The comparison of clinical features and quality of life after total knee replacement

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Abstract. [Purpose] The purpose of this study is to provide fundamental information for efficient management of patients after a total knee replacement (TKR) through the evaluation of changes of range of motion, pain, functional level, and quality of life. [Subjects and Methods] For a total of 63 knee osteoarthritis patients, VAS, KSKS, KSFS, HSS, WOMAC scores and quality of life were evaluated for functional levels at pre-operation, post-operation, six months after operation, and 12 months after operation. [Results] After the TKR operations, participants showed significant improvement in KSKS, KSFS, WOMAC, and SF-36 scores when compared to pre-operation. [Conclusion] After a TKR operation, ROM, and pain management, along with a therapeutic program for improvement of function, should be conducted 6 months after the operation.

Key words: Osteoarthritis, Total knee replacement, Quality of life

INTRODUCTION

Knee osteoarthritis is a disease that causes pain, functional limitation and disability, and its incidence rate is gradually rising with an increase in the elderly population1, 2). One of the main symptoms found among knee osteoarthritis patients is pain. It is known that there is a high correlation between pain and limited functional activities that use the knee in osteoarthritis patients. The pain affects the range of knee flexion and, as a result, quality of life can change3).

Knee osteoarthritis brings about a change in muscle structure resulting in pain. The pain leads to taking part in limited functional activities, resulting in an increase in body mass index and a decrease in both knee flexion range and quadriceps thickness, while displaying asymmetry of weight support and gait limitations4). Total knee replacement is an effective surgical intervention for patients with knee osteoarthritis. It reduces pain in the knee joints and enhances quality of life and joint function, allowing for a smoother gait. A study of the cohort of patients with total knee replacement showed a significant increase in their 36-item Short Form Health Survey scores5, 6).

However, not all prognoses of patients with total knee replacements are positive. Some patients with total knee replacement show little improvement in knee function after surgery7), and complain of a decrease in knee extension torque, range of motion and functional mobility, and difficulty in carrying out daily functional tasks8, 9). Most evaluations of total knee replacement assessments are centered on levels of body structure and function. There is also a dearth of studies on the quality of life of patients with total knee replacements, which can be used as clinical data. Therefore, the present study aims to explore the effects of a total knee replacement, in a more comprehensive and multi-dimensional manner, by comparing range of motion, pain, functional level and quality life of patients who underwent total knee replacement operations, during specific time periods, after the operation.

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SUBJECTS AND METHODS

The present study was approved by the Sahmyook University Institutional Review Board. Participants for this study were 63 patients selected from a population of people who had total knee replacement surgeries, because of knee osteoarthritis, at H Hospital in South Korea. The inclusion criteria were as follows: patients who have had no other operation besides knee surgery, no functional limitations from nervous system disorders or other diseases, and the ability to understand the purpose of the study and are willing to fully participate in it. The exclusion criteria were as follows: patients who have other diseases besides knee arthritis and patients who had a reoperation within one year. The objective of the study and its requirements were explained to the subjects, and all participants provided written consent, in accordance with the ethical principles of the Declaration of Helsinki. During the study, the general characteristics of research subjects were collected from the subjects’ medical records and their medical characteristics, such as the diagnosis of knee osteoarthritis, were added to the records. General characteristics of the subjects were: mean age was 71.0 (7.3) years, mean height was 151.8 (5.9) cm, mean weight was 62.8 (9.0) kg and mean BMI was 27.2 (3.3) kg/m².

