

Simultaneous bilateral total knee arthroplasty in a single procedure

T.-K. Liu, S.-H. Chen

Department of Orthopaedic Surgery, National Taiwan University Hospital, Taipei, Taiwan

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Summary. *Eighty-eight consecutive patients undergoing total knee arthroplasty (TKA) were reviewed retrospectively and divided into two groups. Group I (64 patients) had both knees replaced simultaneously by one team in a single procedure while Group II (24 patients) had 2 operations staged about 7 days apart. The blood loss, operative time, knee functional score, period of hospitalisation and complications were documented in order to compare the 2 groups. Performing simultaneous bilateral TKA (Group I) did not increase the incidence of operative or post-operative complications. Equally, the functional score and mean intra- and post-operative blood loss were not influenced. The operative time and duration of hospitalisation were significantly shorter in Group I than in Group II. On the basis of the results of this study, it appears that simultaneous bilateral TKA is beneficial.*

Résumé. *Quatre vingt-huit patients consécutifs opérés de l'arthrose (TKA) ont été revus rétrospectivement. Ils ont été divisés en deux groupes. Le groupe I (64 patientes) ont eu leurs genoux remplacés simultanément par une équipe durant une procédure unique. Le groupe II (24 patients) a subi deux opérations séparées sur 7 jours durant un séjour à l'hôpital. Il en a résulté qu'opérer simultanément une TKA bilatérale (groupe I) n'a pas entraîné d'incident opératoire, ni aucun accroissement des réactions postopératoires. Il n'y a pas eu d'influence sur le résultat fonctionnel, ni aucune perte sanguine durant ou après l'opération. Le temps d'opération et la durée d'hospitalisation ont été beaucoup plus courts dans le groupe I que dans le groupe II. En*

prenant en compte les résultats de cette étude, il apparaît qu'une TKA bilatérale simultanée n'a pas seulement été bénéfique, mais aussi un choix alternatif pour les patients.

Introduction

Total knee arthroplasty (TKA) is widely undertaken for relief of pain and restoration of function in patients with advanced osteoarthritis and rheumatoid arthritis. In those with arthritic involvement of both knees, bilateral operations may be required. Bilateral total knee arthroplasty may be performed as a one-stage procedure or staged separately during a single hospitalisation. The disadvantages of staged TKA include prolonged hospitalisation, delayed recovery of knee function and prolonged rehabilitation [15]. There have been several reports describing simultaneous TKA and evaluation of the outcomes are comparable [2–4, 10–16]. However, there has been debate as to the risk of post-operative complications [6]. Morbidity following simultaneous one-stage TKA has been reported to be less [10, 14], equal to [4], or greater [10, 16] than in the staged procedure. The most significant risks associated with simultaneous TKA are venous thrombosis and pulmonary embolus [10, 16].

Russell et al. [13] suggested that concurrent bilateral TKA can be performed without any significant increase in patient morbidity or mortality. The purpose of the present study was to assess the morbidity and clinical outcome associated with simultaneous bilateral TKA undertaken by one team of surgeons, as compared with a group of procedures staged during one hospital admission.

Materials and methods

From January 1993 to June 1995, total knee arthroplasty (TKA) was performed in 88 patients (176 knees). They were divided into 2 groups. Group I (64 patients, 128 knees) underwent simultaneous bilateral TKA, while Group II (24 patients, 48 knees) had staged TKA at an average of 7.4 days apart (range, 5–11 days), during one hospital admission. The choice of simultaneous or staged procedures was made by the surgeon after consideration of the medical risks such as cardiovascular disease, chronic obstructive pulmonary disease, diabetes, hypertension and renal insufficiency, and discussion with the patient.

Group I consisted of 61 women and 3 men. Fifty-nine had osteoarthritis (OA) and 5 rheumatoid arthritis (RA). The mean age at surgery was 66.7 years (range, 44–78 years). Six individuals in this group suffered from diabetes and 23 had hypertension. Group II comprised 24 women and no male patients. Twenty-three had OA and one RA. The mean age at surgery was 68.6 years (range 54–79 years). Five patients suffered from diabetes and 7 had hypertension. The mean follow-up period was 31 months (range, 18–44 months).

