Effect of Aerobic Exercise on Immune System after Renal Transplantation

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Abstract

Objective: The study was conducted to find out the improvement of immune system response post renal transplantation through Aerobic exercise mainly treadmill.

Subjects: Thirty patients with renal transplantation were selected randomly and divided into 2 groups with equal numbers. Study group: They were fifteen patients with renal transplantation who received selective physical therapy program (Aerobic exercise) mainly treadmill for two months in addition to medical intervention.

Control group: They were also fifteen patients with renal transplantation who did not receive any form of physical therapy intervention program but received medical therapy only. Results Immunoglobulin M (IgM) results showed clinical increase but there was no Statistical significant difference in post treatment IGM in compared to pre treatment after two months of selective physical therapy program (Aerobic exercise) mainly treadmill for two months in addition to medical intervention.

Control group: They were also fifteen patients with renal transplantation who did not receive any form of physical therapy intervention program but received medical therapy only. Results Immunoglobulin M (IgM) results showed clinical increase but there was no Statistical significant difference in post treatment IGM in compared to pre treatment after two months of selective physical therapy program (Aerobic exercise) mainly treadmill for two months in addition to medical intervention.

Conclusion: For renal transplantation patients the selective physical therapy program (Aerobic exercise) mainly treadmill for two months clinical increasing IgM levels.

Key Words: Immune response – Renal transplantation – Aerobic exercise – Selective physical therapy program.

Introduction

PHYSICAL exercise is any bodily activity that enhances or maintains physical fitness and overall health and wellness. It improves mental health and helps prevent depression [1].

Regular exercise has been reported to have several favorable effects on physiological, psychological, and immunological functions [2-5], and increase in the resistance against infections [3,6].

Immunology is the defense mechanism or resistance of a host against a foreign body [7]. The immune system includes chemicals and proteins in the blood, such as antibodies, complement proteins, and interferon [8].

Immunoglobulins also called antibodies are glycoprotein molecules that are produced by plasma cells in response to an immunogen and which function as antibodies. Immunoglobulin M (IgM), is a basic antibody that is produced by B cells. It is by far the physically largest antibody in the human circulatory system. It is the first antibody to appear in response to initial exposure to antigen [9].

The objective of this study was therefore to determine the influence of selected exercise (aerobic) on serum immunoglobulin M after two months of exercise.

Material and Methods

Study on patients selected from Surgical Department" University Teaching Hospitals" and "Kasr El-Aini Hospitals" during 2015.

Thirty subjects (male and female) with renal transplantation were selected and divided randomly into 2 groups:

A- Experimental (study) group. (Medication therapy + Aerobic exercise). They were fifteen patients with renal transplantation; represent the group who received selected selective phys-
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Aerobic exercise program (Aerobic exercise mainly treadmill) for two months in addition to medical intervention.

B- Control group. (Medication therapy). They were also fifteen patients with renal transplantation; represent the group who did not receive any form of physical therapy intervention program but received medical therapy only.

Criteria of patient selection:

Inclusive criteria:
- All patient performed renal transplantation.
- Well healed incision.
- The age of patient ranged 20-45 years old.
- All the patients non diabetic, non smoker and non alcoholic patients.
- All the patients had no evidence of impairment of cardio-pulmonary function.
- All the patients received a good explanation of treatment, measurement devices and the examination included through physical evaluation.
- All the patients received the same medical care.

Exclusive criteria:
- All patients will be assessed carefully by the physician and or surgeon before the starting of the study procedures and the patients will be excluded from this study included.
- Patient with bleeding incision.
- Patient will sever lymph edema.
- Patient with nerve injury.
- Inflamed or infected wound.
- Open wound.
- Patient with orthopedic limitation, psychiatric condition.
- Patient with multi-organ transplantation.
- Patient with hypoxemia.

The treatment for Group A (study group) was conducted for 30 minutes on a treadmill (770cf) per day. Two times weekly for two months.

Blood samples were taken to measure immunoglobulin (IGM) for the 2 groups after 2 months.

Statistical analysis:

Statistical analysis was conducted using SPSS for windows, version 18 (SPSS, Inc., Chicago, IL). The current test involved two independent variables. The first one was the (tested group); between subject factor which had two levels (Group A receiving selected selective physical therapy program (aerobic exercise mainly treadmill) for two months in addition to medical intervention. And Group B receiving medical therapy only and not receiving any form of physical therapy intervention Program). The second one was the (training periods); within subject factor which had two levels (pre and post). In addition, this test involved one tested dependent variables (IGM). Accordingly, "paired t-test" was used to compare between “pre” and “post” tests for each dependent variables for each group. "Unpaired t-test" was conducted to compare dependent variables between both groups with the alpha level 0.05.

