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Functional outcome of single stage bilateral total knee replacement measured using oxford knee score☆

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ABSTRACT

Arthritis of the knee joint is one of the most common cause of knee pain in middle age and elderly population. Among all, osteoarthritis remains the most common cause, followed by rheumatoid arthritis and other types of inflammatory arthritis. Though medical management remains the most common modality of treatment, patient with severe arthritis see total knee replacement as the definitive way to improve their quality of life. Bilateral total knee replacement in one stage has an advantage of single hospital admission, shorter rehabilitation and is less expensive. But till recently single stage bilateral total knee replacement was in limited vogue due to fear of the perioperative complications. This study was done to evaluate the functional outcome of this surgery.

Aim: To study the clinical and functional outcome in a series of 101 patients who were operated for single stage bilateral total knee replacement using oxford knee score.

Materials and methods: The study is a prospective 1 year pilot study involving a series of 101 consecutive patients who were operated for single stage bilateral total knee replacement using Optetrak posterior stabilised high flex knee system (Exatech). Inclusion criteria were patients with bilateral osteoarthritis who underwent single stage bilateral total knee replacement. All patients underwent a pre and post-operative evaluation using oxford knee score at 3rd and 12th month.

Result: The mean age of our study population was 65.06 ± 7.53, 73.3% were female. The mean duration of hospital stay was 7.02 ± 0.346. The mean preoperative oxford knee score improved from 11.47 preoperatively to 35.57 three months postoperative. At one year the mean oxford knee society score was 46.31. The mean change in oxford knee score from preoperative to 3 month postoperative and from 3 month postoperative to 1 year postoperative was statistically significant.

Discussion: Single stage bilateral total knee arthoplasty improves the quality of life in patients with severe osteoarthritis as reflected in oxford knee score.

1. Introduction

Osteoarthritis is prevalent among 80% of population above 65 years. One third of the patients present with symptoms pertaining to both the knees. Two third of the patients who undergo total knee arthoplasty have bilateral degenerative disease.[1] The options before these patients are to go for a single stage bilateral total knee replacement or staged total knee replacement either during the same hospitalisation or two different hospital stay. The duration between the two admission can be 3 months, 6 months or even longer. 20% of patients undergoing unilateral total knee arthoplasty undergo surgery of 2nd knee within 2 years since the first.[2] Moreover when the disease is bilateral addressing only one knee will give both suboptimal results and impaired benefits of the replaced knee.[3]

Most of these patient get benefitted by bilateral total knee replacement. It is now well accepted that total knee arthroplasty is a good treatment for pain relief and restoration of function in patients with advanced degenerative disease.[4] Single stage bilateral knee replacement has the advantage of shorter hospital stay, shorter rehabilitation and reduced patient management costs.[5]

Single stage bilateral total knee replacement has been studied both retrospective[6–9] and prospective.[10] There appears to be some

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difference in complication rates with some studies finding a decrease in morbidity,[11,12] some similar[13–15] and some a higher morbidity rates.[16,17] Studies have shown financial savings ranging between 18% and 50% when performing bilateral rather than two unilateral replacements.[18,19]

The aim of this prospective study was to evaluate the clinical and functional outcome of single stage bilateral total knee arthoplasty, and perioperative complications.

2. Materials and methods

This was a 2 year prospective pilot study in a series involving 100 consecutive patients who were operated for single stage bilateral total knee replacement under same anaesthesia without a control group. Inclusion criteria were primary or secondary osteoarthritis of knees. Exclusion criteria were rheumatoid and other inflammatory arthritis, patients who opted for staged knee replacement and revision arthroplasty.

3. Anaesthesia methodology

A systematic preoperative workup with anaesthesia consultation was done 2 weeks prior to the surgery. That included complete blood count, coagulation, liver & renal function test, urine examination, chest X ray and cardiac examination (electro and echocardiogram). The anaesthesiologist then assessed the patients and determined whether the patient was apt for surgery. After which a combined decision was taken to decide whether the patient can be planned for single stage bilateral total knee replacement by the orthopedician and the anaesthetist.

The patients were then explained about the pros and cons of undergoing single stage bilateral total knee replacement and an informed consent was obtained. Patients either received general anaesthesia or spinal anaesthesia based on anaesthetic assessment. All patients received nerve block (femoral or adductor) immediately after the surgery.

