Full length article

Is simultaneous bilateral total knee arthroplasty safe in geriatric population? A retrospective cohort study with upto 9 years follow up

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ABSTRACT

Introduction: Considering the old age, uncertain life expectancy, co-morbidities and fear of postoperative complications, elderly patients often hesitate to undergo simultaneous bilateral total knee arthroplasty (SBTKA).

Materials & methods: A retrospective study of SBTKA in 46 patients (92 knees) of age >70 years done between 2003 and 2012. Mean age was 80.13 ± 5.24 years (range –70–93 years).

Results: 74 percent had 1 or more major medical problems. There was a significant improvement of KSS at six months (p value = 0.00).

Conclusion: With expected benefits of surgery, SBTKA seems a safe, efficient, and viable procedure for carefully selected elderly patients.

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1. Introduction

In the recent decades, there has been a considerable increase in the number of elderly population in developed countries especially with age >85 years old.¹ It is expected that the population of aged more than 90 years in the USA will quadruple by 2050 and they will comprise 10% of the total population.² This increase in aging population is likely to be associated with a parallel increase in the number of total knee arthroplasty (TKA) done in this age group.²

The average life expectancy at birth in India has also increased to 70 years (68 years in male and 73 years in female) in 2013.³ However, numbers of older adults above 80 years are significantly low in India as compared to the developed countries. Due to the comparatively lower life expectancy of the Indian population, individuals aged above the age of 70 years were considered to be above the normal life expectancy.

Despite the high incidence of degenerative arthritis and its burden of impairment and disability cause significant problems, these older adults are unwilling to undergo TKA surgery.^{4,5} It could be due to several reasons like consideration of old age and uncertainty about life their expectancy, associated comorbidities and fear of potential postoperative complications.¹

However, with recent advances in the medical field, major surgical procedures like TKA can be done safely in elderly patients.⁶ Comparative studies have shown that there is a

significant improvement in pain and function in these patients without increased complication rates when compared to younger counterparts.⁷ There have been very few publications related to simultaneous bilateral total knee arthroplasty (SBTKA) in octogenarian and nonagenarian population and some reports of SBTKA in septuagenarian and younger population of fewer than 70 years.^{8–10} The advantage of performing SBTKA as compared to the two-stage procedures include a shorter time of exposure to anesthesia, less hospital stay, quicker rehabilitation, fewer wound complications, decreased surgical stress and more cost-effectiveness.^{11–13} Despite these distinct advantages, most people still prefer not to do SBTKA due to concerns regarding safety in the elderly patients. Few studies have raised concerns of increased preoperative morbidity and mortality, but in other studies, SBTKA had similar clinical outcomes as compared to unilateral or staged bilateral TKA.^{13,14}

We conducted a retrospective cohort study of SBTKA in patients of age more than 70 years to assess the preoperative comorbidities, pain relief, functional improvement and overall satisfaction, perioperative complications, time and blood loss during surgery, the length of stay (LOS) and mortality after surgery.

2. Materials and methods

The senior author (author 1) performed a total of 177 SBTKA between 2003 and 2012. Of these, we did a retrospective cohort study of 46 patients (92 knees) of age >70 years who underwent SBTKA, under single anesthesia. These patients had surgery under either combined spinal-epidural (93.5%) or general anesthesia (6.5%). Informed consent was taken from all the patients included