To track changes of knee function and quality of life before and after surgery, the VAS, KSKS, HSS, SF-36 and WOMAC were administered before surgery, at six months after surgery and at 12 months after surgery and were evaluated and analyzed. The VAS was used to evaluate the knee pain of subjects. During the study, the patients rated their pain on the 100 mm horizontal, linear scale of 0 to 10 with a higher score indicating more severe pain). The function of knee joints was evaluated based on functional activities measured by the Knee Society Knee Score (KSFS), which encompasses pain, range of motion, stability, flexion contracture and distance of walking. The Knee Society Function Score (KSFS) also includes stair climbing. The Hospital Severity Score (HSS) was used to evaluate the clinical state of patients with a total knee replacement. The 36-item Short Form Health Survey (SF-36) was carried out to assess quality of life and consists of a total of eight subcategories of physical function (PF), role physics (RP), bodily pain (BP), general health (GH), vitality (VT), social function (SF), restriction emotion (RE), and mental health (MH). The score of each subcategory was converted to a scale of 0–100, with a higher score indicating better health. The Western Ontario and McMaster Universities Arthritis Index (WOMAC) was used, along with the SF-36, as tools to evaluate knee function and the patients’ quality of life. It is comprised of a total of 24 subcategories under the key categories of pain, stiffness, and physical function. Scores are on the scale of 0 to 4, with four being the highest score, and low scores indicate low levels of pain and knee function. WOMAC reliability is in the range of 0.77–0.83 during measurement and re-measurement. The tibiofemoral angle was measured on anterior posterior x-ray images in a standing position.

All statistical analyses in this study were performed using the Statistical Package for the Social Sciences (SPSS), version 19.0. The general characteristics of participants are expressed as means and standard deviations, using the descriptive analysis function in SPSS. A multiple regression analysis was used to compare between the SF-36 PCS, SF-36 MCS and quality of life. To compare differences between scores before and after TKR operations, paired t-tests were performed. The level of statistical significance was set at p≤0.05 for all tests.

RESULTS

The mean VAS scores were 7.00 points at A, 2.98 points at B, and 2.59 points at C, respectively, with significant differences between the groups post hoc (C > B > A). The mean KSFS scores were 38.66 points at A, 80.77 points at B, and 82.61 points at C, respectively, with significant differences between the groups post hoc (B, C > A). The mean HSS scores were 65.22 points at A, 81.50 points at B, and 85.53 points at C, respectively, with significant differences between the groups post hoc (C > B > A). The mean WOMAC scores were 71.28 points at A, 82.96 points at B, and 84.05 points at C, respectively, with significant differences between the groups post hoc (B, C > A). The mean total scores of the SF-36 were 43.29 points at A, 59.27 points at B, and 60.73 points at C, respectively, with significant differences between the groups post hoc (B, C > A). The mean score of the SF-36 MCS was 37.86 points at A, 45.56 points at B, 46.26 points at C, respectively, with significant differences between the groups post hoc (B, C > A; Table 1).

DISCUSSION

According to Baumann et al., changes in the pain of total knee replacement patients, which was tracked with the VAS, showed a significant drop in scores from 64.5 points before surgery to 15.4 points at six months after surgery and 12.9 points at 12 months after surgery (p<0.001). Also in this study, pain decreased significantly from 7.00 points before surgery to 2.98 points at six months after surgery and 2.59 points at 12 months after surgery (p<0.05). Though the pain did not disappear completely, even after the total knee replacement surgery, there were significant changes in the pain. In previous studies, 30.4% of the patients with total knee replacement answered that their pain had abated. From the data identifying changes in...
the pain of patients with total knee replacement, total knee replacement surgery is thought to have positive effects on them.

In this study, the mean WOMAC scores were 71.28 points at A, 82.96 points at B, and 84.05 points at C, respectively, with significant differences between the groups (p<0.05). According to Baker et al., the WOMAC scores of patients with total knee replacements rose from 39.9 points before surgery to 77.7 points one year after surgery. In the present study, the WOMAC scores rose from 71.18 points before surgery to 84.05 points one year after surgery. Significant changes before and after surgery were found both in the present study and previous studies (p<0.05). Nevertheless, in the previous studies, there were not significant changes identified between scores one year and three years after surgery. Likewise, in the present study, significant changes were not found between six and 12 months after surgery. This may be because weak knee functions before surgery were reversed right after surgery and the pain in knee joints abated allowing for active locomotion.