Spinal or epidural anaesthesia was used in all patients. In those undergoing simultaneous operation during one anaesthesia, the procedures were performed sequentially by a single surgical team using the same set of instruments for both knees. The operation was started on one side under tourniquet control and the knee was exposed through a midline skin incision with a medial para-patellar arthrotomy. The selection of the prosthesis was based upon the surgeon's own preference. Four types of implants were used including the PCA (Howmedica, Inc., Rutherford, New Jersey), Miller-Galante II (Zimmer, Warsaw, Indiana) Osteonics (Omnifit, Allendale, New Jersey) and Whiteside (Ortholoc II, Dow Corning Wright).

After release of the tourniquet, haemostasis was carried out. Both the femoral and tibial components of the prosthesis were uncemented but all patellae were cemented. While the second assistant closed the wound, the surgeon and the first assistant commenced the operation on the opposite knee and the same procedure was performed. At the completion of the operation, a bulky compressive dressing was applied to both knees. The drains were removed on the 3rd post-operative day. All patients received a banked blood transfusion in the peri-operative and post-operative periods. In Group II, the operation consisted of a unilateral TKA on each knee with a 5 to 11 day interval between the first and second procedures. The operative technique was the same as for Group I.

Preoperatively, the patients in Groups I and II were given parenteral first-generation cephalosporin, and this prophylactic

therapy continued for 72 h postoperatively. No preoperative anticoagulation drug was administered in either Group.

In all patients, continuous passive motion (CPM) in conjunction with active movements was performed daily under the guidance of a physical therapist. Mobilisation with partial weight bearing was begun when the patient could satisfactorily perform straight leg-raising.

Methods of assessment

The knee score of the Hospital for Special Surgery [5], was used for preoperative and postoperative assessment. The total blood loss, total blood transfusion, tourniquet time, operative time, duration of hospital stay and incidence of complications were compared between two groups. Statistical analysis was performed using the student *t*-test.

Results

In Group I, the average HSS score improved from 42 ± 9.58 (range, 14–62) preoperatively to 84.1 ± 4.81 (range, 71–95) at the final follow-up. In Group II, the average HSS score improved from 47.4 ± 11.7 (range, 17–67) preoperatively to 85.3 ± 4.51 (range, 74–94) at the final evaluation (Table 1). All patients showed postoperative improvement of function. The mean postoperative score in group I was not significantly different from that in group II. The average preoperative ROM was 105° in Group I and 110° in Group II, the mean postoperative ROM was 100° in Group I and 105° in Group II. There was no statistically significant difference between the two groups.

The mean operative time in Group I was 19 min less than in Group II. The mean tourniquet time in Group I was 26 min less than in Group II. The total duration of hospitalisation and the mean hospitalisation time in Group I was significantly less than that in Group II. Statistically significant differences were found between Group I and Group II with respect to operative time, tourniquet time and hospital stay (Table 2). Although the total volume of blood loss in Group I was 341 cc more than in Group II, the total

Table 1. Functional score before and after total knee arthroplasty

	Group I	Group II	
Functional scores (points)			
Preop	42.0 ± 9.58 (14–62)	47.4 ± 11.7 (17–67)	NS ($P=0.0528$)
Postop	84.1 ± 4.81 (71–95)	85.3 ± 4.51 (74–94)	NS ($P=0.2777$)

NS: Not significant; Mean+SD; Group I, Simultaneous bilateral TKA; Group II, Staged bilateral TKA

Table 2. Operative time, tourniquet time and duration of hospital stay

	Group I	Group II	
Operative time (min)	143 ± 20.6 (95–190)	162.6 ± 13.7 (130–186)	$P < 0.0001^*$
Tourniquet time (min)	71.9 ± 15.2 (42–101)	98.5 ± 14.3 (53–120)	$P < 0.0001^*$
Hospital stay (days)	16.5 ± 4.58 (12–30)	20.9 ± 3.57 (17–37)	$P < 0.00046^*$

