Abstract

Background. There is no data available explaining the correlation between the intensity of exercise training and kidney transplant recipients’ health and fitness condition.

Objectives. The aim of the study was to evaluate the influence of the intensity of physical activity on the renal transplant recipients’ self-reported health and fitness condition.

Material and Methods. A retrospective study was performed using a questionnaire form. The questionnaire was filled out by members of the Polish department of the World Transplant Games Federation and the Polish Association of People on Dialysis and After Kidney Transplantation. 167 patients (Age: 36 ± 11 yrs, Males: 52%) were enrolled in the study.

Results. Even two hours of exercise per week after the transplantation statistically significantly ameliorated the recipients’ self-reported health (p = 0.007) and fitness condition (p < 0.0001). The amount of time devoted weekly to sports positively correlated with the patient’s health and fitness condition (p = 0.00325 and p = 0.00123 respectively). People who did not exercise had higher BMI levels than those who practiced sports (25.8 ± 5.2 and 24 ± 3.99 respectively, p = 0.0003) but the weekly training time did not correlate with the BMI of kidney transplant recipients (r = −0.08, p = 0.275).

Conclusions. Regular physical activity did not deteriorate the graft’s function in the examined patients. The results of this study bring authors to the conclusion that physical activity can be recommended for all kidney transplant recipients that do not have other serious comorbidities which would restrain them from practicing sports (Adv Clin Exp Med 2013, 22, 2, 203–208).

Key words: sports, exercise, renal transplantation.

Streszczenie

Wprowadzenie. Pacjenci po przeszczepie nerki chcąc rozpocząć aktywność fizyczną często nie mogą uzyskać odpowiedzi na pytanie, czy wysiłek fizyczny może pogorszyć ich stan zdrowia.

Cel pracy. Analiza wpływu intensywności aktywności fizycznej u pacjentów po przeszczepie nerki na własną ocenę swojej wydolności fizycznej i stanu zdrowia.

Materiał i metody. Przeprowadzono retrospektywne badanie ankietowe wśród członków Polskiego Stowarzyszenia Osób Dializowanych i Osób Po Przeszczepie Nerki, a także wśród członków polskiego oddziału World Transplant Games Federation. Ostatecznie analizowano dane od 167 pacjentów (wiek: 36 ± 11 lat, mężczyźni: 52%).

 Wyniki. Nawet dwie godziny aktywności fizycznej tygodniowo istotnie statystycznie poprawiły własną ocenę stanu zdrowia (p = 0.007) i kondycji fizycznej (p < 0.0001). Tygodniowy czas przeznaczony na aktywność ruchową korelował dodatnio z własną oceną zdrowia i kondycji fizycznej pacjenta (odpowiednio: p = 0.00325 i p = 0.00123). Osoby, które nie ćwiczyły miały większe BMI niż ci, którzy uprawiali sport (odpowiednio: 25.8 ± 5.2 i 24 ± 3.99; p = 0.0003), ale wśród osób, które ćwiczyły tygodniowy czas poświęcony na treningi nie korelował z wartością BMI (r = −0.08; p = 0.275).
Renal transplantation (KTx) has become a common way of treating end-stage renal disease so there are more and more patients who have undergone this operation. The main cause of death among renal transplant recipients is cardiovascular disease [1]. Obesity is observed among two-thirds of KTx patients [2]. Corticosteroids, which are a part of the immunosuppressive therapy, also result in many adverse effects like osteoporosis, weight gain and muscle damage [3, 4]. An effective way of coping with obesity would be physical activity, which also decreases the risk of atherosclerosis, diabetes mellitus and osteoporosis [5].

Many patients who have been highly active before the development of renal disease are eager to return to their training routine. Lack of up-to-date knowledge about the positive impact of intensive sports on renal transplant recipients may inhibit doctors from encouraging transplant patients to commence sport training. There are studies which confirm that physical activity is beneficial for the transplant population [6–13]. Better quality of life, greater physical endurance and a lower BMI are key achievements of people who implement sports in their daily routines [14, 15]. Studies conducted among participants of the 2006 Canadian Transplant Games revealed that the general population has a slightly higher respiratory function than patients after KTx [16]. Nevertheless, patients who have undergone renal transplantation are thought to have a good tolerance for physical effort and can achieve results comparable to a healthy population [17]. However, there are no studies that show how the intensity of training correlates with the patients’ health and fitness after kidney transplantation.

