

Total knee replacement at Southwestern Saudi Arabia: A single-center experience

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ABSTRACT

Background: Knee replacement enables the surgical management of end-stage knee joint osteoarthritis. In Saudi Arabia, there has been a recent increase in total joint replacement surgery. However, there is insufficient literature regarding patient outcomes in this region. Here, we assessed characteristics of patients who underwent total knee arthroplasty and their improvements on knee society score, timed up and go test, and 2-min. walk test. **Methods:** Patients who underwent primary total knee replacement at our tertiary care private hospital in Abha from January 2013 to January 2020 were included. The same orthopedic surgery performed primary cemented cruciate-substituting knee replacement. Knee function was evaluated using the knee society scoring system, timed up and go test, and 2-min. walk test. **Results:** Out of 420 patients, 350 were females (83.33%) and 70 males (16.67%). The mean age was 69.50 ± 7.48 years (range, 48–90). Most patients had osteoarthritis (84.5%), either degenerative or secondary because of trauma. Knee society functional and knee scores were poor preoperatively (mean, 38.21 ± 9.65 ; SD, 36.89 ± 8.23) but improved postoperatively (mean, 81.42 ± 12.74 ; SD, 85.49 ± 11.69 ; $P < 0.001$). The timed up and go test significantly changed from 28.51 ± 3.29 s to 18.18 ± 3.17 s ($P < 0.001$) and 2-min. walk test from 51.83 ± 6.48 m to 85.72 ± 8.92 m ($P < 0.001$). **Conclusion:** Despite knee replacement's late acceptance in Saudi Arabia, there have been increased cases in recent years and excellent improvements in knee function. The resulting knee society functional and knee scores, timed up and go tests, and 2-min. walk tests were better or similar to results seen by other researchers worldwide.

Keywords: Knee society score, osteoarthritis, Saudi Arabia, total knee arthroplasty

Introduction

Knee joint osteoarthritis is one of the most common orthopedic conditions, and the resulting clinical problems place a major burden on the health care system worldwide. More than 40% of the elderly after the age of 60 years are believed to suffer from this disorder.^[1,2] In the Kingdom of Saudi Arabia, the prevalence rate of osteoarthritis was reported to be between 13 and 30% in various regions.^[3-5] Knee replacement surgery, or knee arthroplasty, was first performed in 1968. Since then, improvements in surgical materials and techniques have greatly

increased its effectiveness. Total knee arthroplasty (TKA) is one of the most successful procedures in surgery for knee osteoarthritis.^[3]

According to the Agency for Healthcare Research and Quality, more than 600,000 knee replacements are performed each year in the United States, and approximately 35,000 patients undergo TKA annually in the United Kingdom.^[6] In the Middle East, including the Kingdom of Saudi Arabia, the annual number of TKA performed showed a substantial increase over recent years, likely because of increased survival and high success rates. TKA enables the restoration of normal knee function and the successful management of the pain and reduction of daily activities associated primarily with osteoarthritis.^[7,8] The advancements in technology combined with increased surgeon experience have led this procedure to become a proven rewarding surgery in patients with proper indication.^[9-13]

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Knowing patient characteristics and their outcomes after TKA surgery is important. It will help healthcare professionals in planning preventive strategies and provide improvements in surgical procedures. As per different regions in Saudi Arabia having various prevalence rates of osteoarthritis, the difference in cultures, patients, and surgeons leads to different characteristics and outcomes.^[3,14-16] The current study aimed to analyze and discuss patient characteristics and their outcomes in the Abha region of Southwestern Saudi Arabia.

Methods

The present study was approved by the Ethical Committee of the Scientific Research of the University (ECM#2020-204 - HAPO-06-B-001). Approval obtained from Research Ethical committee of the King Khalid University date of acceptance was 19/4/2020. The study included all consecutive cases of TKA from a single institution (Abha Private Hospital, Abha, Kingdom of Saudi Arabia). All TKA patients who were included in the study signed written informed consent. Assurance from the investigator was given to keep the patient information confidential. Male and female subjects who were suffering from severe knee joint degeneration because of osteoarthritis, trauma, or rheumatoid arthritis, or any other reason were included in the study. Patients who were expected to have complications because of surgery like diabetes, hypertension, infections, and uncontrollable seizures were excluded from the study. The patients were recruited from January 2013 to January 2020.