Results

Physical characteristics of patients in both Groups (A & B) are presented in Table (1).

Paired t-test revealed no statistical significant difference in post treatment IGM in Group (A) compared to pre treatment as the mean value of pre treatment was (131.300 ±58.3876) and for post treatment was (137.907±42.5850) where the t-value was (–0.542) and p-value was (0.596). But there was clinical significant increase after two months of selective physical therapy program (Aerobic exercise mainly treadmill) in Group A and the percentage of improvement was 4.79% (Table 2).

In Group (B) there was no statistical significant difference in post treatment IGM compared to pre treatment as the mean value of pre treatment was (122.13±51.92) and for post treatment was (123.166±51.28) where the t-value was (–1.423) and p-value was (0.177). And nearly there was no clinical significant difference in post treatment IGM in compared to pre treatment as the percentage of improvement was 0.84% (Table 3).

In Group (B) there was no statistical significant difference in post treatment IGM compared to pre treatment as the mean value of pre treatment was (122.13±51.92) and for post treatment was (123.166±51.28) where the t-value was (–1.423) and p-value was (0.177). And nearly there was no clinical significant difference in post treatment IGM in compared to pre treatment as the percentage of improvement was 0.84% (Table 3).

The independent t-test results for the IGM pre and post treatment between groups A and B showed no significant difference in pre treatment values where the t-value was (0.454) and p-value was (0.653). However, there was no significant difference in the post treatment values in IGM between groups, where the t-value was (0.856) and p-value was (0.399) (Table 4).
Table (1): Physical characteristics of patients in both groups (A & B). (Mean ± STD).

<table>
<thead>
<tr>
<th>Items</th>
<th>Group A</th>
<th>Group B</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean±SD</td>
<td>Mean±SD</td>
<td>t-value</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>29.46±6.47</td>
<td>30.53±6.36</td>
<td>-0.455</td>
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<tr>
<td>Weight (Kg)</td>
<td>72.13±11.84</td>
<td>73.73±10.45</td>
<td>1.038</td>
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<tr>
<td>Height (cm)</td>
<td>162.06±6.36</td>
<td>167.53±9.34</td>
<td>-1.872</td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td>27.46±4.29</td>
<td>26.18±2.06</td>
<td>-0.392</td>
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</table>


Table (2): Mean and ±SD, t and p-values of IGM pre and post treatment of Group (A).

<table>
<thead>
<tr>
<th>Group A</th>
<th>IGM</th>
<th>Pre treatment</th>
<th>Post treatment</th>
<th>Mean difference</th>
<th>t-value</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean±SD</td>
<td>131.300</td>
<td>137.907</td>
<td>-6.6067</td>
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<tr>
<td></td>
<td>Mean ±SD</td>
<td>±58.3876</td>
<td>±42.5850</td>
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<tr>
<td>Mean difference</td>
<td>4.79%</td>
<td></td>
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<tr>
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<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>p-value</td>
<td>-0.542</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>S</td>
<td>NS</td>
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</tbody>
</table>

Table (3): Mean and ±SD, t and p-values of IGM pre and post treatment of Group (B).

<table>
<thead>
<tr>
<th>Group B</th>
<th>IGM</th>
<th>Pre treatment</th>
<th>Post treatment</th>
<th>Mean difference</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean±SD</td>
<td>122.13</td>
<td>123.166</td>
<td>-1.03</td>
<td>-1.423</td>
<td>0.177</td>
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<tr>
<td></td>
<td>Mean ±SD</td>
<td>±51.92</td>
<td>±51.28</td>
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<td></td>
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</tr>
<tr>
<td>Mean difference</td>
<td>0.84%</td>
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<tr>
<td>p-value</td>
<td>-1.423</td>
<td></td>
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</table>

Table (4): Independent t-test between Groups A and B for IGM pre and post treatment.

