ORIGINAL ARTICLE

COMPARATIVE OUTCOMES OF TOTAL KNEE ARTHROPLASTY ON PHYSICALLY ACTIVE AND PASSIVE PATIENTS

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Summary: The physical activity of the population is decreasing due to an increase in sedentary lifestyles. The aim of the study was to analyze midterm results of total knee arthroplasty according to the lifelong physical activity of the patients. We evaluated 37 patients (23 women, 14 men), with age average 70.0 years (range 53–87). We divided the patients according to lifelong physical activity. The active group included 11 patients with any history of physical activity and the passive included 26 patients with a sedentary lifestyle. No intergroup differences existed in age, gender or preoperative Knee Score. The active group had a higher postoperative Knee Score 90,5 (±5,0) compared to the passive 87,4 (±5,0). Pain after arthroplasty was experienced significantly more in the active group. Between the active 87,3 (±9,3) and passive 67,5 (±16,7) groups we measured a statistically significant difference in the improvement of Functional Score – ability to walk and climb stairs. Sedentary lifestyle affects the clinical outcomes of total knee arthroplasty. This data is demonstrating that physical activity ameliorate functional postoperative results.

Key words: *Total knee arthroplasty; Physical activity; Lifestyle; Knee Society Score, Knee Score, Functional Score*

Introduction

The increasing sedentary lifestyle of recent generations has restricted the physical activity of the population. Physicians caring for middle-aged and older patients frequently overlook the importance of regular physical activity. Exercise on a routine basis is an important component of successful aging. It has been shown that many age-related declines in musculoskeletal function can be markedly reduced by participation in some form of regular exercise (4).

Total knee arthroplasty (TKA) is an effectual operative treatment of the degenerative changes, deformities and restricted motion of the knee. Postoperative rehabilitation is essential for TKA function. Without exercise and patient cooperation it is impossible to obtain correct functioning of the artificial joint. Slow progress in rehabilitation is associated with heightened postoperative pain (2).

The aim of the study was to compare results of TKA implantation according to patient's lifelong physical activity.

Material and Methods

In the period from January to June 2005, in our clinic, we operated on 49 patients with symptomatic osteoarthritis of one knee with radiological changes grade 3 to 4 (7). The preoperative diagnosis was primary osteoarthritis in 44 cases, post-traumatic arthritis in 4 cases and one case of rheumatoid arthritis.

Patients received a cemented, total-condylar-type prosthesis without resurfacing of the patella. We used a medial parapatellar arthrotomy. A tourniquet was used until the implants were cemented. Physical therapy started on the day after the operation with exercising to restore range of motion, from the second day after drainage removal verticalisation on crutches was started. All patients were limited to partial weight bearing for three months. Patients stayed in our clinic until wound consolidation, which occurred on the 10^{th} to 12^{th} postoperative day. At a three-month follow-up, the mechanical alignment of the leg, knee stability and range of motion was measured. The patients described any pain and described their ability to walk. At a six month follow-up radiographs were performed to measure position, radiolucent zones and para-articular calcifications. Postoperative spa treatment was then recommended.

To homogenize the group of patients excluding criteria were severe general medical problems and mental treatment that could influence score results. Our postoperative complications were part of the exclusion criteria as well. Patients with arthroplasty who had normal function in other joint regions functioned were not excluded. Twelve patients did meet one or more of the exclusion criteria.

We divided patients into two groups according to their lifelong physical activity and lifestyle after the age of 35. We

used a Tegner Activity Score (16). Active patients had an activity score of 3 or higher. These patients regularly practiced aerobic walking, cycling, swimming or practiced recreational sport. The passive patients had a sedentary lifestyle, with a Tegner Activity Score (TAS) of 1 or 2. These patients did not practice any recreational sport and did not have any physical activity during the day, or stop it after retire. Limited walking was the only necessary activity for these patients, in most cases even their employment was sedentary.

All patients were assessed four years after implantation with composite of the Knee Society Score (6). The Knee Society Score is scored out of 200 points, which represents good health status. In this knee rating system the subscales Knee Score (KS) rates only the knee joint itself (pain, range of motion, alignment) and the Functional Score (FS) rates the patient's ability to walk and climb stairs. The data which was analyzed using the program Statistica Version 8 (Statsoft) and a $p < 0,05$ was considered statistically significant.

Results

We evaluated 37 patients, 23 women and 14 men, average age 70,0 (range 53–87 years). Everybody had identical rehabilitation protocol and underwent postoperative spa therapy.

In 36 patients the mechanical alignment of the leg reached a straight axis, one patient had a valgosity of 5°. There were no evident signs of ligament instability or restricted motion after TKA. One patient had a 5° deficit in extension. There were no radiolucent zones, malposition or paraarticular calcifications on radiographs.

Thirty seven patients reached preoperative Knee Score 21,0 points and Functional Score 33,2 points.

According to TAS 11 patients had an active lifestyle, 7 women and 4 men, average age 70,2 (range 53–78 years). One patient had an activity level of TAS 4, the remaining had 3. Twenty six patients had a passive lifestyle, 16 women and 10 men, average age 69,9 (range 57–87 years).