Detailed histories of all patients were obtained, and physical examinations were performed. Knee joint weight-bearing X-ray images were taken at all planes, and laboratory investigations were monitored preoperatively. Patients with comorbid medical conditions, such as diabetes, hypertension, rheumatoid arthritis, asthma, urinary tract infections, and dental abscess were excluded. All patients received preoperative instructions, which included instruction on when to stop using certain medications and which medications should be continued; for example, antihypertensive medication should be continued, and anticoagulants should be withheld when possible, as well as preoperative physical therapy evaluation and suggestions. The laboratory check-up included routine blood tests: complete blood count, prothrombin time, activated partial thromboplastin time, international normalized ratio, ABO blood grouping, urea, and electrolytes. Other selected tests were added as needed, such as glycosylated hemoglobin in case of uncontrolled diabetics or thyroid-stimulating test in thyroid disease patients.

The surgical protocol included determining the mode of anesthesia with close consultation with our anesthesia department after reviewing all related medical information, which can be general, spinal, or epidural. All patients were required to fast for 6 h before the surgery. Prophylactic antibiotic (ceftriaxone 1 g) was given intravenously at the induction of anesthesia. The addition of gram-negative coverage antibiotics (80 mg of

intravenous gentamycin) was performed selectively. A single preoperative dose of tranexamic acid (30 mg/kg, maximum 2.5 g) was administered 45 min. before tourniquet inflation.^[17] Surgery was performed under either general or spinal anesthesia. All surgeries were performed through a midline incision (10–13 cm in length) with medial parapatellar arthrotomy. Synovectomy was done in cases with hypertrophied synovium, including cases of encountered pigmented villonodular synovitis. Soft tissue balance was carefully evaluated after osteophyte removal from the bony edges. Next, the knee was placed in full flexion with the patella either everted or slid laterally. Ruminants of the cruciate ligaments and menisci were removed to prepare for standard posterior stabilized knee bone cuts using an intramedullary femoral guide and extramedullary tibial one if needed. In certain cases, the intramedullary guide had an entry point, which was lateral to the center point. To avoid hanging over due to a smaller tibia surface for the placement of the tibial component, a narrow component was more frequently selected in femoral bone finishing cuts. Primary cemented cruciate-substituting knee replacement was performed most of the time. We selected gender-specific knees and preferred anatomical knees because of the small sizes. A drain was used in all cases and was removed within 48 hours. The drained amount was reduced due to the use of tranexamic acid, but drain use was continued even if it was removed on the first postoperative day. Surgery duration ranged from 95 to 130 min., and the same orthopedic surgeon performed all surgeries.

The postoperative management protocol included 1–3 days of prophylactic antibiotic use according to the patient's comorbidity.^[10] Antithrombotic therapy with enoxaparin was administered subcutaneously (4,000 IU/day) for 5 days. Patients were given oral therapy with Xarelto tablets (10 mg for 12 days) and aspirin (100 mg for 3 months) postoperatively. Compressive Robert-Jones bandage and ice were applied to the knee to relieve pain and decrease postoperative hemorrhage for the first 24 h. Physiotherapy was started shortly after surgery when patients were transferred to the ward. Continuous passive motion exercises were started on the first postoperative day, including static quadriceps muscle exercises, active straight leg raising, and mobilization with crutches. Weight-bearing mobilization with a walker was started on the second postoperative day. Patients were mostly discharged 5–7 days post-surgery. The preoperative degenerative condition of the knee joint and postoperative prosthetic knee X-ray is described in Figure 1.

Sutures were removed 2 weeks post-surgery, and outpatient physiotherapy was performed for 6 weeks. Patients were followed up at 6 weeks, 3 months, 6 months then annually thereafter. The follow-up visits included clinical and radiological examination. All patients were evaluated using three outcome measures; the primary outcome was the Knee Society Scoring System, which is a valid and responsive scale to assess the outcome of total knee replacements. It has functional and knee scorings; the higher the scores, the better is the patient outcome and vice versa.^[18] The balance was measured by timed up and go test, which was a simple

test performed by asking the patient to rise from a chair, walk 3 m, turn back, and come and sit in the chair. The scoring was obtained in seconds; the fewer seconds it takes to complete this task, the better is the patient's balance.^[19] The walking capacity was assessed by a 2-min. walk test, which was performed by asking the patient to walk for 2 min. and see how many meters they can cover. The more number of meters they can cover, the better is the patient's walking capacity.^[20] All of these tests were conducted preoperatively and 6 weeks postoperatively by the same investigator.

