverse events, morbidity, mortality and quality of life and consideration of factors such as age and diabetes when selecting participants.

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