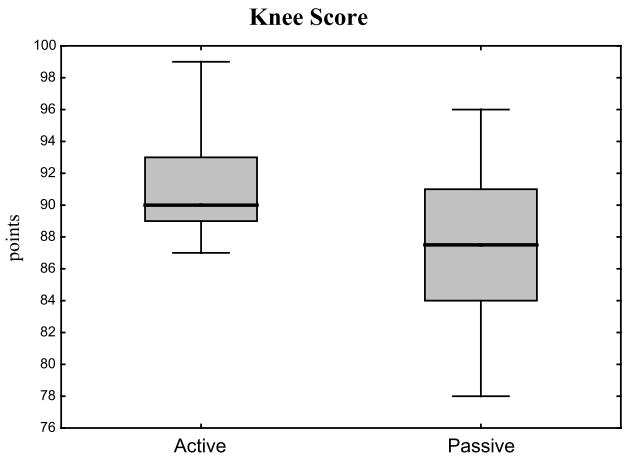

Fig. 1: Postoperative KS with no statistically significant differences.

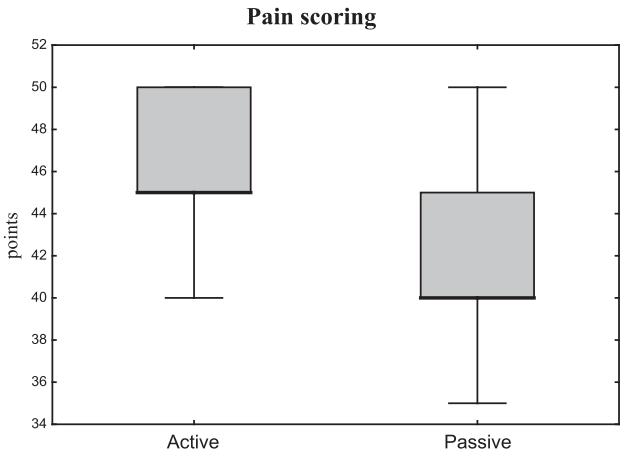

Fig. 2: Active patients had only occasional mild pain, passive patients had regular mild pain during their daily routine.

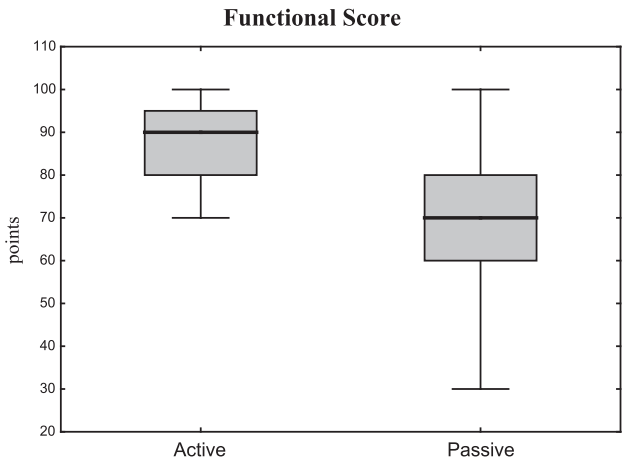

Fig. 3: Passive group with functional unfavorable condition.

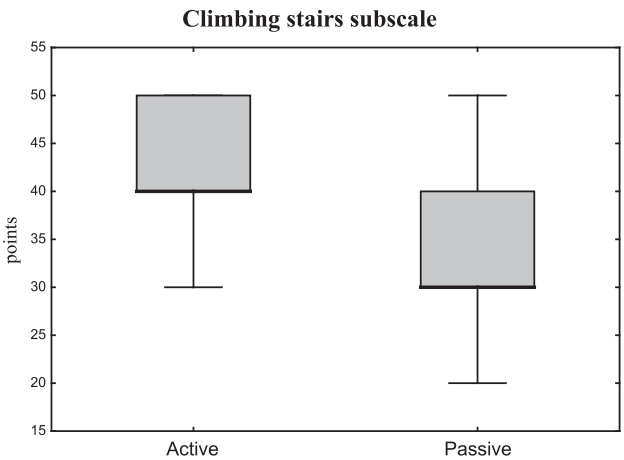

Fig. 4: For climbing stairs it is necessary for the passive patients to use stair rail or cane.

The groups had been well-balanced preoperatively concerning the demographic data. Differences in the age ($p = 0.93$), gender ($p = 0.91$), preoperative Knee Score ($p = 0.80$) and Functional Score ($p = 0.42$) were not statistically significant.

The active group reached a postoperative KS 90,5 (±5.0), while the passive obtained an 87.4 (±5,0). This marked difference was not statistically significant, $p = 0.09$ (Fig. 1).

In the pain scale the passive group obtained a 41.5 (±4.4) and the active a 45.9 (±3.0), $p < 0.05$ (Fig. 2). Range of motion was 107.7° (±9.9) for active and 108.8° (±8.8) for passive, $p = 0.73$. There were no statistically significant differences in alignment $p = 0.60$.