Statistical package for social sciences (SPSS) version 21 was used for analysis. A *P* value of < 0.05 was considered significant, and results were provided in mean and standard deviations. Patient characteristics, such as age, gender, the side affected, and the reason for surgery, were analyzed using descriptive statistics. The outcome measures improvements were analyzed between baseline and 6 weeks postoperatively using paired *t*-tests.

Results

A total of 420 patients with TKA were included in the present study—350 females (83.3%) and 70 males (16.7%). Most of the cases involved the right side (*n* = 320, 76.2%) with the rest on the left (*n* = 100, 23.8%). Ages ranged from 28 to 90 years, with an average of 69.5 ± 7.4 years. Most of the patients who underwent surgery were obese with a BMI greater than 25 (range, 17–39) and an average BMI of 28.4 ± 3.3 . The most common reason for surgery was osteoarthritis (*n* = 355, 84.5%) followed by trauma (*n* = 46, 10.9%) and rheumatoid arthritis (*n* = 19, 4.5%). Except for traumatic cases, all cases had chronically suffered from the disease for more than 5 years. The partial weight-bearing was started on the second-day post-surgery, and patients were discharged on day 5 post-surgery unless there were complications.

Table 1 shows the baseline (preoperative) and 6 weeks TKA postoperative values for knee society knee score, knee society function score, timed up and go test, and the 2-min. walk test. Preoperative knee society functional and knee scores were uniformly poor with mean and SD of 38.21 ± 9.65 and 36.89 ± 8.23 , respectively, and they improved postoperatively with mean and SD of 81.42 ± 12.74 and 85.49 ± 11.69 values, respectively, with *P* value less than 0.001. All three outcome measures showed significant improvement (*P* = 0.001) postoperatively. The knee society score clinical grading was also calculated. Out of 420 operations, 301 (71.67%) had excellent, 92 (21.90%) had good, 19 (4.254%) had fair had poor grading.

Despite every precaution taken to avoid complications, some cases encountered infections, fractures, and dislocations. Table 2 shows the details of these complications and the management solutions observed in our study [Table 2].

Discussion

In the present study, we provided an overview of TKA results

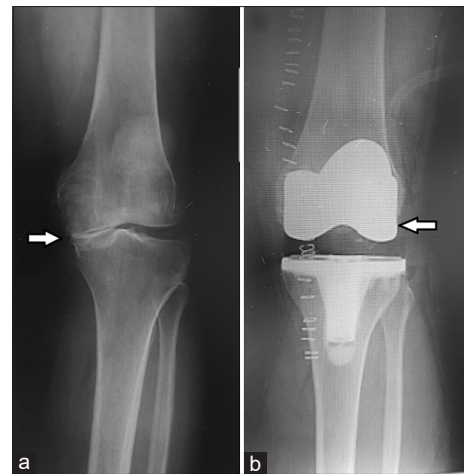


Figure 1: Patient knee joint weight-bearing X-ray. (a) Showing degenerative changes in the knee joint preoperatively and arrow pointing toward medial compartment erosion. (b) Showing prosthetic knee postoperatively and arrow pointing excellent joint alignment

Table 1: Comparison of pre-operative and post-operative values (mean and standard deviations) of different outcome measures

Outcome measure	Pre (mean±SD)	Post (mean±SD)	<i>P</i>
Knee society knee score	36.89±8.23	85.49±11.69	<0.001
Knee society function score	38.21±9.65	81.42±12.74	<0.001
Timed up and go test (sec)	28.51±3.29	18.18±3.17	<0.001
2-minute walk test (meters)	51.83±6.48	85.72±8.92	<0.001

in the Aseer region of Southwestern Saudi Arabia. Knee arthroplasty is well known for over 50 years and is the standard surgical procedure for advanced knee osteoarthritis. In recent years, there has been a substantial increase in knee osteoarthritis survival rates because of improvements in surgical techniques, implant designs, and patient acceptance to undergo TKA. This has led to the preservation of knee function before major bone deformities and muscle weakness develop. In Saudi Arabia, only a small number of knee replacements were performed in the 1990s.^[21] However, over the last 30 years, there has been a noticeable increase in TKA procedures because of the presence of multiple well-equipped specialized centers with well-trained personnel, including experienced well-trained board-certified surgeons.