The aim of the study was to examine how regular physical activity affects the health condition and the physical fitness level of patients after renal transplantation and to show the difference between patients who do not implement sports in their lives, and those who do so in a moderate or intensive manner. The main hypotheses tested were as follows: Does physical activity help to maintain body weight among the kidney recipients? Does exercising improve the health and fitness of patients after KTx? Is longer and more frequent physical training correlated with better health and fitness condition? Finally, how long after the transplantation should physical activity be initiated?

Material and Methods

Study Design

The authors prepared a questionnaire for members of the “Polish Association of People on Dialysis and After Kidney Transplantation”. 271 patients responded by filling-out the questionnaire. All respondents were kidney transplant recipients, thus eligible for further analysis. The data of 104 patients was not taken into consideration as they did not meet the inclusion criteria. The criteria were as follows: no symptomatic cardiovascular disease, no orthopedic disorders that could limit physical activity, and strictly following the immunosuppressive therapy. Finally, the data of 167 patients were analyzed in the study. The population characteristics are shown in Table 1.

Table 1. Characteristics of the patients
Tabela 1. Charakterystyka pacjentów

<table>
<thead>
<tr>
<th>Characteristics of the patients (Charakterystyka pacjentów)</th>
<th>Patients who did not exercise (Pacjeni niećwiczący) N = 39</th>
<th>Patients who exercised (Pacjeni ćwiczący) N = 128</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (Mężczyźni)</td>
<td>18 (46%)</td>
<td>69 (54%)</td>
</tr>
<tr>
<td>Age (Wiek)</td>
<td>37 ± 9</td>
<td>35 ± 11</td>
</tr>
<tr>
<td>Hypertension (Nadciśnienie)</td>
<td>13 (33%)</td>
<td>56 (44%)</td>
</tr>
<tr>
<td>Impaired renal graft function (Nieprawidłowa czynność prze- szczepu)</td>
<td>12 (31%)</td>
<td>29 (23%)</td>
</tr>
<tr>
<td>Posttransplant diabetes (Cukrzyca poprzeszczepowa)</td>
<td>5 (13%)</td>
<td>20 (16%)</td>
</tr>
</tbody>
</table>
the advancement of one’s physical fitness, the authors surveyed the frequency and mean length of training sessions, overall weekly time of sport exercise and the most frequently exercised sports disciplines. The mean time from the transplantation to commencing physical exercise was also surveyed. In the last section of the questionnaire, the authors asked for a subjective assessment of the patient’s health and fitness before the renal disease, after the transplant, and at present. To simplify and standardize the subjective assessment of the health and fitness condition, a scale of 0 to 10 points was used. The patients were asked to answer 0 if their health condition was extremely bad and symptoms were perceived as unbearable, and 10 if they felt very well. The same applied to fitness condition.

Statistical Analysis

Statistica 9.0 software, Statsoft Inc. was used to perform all statistical calculations. The normality of distribution was assessed by a Shapiro-Wilk test. Normally distributed data was tested by a Pearson’s test in the search for a correlation between variables, whereas data where normal distribution did not exist was analyzed using Spearman r-rank. Statistical significance was at a standard level of 0.05. Mean values of Body Mass Indices were compared using a Student t-test.

Results

Physical Activity

Among 167 patients, 39 (23%) did not exercise. 128 (77%) study participants stated that they exercised regularly. The most popular sports disciplines were cycling (34% of patients), skiing (28%), fitness training (21%), swimming (18%), Nordic walking (16%), jogging (12%), football (7%) and body building (7%). The mean time from the surgery to sport commencement was 10.3 ± 13.8 months (median = 6 months). The average training session lasted 1.33 ± 0.89 hours (median = 1 hour), with 2.1 ± 1.1 training sessions per week (median = 2 sessions). The mean weekly training time was 2.79 ± 2.8 hours, (median = 2 hours).

Health Condition

As is shown in Fig. 1, the number of training sessions per week was positively correlated with the self-reported health condition ($r^2 = 0.325$, $p < 0.0001$). Even one training session per week accounted for a significant improvement in the patient’s health condition ($p = 0.029$). It is also worth mentioning that patients who did not exercise did not notice an improvement of health condition over time ($p = 0.42$).

Overall training time per week was positively correlated with the self-reported health condition ($F(12, 238) = 2.5663$, $p = 0.0033$) (Fig. 2). In the presented population, the most effective amount of time devoted to physical activity per week was 8 hours ($F = 32.7; p < 0.0001$). Those who did not train at all or trained only one hour per week did not assess their present health condition as better than postoperatively (0 hours, $p = 0.423$; 1 hour, $p = 0.067$; 2 hours, $p = 0.007$).