In FS the active group obtained an 87.3 (±9.3) and the passive 67.5 (±16.7), this difference was statistically significant $p < 0.05$ (Fig. 3). In the subscale of ability to walk the active group obtained a 45.9 (±4,9) and the passive a 39.4 (±8.3), also a significant difference of $p < 0.05$. In the subscale of climbing stairs (Fig. 4), the active group obtained a 41,8 (±6.0) and the passive a 32.3 (±7.6), $p < 0.05$. The statistically significant difference was in functional deductions for cane use $p < 0.05$.

Discussion

The significant differences in the FS subscales ability to walk and climb stairs showed a functional insufficiency in the patients with a sedentary lifestyle. Physical activity is beneficial for older people with osteoarthritis in improving muscle strength and balance in active mass (15). After TKA it is often a problem to restore muscle coordination and dynamic stability. This is due to an inadequate proprioception in the joint (18). Training of neuromuscular control has become increasingly important and plays a major role in the rehabilitation of the subject who does not participate in much physical activity. The influence of exercise is on the knee joint contact forces and the tension of the ligaments (17). Past experience with physical activity helps with postoperative rehabilitation. The effect of aerobic walking and strength training programs on static postural stability among older adults with knee osteoarthritis is connected to trunk stability. Physical activity programs significantly improve postural sway in older adults (11). In our study the use of canes and stair rails showed functional insufficiency of muscle cooperation. Passive patients needed more support safety than discharge of load. Differences in postoperative KS were most influenced by self-reported pain. But clinical results of alignment and range of motion were similar. Although arthroplasty implantation was successful and there were expressive improvements in pain and joint function after operation, patients of neither group were without pain.

Osteoarthritis is not only manifested in the structural degenerative changes of the joint. Quadriceps strength, knee pain and age are more important determinants of functional impairment in elderly subjects than the severity of knee osteoarthritis as assessed radiographically. Strategies designed to optimize muscle strength may have the potential to reduce a vast burden of disability. Subjective symptoms of patients are modified with psychological and social factors (10). Disability and pain correlate with the degree of psychological involvement and are strongly influenced by psychological impact (14). Preoperative depression and anxiety are associated with worst subjective results (2). We did not measure the psychological profile of the patients, but mental treatment or using of anti-anxiety drugs were exclusion criteria. Our postoperative pain results of passive patients are explained by a deterioration in walking ability and self-service, which is subjectively negatively perceived.

Other researchers reported similar results in KS (9, 12). In FS, our patients obtained higher scores, but patients with low FS caused by postoperative complications and general disability were excluded from the study. This is why our results of TKA implantation are similar to previously published data.

Active and younger patients walked more on average than passive and older patients .This data can show a substantial source of variability in rates of polyethylene wear. Active patients want a fast return to a high level of activity, but prostheses are not designed for repeated stress overloading. This approach may provide prognostic information regarding the survival of joint prostheses (18). The risk of inadequate activity we did not note.

On the other hand, patients with passive lifestyles not only have weak muscle function, but also less density of bone mass. This is risk factor of prostheses loosening (5). We had no patients with sport overloading and in midterm results we had no loosening. Good bone quality is a convenience in primary implantation or revision. But the long-term survivorship of TKA must be considered, because revision surgery has worse results in KS as well as in FS than in primary implantation (13).

The utility of scoring systems used to determine the health status of treatment benefits in patients with knee osteoarthritis is under discussion. The application of these scoring systems in measuring health status in patients appears to be an acceptable method to investigate. Presentation of the results of knee scoring systems should include detailed information on the maintaining of subscales for better understanding of the results (8). Walking ability is assessed in Knee Society Score exactly and this scoring system is commonly used for TKA results (8, 9, 12, 13).

We compared groups of patients according to lifelong physical activity after excluding other influences on postoperative results. TAS is commonly used for patients after ligament knee injury. To us helped truncate physical activity, recreational and competitive sports in full details, because household and yard work were for our patients from urban area useless.

Our evaluated group was relatively small, but we had clear data connected to physical activity and functional results of TKA. Passive patients in our study predominate at the same ratio as in the general population.

The evolution of the general population shows a tendency towards a deterioration of obesity, sedentary lifestyle and arthritis. This trend is accountable for the increasing number of patients with joint functional disability (1). Physical activity benefits all body organs as well as the psyche. The most dramatic benefits have been found in cardiovascular systems (3). Exercise reduces anxiety in elderly patients and improves cognitive function.

Conclusions

This data is demonstrating that physical activity and exercise ameliorate experience of pain, disability and functional postoperative results.

Postoperative improvement is dependent on the expended effort of the patients and does not depend on the operation technique or the implants. After TKA patients are not completely without pain, sedentary lifestyle affects adversely the clinical outcomes of total knee arthroplasty.

Exercise intervention for patients may reduce postoperative costs with faster returning patients on previous level of activity. Improve patient-perceived outcomes, motivation of seniors.

Acknowledgements

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