We conducted this study to evaluate our experience with TKA. Most patients were female (83.33%), and the most frequent preoperative diagnosis was osteoarthritis (84.5%). This is similar to results reported by Dhillon *et al.*^[22] where the majority of patients in Malaysia were female (76%) and the preoperative diagnosis was osteoarthritis in 81% of the cases. Ranawat *et al.*^[23] also reported that most of their patients were female (80%); however, osteoarthritis was present in 44.6% of their sample, while rheumatoid arthritis was noted in 53.4% of cases. The mean age in the present study was 69 years (range 28–90), which was similar to that reported in other studies by Stern and

Table 2: Postoperative complications observed in the present study and their management

Postoperative complication	Number (%)	Management
Superficial infection	3 (0.71%)	Intravenous antibiotics
Traumatic patella dislocation	2 (0.47%)	Treated conservatively
Periprosthetic fracture around tibia tray	2 (0.47%)	Fixed intraoperatively with plate and screw
Early deep infection	2 (0.47%)	Exchange liner and washouts

Insall^[24] (63 years; range, 17–87) and Scott *et al.*^[25] (66.9 years; range, 22–85). On the other hand, younger average ages were reported by Duffy *et al.* (43 years)^[26] and Diduch *et al.*^[27] (51 years; range, 22–55) because they specifically studied the effect of TKA in young individuals.

A study was conducted to assess the functional and radiological outcomes of TKA using the knee society score. In the Vala *et al.* study, the knee society knee scores improved from baseline to 6 weeks of the postoperative period from 28.13 ± 7.54 to 95.38 ± 5.55 , and functional scores improved from 41.83 ± 9.33 to 83.79 ± 8.62 .^[28] In our study, we had similar improvements from baseline to 6 weeks of postoperatively for knee scores from 36.89 ± 8.23 to 85.49 ± 11.69 , and functional scores were improved from 38.21 ± 9.65 to 81.42 ± 12.74 . Overall, the knee society scores clinical grades improved after TKA. In our study, excellent and good grades were achieved in 93.57% of the cases, an outcome that is similarly reported in other studies.^[29]

In general, Saudi knees have anatomical variations compared to the Western population and resemble some extent those of Asian knees. Furthermore, the southwest region of Saudi Arabia has drawn the attention of joint reconstruction surgeons being the provider of the smallest implanted component in TKA. Surgeons worldwide have noticed that total knee prosthesis is challenged with the local patients' native knee anatomy because knee replacement implants are primarily manufactured in accordance with the knee anatomy of the Western population.^[30]

The most common complications in our patients were superficial infection (3), traumatic patella dislocation (2), periprosthetic fracture around the tibia tray (2), and early deep infection (2) within the first 3 weeks of the postoperative period. Callahan *et al.*^[31] reported that approximately 18% of patients experienced postoperative complications following TKA, including superficial infections 3.9% (range, 0–14.8%), deep infections 1.7% (range, 0–11.4%), pulmonary embolism 2% (range, 0–9.7%), DVT 6.5% (range, 0–56.6%), and peripheral nerve injury 2.1% (range, 0–18.8%). Scott *et al.*^[25] reported 13.1% complications post-TKA, including deep infections and delayed healing (3 knees), death, urinary tract infection (2 each), hepatitis (1 knee), and patella fracture (6 knees). Diduch *et al.*^[27] reported late infection (2%; 2 of 103 knees), polyethylene thinning (1%), dislocation of the tibial component (3%), and instability requiring a change of the tibial insert (1%). As there was a surgical advancement from the time of these studies, the number of complications reduced drastically in the current era. Thus, in our study, some unavoidable complications were observed only in a small number of patients [Table 2].

The number of TKA procedures in Saudi Arabia has increased, reflecting the excellent results seen globally. Manufacturing of smaller-size and right-left knees and gender-specific implant designs has contributed to improved surgical techniques, leading to excellent outcomes. Our data confirms what is documented in other studies worldwide.

Although data from several ethnic knee studies in Asia and the Middle East explain some findings regarding our knee component sizes, there is still a need to conduct biometric studies to evaluate these findings. These future studies should focus on multi centric trials, including advanced outcome measures, to improve the clinical findings of TKA in the region.

Conclusion

We included 420 TKA procedures in this study. The most common reason for surgery was osteoarthritis, and it most commonly affected the right side of the female population. The rate of surgeries has increased annually, and the success rate was excellent in more than 90% of cases on knee society scores. Even balance and capacity of walking improved significantly.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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