4. Surgical procedure

Patients were administered prophylactic injection cefuroxime 1.5 gm during induction of anaesthesia and another dose just before second knee incision was made. Following which the patients receive 2 more doses of antibiotic every 8th hour postoperatively.

All patients were operated by standard anteromedial approach. Soft tissue balancing and bone cuts were made using standard techniques. A cemented posterior stabilised knee implants (Optetrak Exatech Hi flex) were used.

A bilateral sequential pneumatic tourniquet was used in all cases. The surgical procedure was done by the principal surgeon and investigator in the study, began when tourniquet was inflated. Only when the 1st knee skin was closed and tourniquet released, the pneumatic tourniquet in the 2nd knee inflated. Haemostasis achieved before skin closure and none of our patients had drain left in situ. Preventive anticoagulant therapy with oral novel anticoagulant started within 12 h after surgery and continued for 15 days.

5. Postoperative protocol

The patients were educated and advised to start on active ankle toe mobilization immediately after the surgery. The patients were mobilized full weight bearing on 1st postoperative day and were taken for staircase climbing on 2nd postoperative day. Knee bending also were started on day 1. Then goal was to ambulate the patient to the restroom full weight bearing and knee bending to 90° by the 7th day. They were routinely discharged on day 7 and sutures were removed on day 14 in outpatient department.

6. Pre, peri and postoperative evaluation

Radiological assessment was done based on bilateral AP and lateral knee X rays. Assessment of clinical function was based on the oxford knee score. Clinical assessment was done preoperatively, 3 months and 1 year postoperatively.

6.1. Statistical analysis

The collected data were analysed with IBM.SPSS statistics software 23.0 Version. To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference in the multivariate analysis for repeated measures the Repeated measures of ANOVA was used with Bonferroni correction to control the type I error on multiple comparison. In all the above statistical tools the probability value 0.05 is considered as significant level.

6.2. Results

101 patients were included in the study with age ranging between 50 and 83. Mean age was 65.06 ± 7.539. The average duration of stay in hospital was 7.02 days ±0.346 (Table 1). There were 74 female and 27 male in our study. So female accounted for 73.3% of the study population (Table 2) (Fig. 1). All patients were given the scoring sheet containing oxford knee score to be filled on the day of admission. The patients were usually admitted on the day before the surgery and started on incentive spirometry, static quadriceps exercise.

The same scoring sheet was given both at 3 month postoperatively and 1 year postoperatively. The score filled by them was then updated to the database. These data was then statistically analysed using IBM SPSS software 23.0 version.

The mean oxford knee score was 11.465 ± 0.117 preoperatively. It increased significantly to 35.574 ± 0.186 at 3 month postoperative period. There was a 24 point increase in the oxford knee score during this period. The mean oxford knee score was 46.307 ± 0.093 at 12 month follow up. Thereby an increase in 35 points since preoperative period and increase in 11 points between 3rd and 12 month postoperative. The P value and F value were significant between the preoperative and 3rd month follow up, between preoperative and 12th month follow up and also between 3rd and 12th month follow up. (P value − 0.0005/F value − 15204) (Table 3) (Fig. 2).

In our study we encountered minor complication in 10 patients (postoperative confusion, superficial wound infection and pressure sore). They were not statistically significant. None of our study population encountered major complications (Table 4).

7. Discussion

Literature reviews have substantiated the significant beneficial effects of single stage bilateral total knee replacement in terms of

Table 1
Descriptive statistics.

	N	Minimum	Maximum	Mean	Std. Deviation
Age	101	50	83	65.06	7.539
Hospital stay	101	6	8	7.02	.346

Table 2
Sex.

Sex	Frequency	Percent
Female	74	73.3
Male	27	26.7

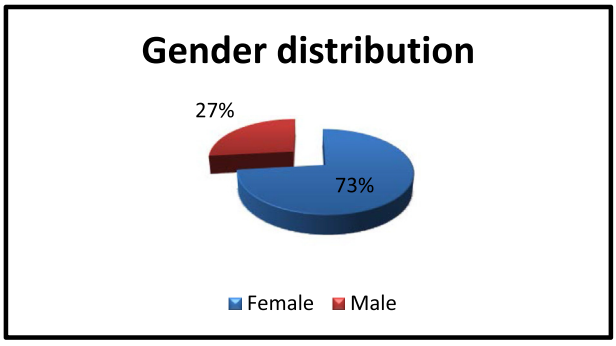

Fig. 1.

