Simultaneous bilateral total knee arthroplasty

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Abstract: Total knee arthroplasty (TKA) was performed simultaneously on both knees by two teams in a single procedure. The study population consisted of 74 patients (148 knee joints) with osteoarthritis (OA) or rheumatoid arthritis (RA). The peri- and postoperative results were compared with those in a group of 22 OA and RA patients (44 knee joints) who underwent staged operation during one hospital stay. Comparisons were made of functional score and range of motion (ROM) before and after operation, mean total blood loss, operative time, duration of hospital stay, and operative and postoperative complications. The simultaneous performance of bilateral procedures did not influence the functional score, ROM after operation, or mean intra- and postoperative blood loss. Nor was the incidence of operative and postoperative complications increased compared with that in the staged operation group. The operative time in the simultaneous TKA group was significantly shorter than the time that would have been required had separate procedures been performed on both knees. Simultaneous bilateral TKA is beneficial for the patient.

Key words: total knee arthroplasty, simultaneous bilateral replacement, rheumatoid arthritis, osteoarthritis

Introduction

The bilateral knee joints are sometimes involved in both rheumatoid arthritis (RA) and osteoarthritis (OA). These patients are often unable to walk because of deformities, instability, and pain in the knees. Bilateral total knee arthroplasty (TKA) can be performed either simultaneously, or in stages on different days during the same hospitalization, or during separate hospitalizations.

In patients who have undergone bilateral TKA on different days, the recovery of knee function often requires prolonged hospital stay and long-term rehabilitation. In addition there is the attendant morbidity and risk associated with two separate operations and with the anesthesia. A number of authors have reported simultaneous bilateral TKA,1,3,5-11 Soundry et al.9 have reported identical clinical results and similar incidence of complications in patients who underwent unilateral, bilateral one-stage, and bilateral staged TKA. McLaughlin et al.6 conducted a study of the relative safety of simultaneous (two-team), sequential, and staged TKA, and concluded that there were fewer complications and significantly shorter hospitalizations in patients who underwent simultaneous bilateral TKA.

Although the bilateral one-stage technique has several advantages, it usually takes 3–4 h. Since July 1984, we have been performing bilateral TKA, using two surgical teams, in order to reduce the operative time. We report the postoperative results and the advantages and disadvantages of simultaneously performed bilateral TKA.

Materials and methods

Patient population

Between January, 1984 and December, 1993, TKA was performed in 212 patients (332 knees) at Itabashi Hospital of Nihon University. Ninety-two of these patients underwent unilateral TKA and in 120 patients (240 knees), bilateral TKA was performed. In 79 of these patients (158 knees), the bilateral TKA was carried out simultaneously.

Follow-up data were available for 113 patients (226 joints) who underwent bilateral TKA. This population
Table 1. Characteristics of patients in whom bilateral total knee arthroplasty (TKA) was performed

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients (n)</td>
<td>74</td>
<td>22</td>
</tr>
<tr>
<td>Knees (n)</td>
<td>148</td>
<td>44</td>
</tr>
<tr>
<td>Age (years, mean)</td>
<td>64.3 (39-85)</td>
<td>64.1 (50-71)</td>
</tr>
<tr>
<td>Female:Male</td>
<td>65:9</td>
<td>18:4</td>
</tr>
<tr>
<td>RA:OA</td>
<td>46:28</td>
<td>14:8</td>
</tr>
<tr>
<td>Follow-up period (years, mean)</td>
<td>5.4 (2.4-8.7)</td>
<td>6.2 (2-9.4)</td>
</tr>
</tbody>
</table>

Numbers in parentheses indicate ranges.
Group I, Simultaneous bilateral TKA; Group II, staged bilateral TKA. RA, rheumatoid arthritis; OA, osteoarthritis

included patients treated by each of the three methods. Seven patients dropped out of the study, 4 because of unrelated deaths, and 3 who were lost to follow-up.

Simultaneous bilateral TKA (group I) was indicated when the patient had destructive changes in both knees, was considered physically able to withstand the simultaneous bilateral TKA procedure, and expressed a preference for this approach. Group I consisted of 74 patients (148 knees), 65 women (130 knees) and 9 men (18 knees). Forty-six patients had rheumatoid arthritis (RA) (92 joints) and 28 patients had osteoarthritis (OA) (56 joints). Age at the time of operation ranged from 39 to 85 years (mean, 64.3 years). The follow-up period ranged from 2 years and 5 months to 8 years and 8 months (mean, 5.4 years) (Table 1). The prostheses used in this group were: the AXIOM (Orthomet, Minneapolis, MN, USA) (n = 50 joints), AMK (DePuy, Warsaw, IN, USA) (n = 44), Miller-Galante (MG, Zimmer, Warsaw, IN, USA) (n = 34), [MGI (n = 24) and MGII (n = 10)], and several other surface replacement type prostheses (n = 20). Components were fixed with bone cement in 104 joints (70%), and without cement in 44 joints (30%).

The group that underwent staged TKA during one hospitalization (group II) consisted of 22 patients (44 joints). The indications for the staged operation included mental or physical inability to tolerate the simultaneous bilateral TKA procedure, and expressed a preference for this approach. Group II consisted of 22 patients (44 joints). The indications for the staged procedure included uncontrolled hypertension or diabetes, severe heart disease, renal insufficiency, and liver dysfunction. The group consisted of 18 women and 4 men: 14 patients had RA and 8 had OA. Age at time of operation ranged from 50 to 75 years (mean, 64.1 years). The follow-up period ranged from 2 years to 8 years and 5 months (mean, 6.2 years). The prostheses used in this group were: MG (n = 20) [MGI (n = 16) and MGII (n = 4)], Kinematic stabilizer (Howmedica, Rutherford, NJ, USA) (n = 12), and other types of surface replacement prostheses (n = 12). Bone cement was used for fixation of components in 34 joints (77%). Cementless fixation was chosen in 10 joints (23%).

All patients (groups I and II) were hospitalized 1 week before the scheduled date of surgery to permit thorough preoperative medical evaluation.

Operative method

The patients, received combined (spinal and epidural) anesthesia, and the operative procedure was performed in a clean room by two surgical teams, each of which included a surgeon and one assistant. The chief surgeon, who was on the first team, started the operation on one side; an air tourniquet was used. Twenty to 30 min later, the second team started the procedure on the other side, also using an air tourniquet. A time lag of 20–30 min was maintained throughout the operation, so that the chief surgeon could constantly supervise progress on both knees. To avoid stress to the cardiovascular system, the tourniquets on the two knees were applied and released at intervals of 15–20 min. The tourniquets were released for 10 min so that hemostasis could be achieved. They were then, reapplied to protect against further bleeding from bone prior to skin closure. Epidural anesthesia was maintained continuously for 3 or 4 days postoperatively to avoid postoperative pain in the two knees.

For hemostasis, when the TKA was completed and the wound bandaged, 50 cc of saline, containing epinephrine (1:200000) and 0.5 g antibiotic (Flomoxef sodium, Flumarin, Shionogi, Osaka, Japan) was injected into the knee via the drain. The drain was clamped for 20 h (overnight) (drain clamp method). It was then unclamped to begin aspiration. The drain was retained for 48 h after surgery. This procedure was employed in all patients.

The operative schedule in group II consisted of unilateral TKA on each knee, with a 3- to 4-week interval