

Assessment of Efficacy of Bilateral Total Knee Arthroplasty in Single Sitting

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Abstract

Background: A large number of patients with severe end-stage degenerative joint disease have symptomatic bilateral knee joint affliction, necessitating bilateral knee joint replacement.

Aim: To assess clinical and functional efficacy of bilateral total knee arthroplasty in single sitting.

Material and methods: This ambispective observational study was carried in tertiary care teaching hospital in Pune city, India. All patients underwent standard preoperative workup including cardiac fitness with 2D ECHO and pre-anaesthetic checkup. Those patients deemed fit to undergo total knee replacement in single sitting were included in the study. Functional outcome was evaluated using the Knee Society Score (KSS) and clinical outcome was evaluated using Knee Society clinical score (KCS). Statistical Analysis: Mean, standard deviation, percentages and proportions were used for descriptive statistics. Pair t test and Kruskal Wallis test were used as test of significance.

Results: 38 women and 14 men (3:1) (mean age, 63 years) underwent Simultaneous bilateral total knee arthroplasty (SBTKA) for both knees, either with diagnosis as Osteoarthritis (83%) or Rheumatoid arthritis (17%) using a posterior stabilized, cemented prosthesis. At the 3 month follow-up, the mean KSS improved from 64 to 78 ($p < 0.001$) and the mean KFS improved from 63 to 79 ($p < 0.001$). The difference between the means' of pre op KSS and post op KSS was 36.76 (33.3 to 40.21, 95% CI). The difference between the means' of pre op KFS and post op KFS was 36.24 (33.46 to 39.03, 95% CI). The P value was significant (< 0.001) when the pre op and post op Knee Clinical Scores and Knee Functional scores were compared. Conclusion: Simultaneous bilateral total knee arthroplasty (SBTKA) is a good choice for patient and hospital. SBTKA is effective in improving post-operative clinical and functional outcomes. We recommended larger studies as well as comparative studies for more conclusive evidence.

Keywords

Total knee arthroplasty; Bilateral; Efficacy; Clinical; Functional

Introduction

Total knee Arthroplasty (TKA) is a procedure in which the damaged cartilage in the knee is replaced with artificial bearing surfaces. It is one of the most clinically successful and cost effective medical procedures developed during the last century [1-3].

Published studies in the literature have consistently reported TKA as an efficacious and cost-effective means of alleviating pain and restoring function with consistent improvement in the quality of life after failed conservative treatment [4,5]. A large number of patients with severe end-stage degenerative joint disease have symptomatic bilateral knee joint affliction, necessitating bilateral knee joint replacement [6-8].

Despite these advantages, the safety of simultaneous bilateral total knee arthroplasty (SBTKA) remains controversial owing to the concerns over peri-operative morbidity and mortality [9,10]. Some studies have voted against and questioned the safety and relative risk of SBTKA and demanded further critical evaluation [11,12]. Advances in surgical techniques and improvement in the prostheses used have improved outcomes and reduced recovery time. Indeed, among patients with two damaged knees, many are now electing simultaneous total knee replacement, avoiding a second surgery, hospital stay and rehabilitation.

The surgeon and patient are then faced with the decision of whether to proceed with staged bilateral total knee replacement or bilateral total knee replacement in single sitting. The purpose of this study was to evaluate the efficacy of bilateral total knee arthroplasty in single sitting.

Materials and Methods

This ambispective observational study was carried on tertiary care teaching hospital in Pune city of Maharashtra state of India.

All the patients with age less than 75 years, with clinical and radiological evidence of significant bilateral arthritis, requiring surgical intervention in both the knees that consented for SBTKA were included in the study. Strict exclusion criteria included age more than 75 years, any previous history of local infection within last one year, any previous surgery performed over the knees, remote source of infection, extensor mechanism dysfunction, peripheral vascular disease and patients unwilling to consent for SBTKA.

Before surgery all patients were subjected to a comprehensive medical evaluation. Preliminary preoperative workup for physician fitness, 2D

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Echocardiography for cardiac fitness and pre-anaesthetic checkup was done in all the patients to be deemed fit for SBTKA. The patients with adequate pulmonary and cardiac reserve were declared fit to undergo SBTKA. The level of anesthetic risk was outlined by the American Society of Anesthesiologists (ASA) classification system [13].