*: Significant; Mean+SD; Group I, Simultaneous bilateral TKA; Group II, Staged bilateral TKA

Table 3. The blood loss and total units of blood transfused

	Group I	Group II	
Total blood loss (ml)	2744±727.2 (1185–4700)	2403±551.2 (1565–3735)	<i>P</i> <0.02210*
Total blood transfusion (units)	4.82±1.39(3–8)	4.94±1.58 (3–9.5)	NS (<i>P</i> =0.9174)

*: Significant; NS: Not significant; Means±SD; Group I, Simultaneous bilateral TKA; Group II, Staged bilateral TKA

Table 4. Complications

	Group I	Group II
	(<i>n</i> =64 patients)	(<i>n</i> =24 patients)
Medical complications		
Pulmonary embolism	0	0
Myocardial infarction	0	0
Congestive heart failure	0	2 (8.3%)
Deep vein thrombosis	0	1 (4.17%)
Surgical complications	(<i>n</i> =128 knees)	(<i>n</i> =48 knees)
Patellar subluxation	5 (3.9%)	1 (2.1%)
Superficial infection	1(0.78%)	1 (2.1%)
Deep infection	1 (0.78%)	0
Bed sore	5 (3.9%)	1 (2.1%)
Urinary retention	4 (3.1%)	0
Loosening of prosthesis	0	0

Group I, Simultaneous bilateral TKA

Group II, Staged bilateral TKA

units of blood transfused were equal in both groups (Table 3).

Postoperative complications occurred in a few individuals. These included urinary retention, bed sores, patella subluxation, congestive heart failure, deep vein thrombosis, superficial and deep wound infection (Table 4). Loosening of the prosthesis or peroneal palsy were not seen. No patients died in hospital, and there were no instances of myocardial infarction or pulmonary embolism. There were no significant differences between Groups I and II with respect to complications (Table 4).

Discussion

The treatment of bilateral knee OA and RA with total knee arthroplasty is well documented [1, 3, 9, 14, 16]. It has been reported that bilateral TKA produces marked functional improvement in patients with OA and RA of both knees [7]. Hardaker et al. [4] and Stanley et al. [15] compared simultaneous bilateral TKA with staged bilateral procedures. Their patients all showed postoperative improvement of function and the complication rate was no greater for simultaneous surgery. Morrey et al. [11] concluded that the incidence of morbidity and mortality associated with simultaneous bilateral TKA is not greater than that of staged bilateral TKA during the same hospitalisation.

The major concern in performing bilateral TKA is the risk of pulmonary embolism [2, 3, 6, 10, 14, 16]. This complication has been attributed to fat embolism secondary to increased intramedullary pressure dur-

ing the use of intramedullary cutting guides in both the femur and the tibia. Kolettis et al. [8], in his report on the safety of single-staged bilateral TKA, suggested that with appropriate femoral canal decompression, bilateral single-staged TKA appeared to be a safe procedure. Many authors have reported similar results [6, 12, 13]. In our own study, there were no significant differences between the two Groups of patients with respect to intra-operative and postoperative complications. No serious complications, such as pulmonary embolism or deep vein thrombosis occurred in either group.

The advantages of simultaneous bilateral TKA include a single operation, one anaesthetic, decreased hospitalisation time, reduced cost and the ability to rehabilitate the patient symmetrically. In our series, all patients underwent surgery under spinal or epidural anaesthesia as postanaesthetic care is easy and seems to lead to a quicker recovery. Simultaneous bilateral TKA by one surgical team required a shorter operative time than that of a staged operation. A disadvantage associated with simultaneous bilateral TKA is greater blood loss than that which occurs in the staged procedure [6, 8, 13]. Nevertheless, the advantages of the simultaneous bilateral TKA outweigh the disadvantages. The results of this study indicate that simultaneous bilateral TKA appears to be safe in carefully selected patients who have advanced arthritis in both knees.

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