Fitness Condition

With the rising number of training sessions, the study participants were more likely to assess their fitness condition better than those who implemented less sports in their daily routine ($r_s = 0.507$, $p < 0.0001$) (Fig. 3). As little as one session
per week improved the patients’ self-reported fitness condition \((p = 0.0002)\).

Overall training time per week was positively correlated with the self-reported fitness condition \((F(12, 236) = 2.8246, p = 0.0012)\) (Fig. 4). After the transplant, people who did not exercise did not improve in their own assessment of their fitness condition. Those who trained as little as one hour per week described their fitness as statistically better than those who did not \((p = 0.0009)\).

**Body Mass Index**

People who did not exercise at all had statistically significant higher BMI levels than those who exercised regularly \((25.8 \pm 5.2\) and \(24 \pm 3.99\) respectively, \(p = 0.0003)\). The authors did not find a statistically significant correlation between the weekly training time and BMI of the patients \((r^2 = -0.08, p = 0.275)\). The number of trainings per week was not correlated with BMI either \((r^2 = -0.13, p = 0.31)\).

**Post-transplant Sport Commencement**

The post-transplant time when the study participants commenced physical training was neither correlated with the present self-reported health condition nor with the present fitness level \((r_i = -0.07, p = 0.45\) and \(r_i = 0.03, p = 0.38)\).

**Discussion**

Regular physical activity is associated with the improvement in kidney functioning after transplantation [18]. It has been proved that physical activity positively correlated with GFR (glomerular filtration rate) levels [18]. What is more, regular exercise has a positive effect on the quality of life of patients after kidney transplantation [1, 19]. MacDonald et al. (2009) also found that patients who regularly exercise have lower body fat levels.

In the present study, 77% of patients claimed that they exercised regularly. This is in contrast...
with the study carried out by Gordon et al. (2009), where 78% of patients were sedentary. The authors think that this difference occurred in their study due to a selection of patients who were capable of exercising. They did not analyze the data of patients who were not able to practice sports (because of other serious comorbidities), because they wanted to find correlations between the frequency and the duration of exercise trainings and the participants’ well being.

Most of the patients practiced aerobic sports disciplines. Only 12 patients (7%) reported involvement in anaerobic training (body building). The authors believe that further trials are needed to evaluate whether sports associated with an intensive effort of the muscles in the abdominal area are safe for kidney transplant recipients.

There are no studies that analyze the relationship between the post transplant intensity of exercise trainings and the patients’ health and fitness. The authors intended to find correlations between the amount of time devoted to sports and the patients’ self reported health condition and fitness level. Normal regular exercise, even 8 hours a week, was well tolerated by the patients and they reported a better fitness level and a better health condition than those who did not exercise. Those who trained reported an improvement in health condition and physical fitness from the early post transplant period to the day of the present study. Study participants who were sedentary did not notice an improvement in the above-mentioned parameters.

The data of the present study shows that people who trained more than 6 hours a week reported the best health condition and fitness level after the transplantation. However it is not clear whether they underestimated their health and fitness level in the postoperative period in order to emphasize the positive effect of sports on their lives.

People who exercised had statistically significantly lower BMI levels than those who were sedentary. However there was no statistically significant correlation between the weekly training time and BMI. This means that regular exercising is associated with lower BMI levels but the amount of time devoted to sports does not correlate with the BMI. In authors’ opinion, this finding may be explained by the fact that people who exercise intensively have a bigger muscle mass and therefore higher BMI levels.

The post-transplant time when study participants commenced physical activity was not correlated with the self-reported health and fitness condition. This means that starting exercise training even late after the transplantation may be associated with better well-being of the patients.

In the present study, the authors observed that even short periods of time per week devoted to exercise training after kidney transplantation improves with the recipients’ self reported health and fitness condition. The time dedicated weekly to sports positively correlates with the patient’s well-being. People who do not exercise have higher BMI levels than those who practice sports, but the intensity of trainings does not correlate with the BMI of the kidney transplant recipients. The results of this study bring authors to the conclusion that regular physical activity may have a favorable effect on the health condition of transplant patients and can be recommended to all kidney transplant recipients that do not have other serious comorbidities.
References


Address for correspondence:
Tomasz Płonek
Department of Cardiac Surgery
Wrocław Medical University
Borowska 213
50-556 Wrocław
Poland
Tel.: +48 602 127 941
E-mail: tomaszplonek@gmail.com

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