Stevens-Lapsley et al. conducted a study with 39 patients with total knee replacements to track changes in SF-36 scores and observed an increase in the PCF from 36.7 points before surgery to 49.2 points six months after surgery and an increase in the MCS from 51.72 points to 54.5 points in the same time period. In this study, the PCS rose significantly from 30.14 points before surgery to 40.44 points six months after surgery and in the same period, the MCS also rose significantly from 38.76 points to 45.56 points, which supports the findings of previous studies (p<0.05). In contrast with the findings of previous studies, the present study findings showed improvement in quality of life after surgery across all categories while in the previous studies, a significant change was only found in the PCS. According to previous studies, the functional activities of patients who underwent surgery would be limited for up to a maximum of six months after surgery due to their physiological limitations. However, the physiological limitations decreased after six months, which indicates that patients would soon see full recovery of function. Under this context, the PF, VT and SF of the research subjects in the present study showed significant changes.

However, the present study has limitations. One such limitation is that all of the research subjects were patients who received their total knee replacement surgery at the same hospital. In addition, there was a small number of research subjects. Therefore, in future studies there should be a larger number of research participants. In the present study, a direct assessment of muscle strength, which is one of the most important before and after surgery indicators was not included. Hence for future studies, the relationship between the quality of life of patients with total knee replacements during specific time periods after surgery needs to be studied through an objective assessment of muscle strength.

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REFERENCES


Table 1. Comparing knee function and quality of life after TKR

<table>
<thead>
<tr>
<th></th>
<th>Pre-operation (A) (n=63)</th>
<th>After 6 month (B) (n=55)</th>
<th>After 12 month (C) (n=33)</th>
<th>Post hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS</td>
<td>7.0 ± 1.1*</td>
<td>3.0 ± 1.4</td>
<td>2.6 ± 1.7</td>
<td>C &gt; B &gt; A</td>
</tr>
<tr>
<td>KSKS</td>
<td>38.7 ± 4.9</td>
<td>80.8 ± 11.0</td>
<td>82.6 ± 8.8*</td>
<td>B,C &gt; A</td>
</tr>
<tr>
<td>KSFS</td>
<td>33.1 ± 14.0</td>
<td>55.2 ± 11.9</td>
<td>59.1 ± 3.0*</td>
<td>B,C &gt; A</td>
</tr>
<tr>
<td>HSS</td>
<td>65.2 ± 6.5</td>
<td>81.5 ± 8.2</td>
<td>85.5 ± 6.6*</td>
<td>C &gt; B &gt; A</td>
</tr>
<tr>
<td>WOMAC</td>
<td>71.2 ± 5.7</td>
<td>83.0 ± 7.7</td>
<td>84.1 ± 11.2*</td>
<td>B,C &gt; A</td>
</tr>
<tr>
<td>SF-36</td>
<td>43.3 ± 3.5*</td>
<td>59.3 ± 6.0</td>
<td>60.7 ± 7.1*</td>
<td>B,C &gt; A</td>
</tr>
<tr>
<td>PCS</td>
<td>30.1 ± 2.3</td>
<td>40.4 ± 4.0</td>
<td>41.7 ± 3.4*</td>
<td>B,C &gt; A</td>
</tr>
<tr>
<td>MCS</td>
<td>38.8 ± 1.0</td>
<td>45.6 ± 2.8</td>
<td>46.3 ± 3.0*</td>
<td>B,C &gt; A</td>
</tr>
</tbody>
</table>

\*Values are means (SD). VAS: Visual Analog Scale; KSKS: Knee Society Knee Score; KSFS: Knee Society Function Score; HSS: Hospital for Special Surgery; WOMAC: Western Ontario McMaster Universities Osteoarthritis Index; SF-36: 36-item Short Form Health Survey; PCS: Physical Component Summary; MCS: Mental Component Summary, \( p<0.001 \)