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in the study. The patients were informed that their more painful side would be operated first and the second side would be done if there were no significant events during the surgery. All the patients had dobutamine stress echocardiogram (DSE) to assess cardiac function. Associated comorbidities like hypertension, diabetes mellitus, coronary artery disease (CAD), chronic obstructive pulmonary disease (COPD), liver and renal diseases, thyroid disorders, and rheumatoid arthritis were recorded during the preoperative assessment. We recorded the patient's age, sex, weight, height, body mass index (BMI), American Society of Anesthesiologist (ASA) grade, Knee Society Score (KSS), date of surgery, tourniquet time, preoperative and postoperative hemoglobin, perioperative complications during a hospital stay, LOS. The amount of blood loss in the drain (in 24 and 48 h) after surgery, blood transfusions, use of intravenous Tranexamic acid (TA) perioperatively was also noted. Local infiltration analgesia (mixture of 0.25% Bupivacaine (20 ml), 15 mg Morphine, 80 mg Gentamycin, 15 mg Ketorolac, 0.1% Adrenaline and 50 ml normal saline) was used in all cases. KSS were recorded preoperatively, at 6 and 12 months after surgery. The postoperative complications like urinary tract infection, myocardial ischemia, confusion, respiratory tract infection, deep vein thrombosis (DVT) with the positive scan, shifting to high dependency unit or ICU, surgical site infection (SSI), and repeat surgery were also recorded. In all cases, TKA was done through anterior midline incision under tourniquet and cemented, posterior stabilized knee prostheses (Scorpio, Stryker) were used. A drain was put in all cases for 24–48 h. Broad-spectrum intravenous antibiotics were given at the time of induction of anesthesia and continued for 48 h. The patients were encouraged to mobilize and do isometric exercises of the knee on the next day of surgery. A multimodal approach for DVT prevention was employed in all cases using thigh length compression stockings, foot pump, and low molecular weight heparin (Enoxaparin 40 mg subcutaneously daily for five days), followed by oral aspirin (75 mg daily) was continued. Check radiographs, hemogram and electrolytes were done on the first postoperative day. Our threshold to transfuse blood after surgery was 8 g/dl.

All data was collected by a fellow who was not involved in surgery or post-operative follow-up of patients. Those patients who were not coming to OPD for follow-up were contacted telephonically to enquire about their clinical status. The collected

data was recorded in Microsoft Excel, and simple descriptive analysis was done. An average of all the continuous data was expressed in mean $\pm$ standard deviation. Pre- and post-operative KSS were assessed by applying Wilcoxon Signed Ranks test. A *p*-value less than 0.05 was considered significantly different between two variables.

3. Results

Our study included 25 males (54.4%) and 21 females (45.6%). The mean age of patients in our study was 80.13 ± 5.24 years (range 70 to 93 Years), and body mass index (BMI) was 29.4. The number of patients with age between 70 and 79 (a septuagenarian) was 22 (47.8%), those between 80 and 89 (octogenarian) were 23 (50%), and there was a single nonagenarian patient of 93 years. Amongst the preoperative comorbidities, the most common were hypertension (60.9%) (Fig. 1).

There were 14 (30.4%) patients having two diseases and 6 (13%) having three conditions. None of the patients had any significant medical event during anesthesia and surgery and hence were operated on both sides under single anesthesia. Twenty-six percent cases had no major medical problems. Nineteen patients (41.3%) did not require any blood transfusion (Table 1).

The mean pre-operative KSS of both the knees was 38.08 ± 4.85 points and score at six months and one year after surgery was 82.19 ± 5.61 and 82.60 ± 4.18 respectively (Fig. 2).

There was a significant improvement of KSS at six months (*p* value = 0.00). However, no difference in KSS was noted between 6 months and one year (*p* value = 0.242). In our study, 26.08% of patients were ASA grade I, 54.34% were ASA grade II, and 17.4%

Table 1
Patients demographics.

	Mean/number	Standard deviation/percentage
Age	80.13	5.25
Sex		
Male	25	54.4%
Female	21	45.6%
BMI	29.4	5.36

Abbreviations: BMI, body mass index.

Fig. 1. Pie diagram showing the percentage of patients with preoperative comorbidities.

(Abbreviations: HTN, hypertension; DM, diabetes mellitus; CAD, coronary artery disease; COPD, chronic obstructive pulmonary disease; AF, atrial fibrillation)

Fig. 2. Bar diagram showing Knee Society Score at pre-operatively, six months, and one year after surgery.

were ASA grade III and only one case of ASA grade IV. Five patients were shifted to ICU after surgery considering their age, associated comorbidities and higher ASA grading of four. The mean hospital stay of all the cases was 5.97 ± 1.62 days. There were no hospital mortalities. The most common post-operative complication noted was delirium (Table 2).

One patient developed intra-operative fracture of medial condyle of the right femur which was managed by internal fixation with two partially threaded 4.5 mm cancellous screws (Fig. 3).

