

ORIGINAL ARTICLE

SIMULTANEOUS BILATERAL TOTAL KNEE REPLACEMENT: A PROSPECTIVE STUDY OF 150 PATIENTS

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ABSTRACT:

Introduction: The candidate for total knee replacement surgery is usually elderly patients with different other systemic co-morbidities. Continuous epidural analgesia effectively manages postoperative pain, allows early ambulation and reduces mortality in total knee replacement surgery by decreasing deep vein thrombosis and thromboembolism. **Materials & Methods:** Initially, 200 patients (400 knees) with bilateral osteoarthritis requiring simultaneous total knee arthroplasty. However, 30 patients were excluded after applying the exclusion criteria, and 20 patients refused to participate. One hundred and fifty patients were scheduled for both TKA were enrolled in this prospective study, after obtaining approval from our institutional review board and written informed consent from all participating patients. **Results & Conclusion:** In our study we have done simultaneous bilateral TKR in 150 patients 300 knees. Duration of surgery was found to be 3 hrs. Blood loss – 600 ml on an average. Overall hospital stay – 6 days. Knee bending to more than 90 degrees achieved by 4 to 5 days post operatively. Gait training was found to be easier. At the 1-year follow-up, the mean range of motion improved from $100^{\circ}\pm 7$ to $129^{\circ}\pm 6$ ($p=0.032$), the mean KSS from 100 ± 8 to 160 ± 6 ($p<0.001$).

Keywords: Bilateral, Knee Replacement, TKR

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INTRODUCTION:

The knee joint is the largest gliding hinge joint in the body. It is required to rotate, and flex and extend like a hinge. It can also slide backward, forward and side to side.¹ The knee is actually made up of two joints, the tibiofemoral and the patellofemoral joint. The tibiofemoral joint is a meeting of the femur (thigh bone) and the tibia (shin bone). At the lower end of the femur (thigh bone) is a groove called the trochlear groove. The patella (kneecap) contacts this groove forming the patellofemoral joint.² The patella (a button shaped bone with cartilage on its undersurface) sits at the front of the knee and slides down and up the trochlear groove when the knee bends and straightens. The patella protects the knee and gives leverage to the muscles.³

A normal joint is enveloped by a fluid filled sac called a joint capsule. The fluid in this capsule is called synovial fluid which is produced in a thin membrane called the synovium. In a healthy joint, the ends of the bones are encased in smooth articular cartilage. The synovial fluid functions to lubricate the joint and also provides nutrients to the cartilage and connective tissues within the joint capsule.⁴ Osteoarthritis Is also known as ‘degenerative arthritis’. Osteoarthritis can be a result of excessive wear and tear, but it has been postulated that there may be a genetic predisposition to the condition.⁵ The cartilage in your joints deteriorates causing your bones to contact each other directly. This will feel like soreness and stiffness of the joint. Knees, wrists and hips are common areas to experience this condition. With osteoarthritis, the cartilage becomes worn away. Spurs grow out from the edge of the

bone, and synovial fluid increases. Altogether, the joint feels stiff and sore.⁶

The candidate for total knee replacement surgery is usually elderly patients with different other systemic co-morbidities. Continuous epidural analgesia effectively manages postoperative pain, allows early ambulation and reduces mortality in total knee replacement surgery by decreasing deep vein thrombosis and thromboembolism. Total Knee Arthroplasty(TKA) is a reliable treatment for pain relief and the restoration of joint function in arthritic knees and achieves satisfactory outcomes in more than 90% of patients.⁷

To further improve the accuracy of implant selection and position, alignment and bone resection robotic systems have been developed for TKA. Robotic systems are referred to as active systems. They serve as a delivery tool for a surgical procedure planned offline on a computer prior to surgery.

MATERIALS & METHOD:

The study inclusion criteria were as follows: primary osteoarthritis of the knee, no previous hemiarthroplasty or total knee arthroplasty, a mechanical axis between 20 varus and 5 valgus, and no severe instability that could not be treated by cruciate-retaining TKA. The exclusion criteria were previous open knee surgery, revision TKA, a neurological problem. Initially, 200 patients (400 knees) with bilateral osteoarthritis requiring simultaneous total knee arthroplasty. However, 30 patients were excluded after applying the exclusion criteria, and 20 patients refused to participate. The remaining 150 patients constituted the study cohort. One hundred and fifty patients were scheduled for both TKA were enrolled in this prospective study, after obtaining approval from our institutional review board and written informed consent from all participating patients. In all patients, both the knees were assigned to TKA to conventional manual implantation randomly from August 2004 to March 2006. Conventional TKA were performed by single surgeon who had TKA experience more than 150 cases previously. Intraoperatively, operative time,

skin incision length, and flexion and extension gap just before prosthesis implantation were checked. Postoperative hemovac drainage amount was measured in both sides. The posterior cruciate ligament was retained and NexGen prostheses (Zimmer, Warsaw, Indiana) were implanted with cement for arthroplasty.