All SBTKAs were performed using same technique under single, combined spinal and epidural Anaesthesia, in a sequential manner. All patients were catheterized for urine output calculation. Both knees were prepared at the same time Peri-operative intravenous antibiotics were given 30 minutes prior to incision and continued until postoperative day 2 to 5 depending upon the surgeon preference. To reduce peri-operative blood loss, tranexamic acid was given intravenously after the incision (20 mg/kg) and then 3 hourly (20 mg/kg) for next 6 hours. Tourniquet was used in all cases. The tourniquet inflation pressures ranged from 300 to 350 mm Hg. The same surgical technique was used in all cases. A standard midline incision and medial parapatellar approach was used for all procedures. Intramedullary femoral alignment rods were used for all procedures, with overdrilling of the femoral entry point before intramedullary rod insertion. Intramedullary alignment guide was used only on femoral side. Posterior stabilized (PS) prosthesis was used in all cases. Patella was resurfaced in cases with patellofemoral joint mal-alignment. The second knee was begun only after the tourniquet was released on the first knee. Drapes were retained for second knee. A bulb-suction drain was inserted in each reconstructed knee and was removed in 48 hours or if total output for a 12-hour period was <20 mL. The same postoperative protocol was used in all cases. Patients with known comorbidity i.e. grading II or III as per ASA grading or more intraoperative blood loss were nursed in Intensive Care Unit (ICU) for observation. Vital signs, oxygen saturation (SPO₂) and fluid intake/output were monitored up to 24 hours in all patients.

Haemoglobin levels were checked and the decision to transfuse patients with blood postoperatively was based on the following criteria: patients symptomatic with tachycardia, shortness of breath, chest pain, fatigue, or dizziness with activity or hemoglobin <8.5 mg/dl in patients with cardiovascular comorbidity. Care was taken to avoid electrolyte imbalance and hyponatremia. Deep vein thrombosis prophylaxis entailing intravenous low molecular weight heparins either enoxaparin or dalteparin or fondaparinux for 12 hours after surgery and then oral anticoagulants either rivaroxaban or dabigatran for 2 weeks after discharge were given. The urinary catheter was removed 24 hours after surgery. To facilitate early recovery, multimodal pain management was given and included patient-controlled analgesia with epidural pumps. Bulky dressings were removed on 2nd postoperative day. DVT stockings were put on both the knees Patient was put on active physiotherapy for quadriceps and hamstring muscles. Depending on the ability of the patient to actively extend his/her knee, patient was mobilized on a walker by the 2nd day of surgery till the day of discharge. The Patients were discharged from the hospital when they were able to transfer independently from bed to chair and able to ambulate from the bed to the bathroom and back to the bed with the use of a walking aid. Range of motion of both the knees >75° also was a requirement before discharge. Most of the patients were discharged after suture removal on the 12th day.

Pre and postoperative evaluation was done using Knee Society clinical score (KCS) and Functional outcome (ability to walk, sit cross legged, and climb staircase) was evaluated pre and post operatively, using the Knee Society Functional Score (KFS). Standing antero-posterior and lateral

view radiographs of both knees were taken to assess limb alignment and component position.

Statistical analysis

Data was collected using a structured proforma on Excel software (Microsoft, Seattle, USA). Measurements were expressed as means and standard deviations for continuous variables and percentages for categorical variables and was analysed. Pre and postoperative values were compared using the paired t test and Kruskal Wallis test. A p value less than 0.001 was considered statistically significant.

Ethical considerations

The study was conducted according to the Declaration of Helsinki; the protocol was reviewed and approved by the institutional ethics committee of the institute. A written informed consent was taken from all patients after explaining the procedure.

Results

Total 52 patients were included in the study, which included 14 men and 38 women (1:3), mean age was 63 ± 7 years old (48-75). Mean age was lesser (62 ± 7) in patients with Rheumatoid arthritis. The indication of surgery was osteoarthritis in 43 patients (83%) and Rheumatoid arthritis in 9 patients (17%).

The mean initial Knee Society Clinical Score (KCS), score was 41 ± 11 points (13-65 points). The mean initial Knee Society Functional Score (KFS), score was 42 ± 9 points (20-65 points). The American Society of Anesthesiologists (ASA) 13 score was ASA one in 2 cases (4%), ASA two in 36 cases (69%), and

ASA three in 14 cases (27%).