One patient developed patella fracture 10th day after surgery, due to a fall, which was managed with open reduction and internal fixation with tension band wiring. Perioperative intravenous TA and local infiltration analgesia (LIA) was given in 28 (60.8%) and 35 (76%) patients respectively. None of the patients died either during a hospital stay or within one year of the index surgery of SBTKA. No case developed deep surgical site infection and required a revision TKA within one year after the index surgery. However, two patients developed cellulitis away from the surgical site which subsided with IV broad spectrum antibiotics. The mean follow-up duration after surgery in this study was 47 months (range of 12–108 months). Seven out of 46 patients (15.21%) were found to be deceased on telephone inquiry from their family members. The average time of their death was 5.6 years after the surgery and was due to medical causes, which were not related to SBTKA. None of our patients had implant failure and required revision surgery of their knee (Tables 3 and 4).

Table 2

ASA grade of the patients undergoing simultaneous bilateral TKA.

ASA Grade	Number	Percentage
I	12	26.08%
II	25	54.34%
III	8	17.4%
IV	1	2.2%
V	0	0%

Abbreviation – ASA – American Society of Anaesthesiology.

4. Discussion

With an increasing life expectancy of the human population, the age-related disorders like degenerative knee arthritis are on the rise, as there is a direct relationship between prevalence of knee OA to an increasing age.³ Most people have bilateral involvement of the knees and hence require bilateral TKA. Although older adults are more likely to suffer from disabling knee arthritis, there is hesitation to offer TKA in old age, perhaps because of concerns about the safety of SBTKA. These elderly individuals pose many challenges as they may have age-related physical and medical problems, more severe and complex deformities, lesser response to rehabilitation, need for postoperative medical assistance, increased total cost of treatment, etc.^{7,15,16} Hence, there is a tendency for willful neglect of even eligible patients by their family and doctors.¹⁷ Cahill et al. and Anthony et al. included patients of SBTKA with a mean age of 82.5 years and 78.6 years respectively in their series.^{8,10} In our series, the average age of our patients was 80.13 ± 5.24 years. Considering lower life expectancy of our Indian patients (compared to western population), this average age of our studied population seems significant. There are some studies of the outcomes of unilateral THA and TKA in octogenarian patients, and only a few reports addressing the nonagenarian patients.^{2,9,16} We had one patient of 93 years which seems to be the oldest reported case to undergo SBTKA, so far.⁹ Most of the previously published studies are based on either unilateral or staged bilateral arthroplasty, and the data on SBTKA lacks in this group of elderly patients.

The senior citizens, who live much beyond their counterparts, have exceptional qualities like low probability of disease or disability, active engagement with life and high cognitive and physical functional capacity.⁹ In 24% of our cases, there was no significant underlying co-morbid condition, testifying the fact that these elderly patients can be very healthy despite their increased age.

An expected shorter life expectancy and post-operative complications in an elderly may influence the patients' decision

Fig. 3. AP & Lateral radiographs showing fixation of medial condyle fracture with screws in a TKA.

Table 3

Blood and blood products related parameters in the elderly population undergoing simultaneous bilateral TKA.

Parameter	Mean	Standard deviation
Preoperative Hb	12.6	1.62
Postoperative Hb	9.94	1.1
Tourniquet time		
Right Side	44.43	14.01
Left side	45.56	16.63
Postoperative blood loss in drain		
Right side	468.43	296.4
Left side	441.93	219.9
Total	968.19	495.7
Blood transfusion		
No	19	41.3%
One unit	7	15.2%
Two unit	15	32.6%
Three unit	3	6.5%
Four unit	2	4.3%

Abbreviation – Hb – hemoglobin.

Table 4

Post-operative complications of patients.

	Number(n = 46)	Percentage
POCD	3	6.5%
Angina	2	4.3%
MI	1	2.2%
DVT	1	2.2%
Pneumonia	1	2.2%
UTI	2	4.3%
Renal dysfunction	2	4.3%
Patella fracture	1	2.2%
Medial condyle fracture of femur	1	2.2%

Abbreviations: POCD, post-operative cognitive dysfunction; MI, myocardial infarction; DVT, deep vein thrombosis; UTI, urinary tract infection.

of whether to do or not to do the surgery.¹⁸ In this study, many patients had associated comorbid conditions, and some of these patients had more than one major disease. Still, we did not

encounter any particular complications about these diseases. However, an adequate preoperative clinical work up and close perioperative monitoring is required.