All radiographic measurements with regard to changes in mechanical axes and the inclinations of femoral and tibial components were checked with consistent distance according to the Knee Society Roentgenographic Evaluation System. In addition, radiographic measurements were accurately measured using PACS (Picture Archiving and Communication Systems). Two independent investigators performed all radiological measurements to reduce observation bias. Bone cuts at each step done one after the other with single set of instrumentation. Cementing and prosthetic fitting done one after the other allowing the cement to set. Tourniquet removed one after the other with 15 min gap. Closure done simultaneously in routine manner. Post-operative care in intensive care unit for 24 to 48 hrs. Functional outcome (ability to walk, sit crosslegged, and climb staircase) was evaluated pre- and post-operatively, using the Knee Society Score (KSS). One-leg standing, supine anteroposterior, lateral, and skyline view radiographs of both knees were taken to assess limb alignment and component position. Pre- and post-operative values were compared using the paired t test.

RESULTS:

In our study we have done simultaneous bilateral TKR in 150 patients 300 knees. Duration of surgery was found to be 3hrs. Blood loss – 600 ml on an average. Overall hospitals stay – 6 days. Knee bending to more than 90 degrees achieved by 4 to 5 days post operatively. Gait training was found to be easier. At the 1-year follow-up, the mean range of motion improved from 100°±7 to 129°±6 (p=0.032), the mean KSS from 100±8 to 160±6 (p<0.001).

Table 1: Clinical outcome of patients

Clinical Outcome			Preoperative	Month 3	Month 6	Year 1
Knee Society Score	Right knee		100±7.6	127±7.8	145±6.0	160±6.2
	Left knee		100±7.9	129±5.6	140±5.9	160±4.6

DISCUSSION:

Knee replacement was developed following the success of hip replacement and much of the pioneering work was done in Britain. The early knee replacements in the 1960s and 1970s were fairly basic and the results were mixed. Improvements in surgical materials and techniques have greatly increased the effectiveness so that knee replacement surgery today has a high rate of success in relieving pain and restoring mobility.⁸

Osteoarthritis (OA) is a debilitating condition that affects a large population around the world. In the United States, OA is one of the leading causes of functional disability, and its occurrence is steadily rising (Mizner, Petterson, & Snyder-Mackler, 2005).⁹ Currently OA affects 13.9% of adults 25 years and older, as well as, 33.6% adults age 65 and older. The most commonly affect areas include the knees, hips, hands and spine (CDC, 2011). Osteoarthritis is classically described as a gradual degenerative disease that is characterized by decline of structural integrity of the articular cartilage and underlying bone of a joint.¹⁰ The breakdown of these tissues leads to the commonly seen symptoms of joint pain, stiffness, and decline in functional abilities. Osteoarthritis can develop for the following reasons: • age degenerative • rheumatoid arthritis or other inflammatory joint disease • trauma which can damage the joint surfaces • after some birth defects and growth disorders.

Total knee arthroplasty (TKA) is a common treatment of OA in the knee. A prosthetic device replaces the knee joint. The goal of TKA is to improve functional outcomes of the patient (Barbay, 2009).¹¹ While the quality of the patient's life generally improves following joint replacement therapy, there are surgical risks. A TKR involves removing the end of the thigh bone, and the top of the shinbone, and replacing them with prostheses (artificial knee implants). The artificial knee is usually made of metal alloy and high density plastic.¹²

Simultaneous bilateral TKA has been found significant more often associated with severe perioperative complications as myocardial infarction, pulmonary emboli or even mortality when compared to staged bilateral TKA in patients with co-morbidities and age over 70 years.¹² However, in healthy and younger candidates, like our patient, no elevated risk has been detected. The accumulated surgical trauma and blood loss of the simultaneous approach during one anesthesia was

thought to exceed the capacity mounting compensatory physiological responses in morbid and old aged patients.¹³ It has been shown that medical complications of simultaneous bilateral TKA can be reduced by meticulous planning together with the anesthesiologist. Adjusted tourniquet use and operation-time less than 2.5 hours per TKA was reported to significantly reduce blood loss, infection, and revision surgery. The incidence of thromboembolism may be further increased in bilateral TKR. Dorr et al found a 12% prevalence of fat embolism syndrome with simultaneous bilateral TKR, as documented by neurological changes with hypoxemia.¹⁴

Simultaneous bilateral TKR is more economical, enables higher patient satisfaction and quicker return to function, compared with staged bilateral TKR, which doubles the length of hospital stay and is 18%, or even 50%, more expensive. Simultaneous bilateral TKR is 36% less costly than 2 unilateral TKR. The mean reduction in the length of hospitalization is 7 days,¹² although there is a minimal increase in the risk of death or other complications.

Administration of 20 mg/kg of tranexamic acid at induction of surgery is effective in reducing the hemoglobin decrease following TKR.²⁰ Oxygen helps rehabilitation in the immediate postoperative days,²¹ and hence oxygen was given to all our patients for the first 2 days after surgery.

CONCLUSION:

A major limitation of the current study was that it was not comparative. Thus, no conclusions could be made regarding the outcome. Nonetheless, simultaneous bilateral TKR is safe as long as a proper protocol is followed for patient selection. Aggressive pain management and rehabilitation enables early recovery and thus decreases health care expenses.

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