<table>
<thead>
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<th>Independent t-test</th>
<th>IGM</th>
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<th>Post</th>
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</thead>
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<td>14.7400</td>
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<tr>
<td>t-value</td>
<td>0.454</td>
<td>0.856</td>
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</tr>
<tr>
<td>p-value</td>
<td>0.653</td>
<td>0.399</td>
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</table>


Discussion

The results obtained from the current study revealed that Immunoglobulin M (IgM) results showed clinical increase but there was no statistical significant difference in post treatment IGM in compared to pre treatment after two months of selective physical therapy program (Aerobic exercise mainly treadmill) in Group A (training group) as the p-value was (0.596) while in Group B (control group) there is no significant decrease or deterioration in the Immunoglobulin M (IgM) results after two months without training exercise program as the p-value was (0.177). In comparison between the two groups Group A (training group) show clinical improvement in the Immunoglobulin M (IgM) results after two months of training than Group B (control group) but there was no significant difference in post treatment values as the p-value was (0.399). Therefore, the selective physical therapy program (Aerobic exercise) markedly increased the Immunoglobulin M (IgM) results in Group A patients (training group) than the patients who did not perform the training exercises Group B (control group).

This study is consistent with a study on the influence of selected exercise on serum immunoglobulins A, M and G moderate and short drills strengthened the immune system [10].

It is also in concordance with a previous study also on the effects of acute and chronic exercise on immunoglobulins showed that acute moderate exercise, such as a 45-minute bout of walking has been associated with a transient rise in serum immunoglobulin levels [11].
While Mackinon and Smith [12,13] report of the acute and chronic effects of exercise on the immune system other investigators emphasized that no matter the duration of the exercise there is always an increase in the parameters of the immune system. In another study on the topic, the IgG, IgA, and IgM levels in male marathon runners at rest have been reported to be within clinically normal limits [14].

Nehlsen et al., reported that at 60% of max VO2 moderate exercise results in transient increases in the IgG, IgA, and IgM levels [18]. In the same study, it was found that at the 6th week of the training exercise program with intensity of 60% max VO2, similar increase in the basal immunoglobulin levels was noted. In a different study, it has been reported that the plasma immunoglobulin levels was increased by regular exercise of moderate intensity [16]. In which the IgA, IgG, and IgM levels were increased by regular exercise [17].

The results from our study in IgM levels were increased by regular exercise are in agreement with these data and demonstrate the positive effects of exercise on the immune system [18]. The study is in agreement with another study on the effects of training time on serum immunoglobulin in male athlete students, which showed that there were not any significant differences between the amounts of serum immunoglobulins of both groups in pre-test and post-test [19].

However, it is not in agreement with a study on the influence of system ultra endurance exercise on immunoglobulin isotypes and subclasses, which reported that, the serum immunoglobulins were significantly altered after the race [20].

References

الملخص العربي

الهدف: أجريت هذه الدراسة لمعرفة استجابة تحسين الجهاز المناعي لمرضى زرع الكلى من خلال ممارسة الرياضة الوعائية أساساً للسير الكهربائي.

وقد تم اختيار ثلاثين شخصاً مرضى زرع الكلى بشكل عشوائي وتقسيمها إلى مجموعتين من أعداد متساوية. مجموعة الدراسة) وكانتا خمسة عشر المرضى الذين يعانون من زرع الكلى الذين تلقوا برنامج العلاج الطبيعي الانتقائي (التزامين). بينما المجموعة الضابطة وكانوا أيضاً خمسة عشر المرضى الذين يعانون من زرع الكلى الذين لم يحصلوا على أي شكل من أشكال تدخل برنامج العلاج الطبيعي لكنه يتلقى العلاج الطبيعي فقط. IGM (الغلوبرولين المناعي) زيادة أكلينيكية لكن لم يكن هناك فروق ذات دلالة إحصائية بعد برنامج العلاج في M (الغلوبرولين المناعي). واظهرت النتائج المناعي M بالمقارنة مع ما قبل برنامج العلاج.

بعد شهرين من برنامج العلاج الطبيعي الانتقائي (التزامين الرياحية بشكل رئيسي السير الكهربائي) في المجموعة الأولى (مجموعة الدراسة) وكانت القيمة الاحتمالية (96/70) بينما في المجموعة الثانية (مجموعة المراقبة) ليست هناك انخفاض كبير أو تدهور في المانع M (الغلوبرولين المناعي). النتائج بعد شهرين دون ممارسة برنامج التدريب كما كانت ذات قيمة (77/40). الخلاصة بالنسبة للمرضى زرع الكلى برنامج العلاج الطبيعي الانتقائي (التزامين الرياحية) وخاصة السير الكهربائي لمدة شرين ساعد على التحسن في الاستجابة المناعية الاكلينيكية عن زيادة مستويات الغلوبرولين المناعي ولكنه ليس ذو دلالة إحصائية.