ASA grade is a useful indicator of perioperative patients' health status and significantly related to postoperative death.¹⁹ Around 80% of our patients were in ASA grade I and II, and none in grade V. Patel et al. concluded that prolonged wound drainage and soakage in morbid obesity patients was an independent risk factor in arthroplasty.²⁰ The incidence of wound complications in our series could be related to lower mean BMI of our patients (<30). The mortality rate in our study was 15.21% (7/46 patients) at an average follow-up duration of 47 months. However, there was no mortality of patients within the hospital stay and one year after the surgery. Petrucci et al. indicated 59% of mortality after an average of 4 years $\pm$ 2.9 yr in nonagenarian patients.³ Biau et al. found that the mortality in elderly patients undergoing TKA is almost half to that of the general population (standardized mortality ratio of 0.53), and the survival of these patients in their 90s is equal to the survival of age-matched population for at least 2.5 years following surgery.²¹ The lower mortality rate in our study may be attributed to many factors like lower ASA grading, lesser tourniquet time and the inclusion of septuagenarian population.

The results of this study were similar to the previously published studies regarding pain relief, improvement of the quality of life and function, restoration of independence of patients as evidenced by improvement of KSS after the surgery with a mean improvement in KSS of 44.52 ± 5 at one year after the surgery. In the study of Petrucci et al., KSS was improved (42.3 ± 17.8) within this interval.³ Only twenty-five (58.7%) patients in our study required blood transfusion in SBTKA. The decision to transfuse blood depends on pre and post-operative hemoglobin, the amount of blood loss in the drain, as well as a clinical assessment of patients and a predetermined threshold. Petrucci et al. reported 67% blood transfusion rate in primary unilateral TKA among nonagenarian patients.³ Belmar et al. reported blood transfusion in all the 15 patients in his study of unilateral TKA.²² A decreased need for blood transfusion in our study of SBTKA can be attributed to factors like use of

perioperative TA, use of LIA, the release of a tourniquet with cauterization of bleeders before closure of skin and a higher threshold level 8 mg/dl for transfusion.

The most common complication noted was postoperative cognitive dysfunction (POCD), present in 6.5% patients. Older age, electrolytes and fluid imbalance, use of narcotics, acute pain, urinary retention, greater blood loss, and anemia have been reported to be the triggering factors.²² Two patients developed fractures perioperatively and were managed by internal fixation with satisfactory outcomes. Two cases of angina and one case of myocardial infarction were treated as per the hospital protocols, and no adverse outcomes were encountered. One instance of DVT, one case of pneumonia, 2 cases of urinary tract infections, and 2 cases of renal dysfunction were treated medically. Complete DVT prophylaxis was maintained for all patients according to hospital protocols. Mantilla et al. reported that the incidence of DVT was not significantly different with age, sex, and type of operation.²³

The shorter mean hospital length of stay in our study 5.97 ± 1.62 days could be corroborated with no significant medical problems post-operatively, adequate pain relief, availability of proper rehabilitation facilities and aggressive physiotherapy protocols in our hospital. Stroh et al. concluded that TKA is a safe and efficient treatment for disabling knee pain in patients above 80 years of age, despite a higher incidence of medical complications in the perioperative period.²⁴ Laskin observed that in patients older than 85 years, after TKA 76% could live independently and about 1/3rd could also drive their cars.²⁵ Hence, the quality of lives was significantly improved, and TKA seems a valuable procedure for them. In a recently published study by Ravi et al., total joint replacement in moderate to severe osteoarthritis was found to be associated with significant (40%) reduction in subsequent risks of serious cardiovascular events.²⁶ This decrease in cardiovascular events was because of improvement in physical activity, reduction of pain and thus psychosocial stress, and decreased the need for non-steroidal anti-inflammatory drugs.

We did not find SBTKA to be associated with any additional or significantly increased the risk of morbidity or mortality in our patients compared to unilateral or staged bilateral TKA. We believe, that although BSTKA cannot add years to the lives of these patients, certainly can add quality to the remaining years of their lives.

5. Conclusion

With anticipated benefits of surgery, SBTKA seems a safe, efficient, and viable procedure for carefully selected elderly patients. These patients should not be deprived of potential benefits of this surgery. Biological age is more important than the chronological age of these elderly patients while considering them for SBTKA surgery.

Conflict of interest disclosure

Each author wishes to declare that there are no potential conflicts of interest including financial interests, activities, relationships, and affiliations.

Ethical standards

This study has been approved by the appropriate ethics committee and has therefore been performed by the ethical standards laid down in the 1964 Declaration of Helsinki. All

persons gave their informed consent before their inclusion in the study.

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