The mean hospital stay was 9.1 ± 3.5 days (4-19). Mean pre op hemoglobin was 12.3 ± 1.5 g/dL (10.0-17 g/dL) and post op Hb was 9.2 ± 1.4 g/dL (6.0-13.0 g/dL). Mean blood loss including drain output was 553 ml ± 209 ml (200-1250). Mean decrease in Hb was 3.1 ± 1.3 g/dL (0.6-7 g/dL). There were 2 preoperative transfusions in patients who had Hb <10 g/dl. Twenty six patients (50%) received a postoperative transfusion with a mean 1.1 ± 1.4 units (0-6 units). Blood substitutes were preferred over blood in 10 patients; while 31 patients received both blood as well as intra venous blood substitutes (60%).

The patients were assessed 6 weeks post operatively for any signs of post-operative infection. Once post-operative infection was ruled out clinically the patient was assessed clinically, functionally and radiologically using the Knee Society Score at 3 months. 2 patients with post-operative infection were not assessed for KSS. One patient had died. These 3 patients were not included in the post op KSS.

At the 3 month follow-up, the mean KCS improved from 64 ± 6 to 78 ± 7 (p<0.001) and the mean KFS from 63 ± 7 to 79 ± 10 (p<0.001). The pain component of the KSS also improved significantly (p<0.001). According to the Knee Society Clinical Scoring system of the 49 patients assessed in this study 23 patients (47%) had Excellent, 24 patients (49%) had Good, and 1 patient each (2%), had fair and poor results. Whereas according to the Knee Society Functional Scoring system of the 49 patients assessed score was excellent in 31 patients (63%), good in 14 patients (29%), fair and poor in 2 patients each (4% each).

The difference between the means of pre op KCS and post op KCS was 36.76 (33.3 to 40.21, 95% CI). The P value was significant (<0.001) when the pre op and post op Knee Clinical Scores were compared (Tables 1 and 2).

Sr. No.	Grading	Frequency (%)
1.	Excellent	23 (47)
2.	Good	24 (49)
3.	Fair	1 (2)
4.	Poor	1 (2)

Table 1: Grading of Knee Clinical Scores (n=49).

Sr. No.	Grading	Frequency (%)
1.	Excellent	31 (63.27)
2.	Good	14 (28.57)
3.	Fair	2 (4.1)
4.	Poor	2 (4.1)

Table 2: Grading of Knee Functional Scores (n=49).

Discussion

TKA continues to be one of the most successful and effective orthopedic operative procedures and is considered to be extremely safe. Most patients with arthritis of the knee undergo unilateral TKA, however many patients present with symptomatic arthritis of both knees. The question then arises whether SBTKA is a safe operation to perform in this setting and the orthopedic surgeon must then decide. There are known benefits of performing bilateral arthroplasty during one anaesthetic session, in a single sitting. Patient convenience, reduced length of stay in the hospital and a potentially shortened period of rehabilitation and disability are some of the appeals. Then again, the fear of increased complications dissuades some surgeons from performing bilateral arthroplasty during one anaesthetic session.

Majority of the patients presenting for TKA in our setup do so only when they are so disabled by arthritis that walking becomes an ordeal. It is not surprising that many of them especially those with rheumatoid arthritis present with severe deformity and stiffness at the time of arthroplasty. Most of the patients regained at least 90 degrees flexion irrespective of the diagnosis. In 5 rheumatoid knees with arthrofibrosis the progress was slow as expected. Hardaker et al. have reported improvement in knee score from 44 to 81 and 47 to 78 in bilateral and unilateral knee replacement group respectively on patients of mixed diagnostic group including rheumatoid and osteoarthritis. Our cases showed similar improvement in knee score for both clinical as well as functional outcome. There was greater degree of improvement in outcome of rheumatoid patients with polyarticular involvement, with limitation of ambulatory capacity.

Study results are comparable with study carried out by Kiran KE et al. Their study concluded that simultaneous bilateral knee replacement in younger patients with advanced rheumatoid arthritis is safe and effective. Luscombe JC et al. study recommended that fit candidates with bilateral arthritis undergo BSATKR, with its proven good functional results, symmetric knee rehabilitation and possible cost savings [14-16].

Conclusion

Simultaneous bilateral total knee arthroplasty (SBTKA) is a good choice for patient and hospital. SBTKA is effective in improving post-operative clinical and functional outcomes. We recommended larger

studies as well as comparative studies for more conclusive evidence.

Conflict of Interest

We have no conflict of interests to disclose and the manuscript has been read and approved by all named authors.

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