Table 3
Descriptive Statistics oxford knee score.

	Mean	Std. Deviation	N
preoperative oxford knee score	11.47	1.180	101
3rd month postoperative oxford knee score	35.57	1.867	101
12th month postoperative oxford knee score	46.31	.935	101

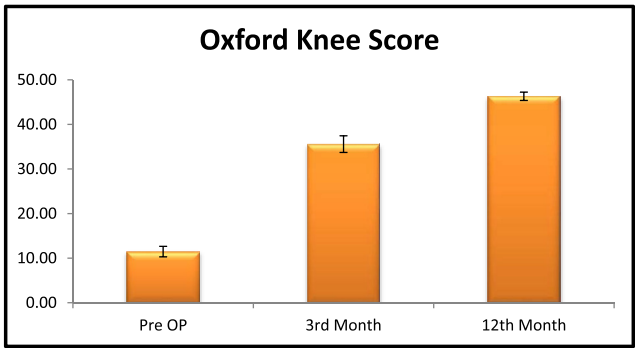

Fig. 2.

Table 4
Complication.

Complications	incidence
MINOR	
Superficial wound infection	6/101
Postoperative confusion	3/101
Urinary tract infection	0/101
Pressure sore	1/101
MAJOR	
Symptomatic DVT/PE	0/101
MI	0/101
Deep infection	0/101
Stroke	0/101
Mortality	0/101

hospital stay, cost effectiveness and in enhancing the patient rehabilitation. Our study too is in concurrence with those studies. In our study we noted an increase in mean oxford knee score from 11.47 preoperatively to 35.57 at the 3rd month follow up. The mean duration of hospital stay in our study population was 7.02 days.

There are conflicting evidences in literature regarding complications associated with single stage bilateral total knee replacement varying from superficial wound infection, deep wound infection, deep vein thrombosis, pulmonary embolism, cardiac complications and mortality. In our study none of the patients developed major complication like deep infection requiring secondary surgical procedures, symptomatic deep vein thrombosis/pulmonary embolism or mortality. We had six patients who had superficial wound infection which was managed successfully with oral antibiotics.

The rates of perioperative complications and morbidity were higher after simultaneous bilateral TKR than unilateral TKR.[23]The complication rates were associated with age-related comorbidities, blood loss, and delayed rehabilitation.[2]But in our study no major complications were encountered. 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.[24] Simultaneous bilateral TKR is 36% less costly than 2 unilateral TKR.[19] The mean reduction in the length of hospitalisation is 7 days,[25] which was similar to the findings in our study. The length of hospital stay is 4 days longer for staged TKR than for single stage bilateral TKR.[2] Expenditure on rehabilitation is about 2 fold greater in staged TKR.[6]

The perioperative mortality rate is similar in those having single stage bilateral TKR and unilateral TKR.[8] But we didn't encounter major complication like perioperative mortality in our study.

Study by Lombardi et al.,[20] in 2001 reported higher incidence of complication in patients more than 80 years, but in our study we had 4 patients with ≥80 years. But none of them had any complications. Rauh et al.,[21] in 2004 reported higher incidence of complication in patients with ASA grade III, but in our study we didn't classify them based on ASA classification.

Girish et al.,[22] in 2011 noted increase in incidence of neurological complication, predominantly confusion during the postoperative period, but in our study we noted only 3 patients with postoperative confusion secondary to hyponatremia but it was not statistically significant (P-0.264).In concurrence with our study Sabari et al.,[22] have reported occurrence of postoperative confusion in 3 patients following single stage bilateral total knee replacement, but he didn't notice any incidence of fat embolism or cardiovascular complications.

Acute renal failure too has been reported as relatively rare complication of single stage bilateral total knee replacement in few studies. But in our study we hadn't encountered complication related to acute renal failure. Urinary tract infection also has been reported in few studies due to retaining indwelling catheter for a longer duration. But we didn't encounter urinary tract infection as we removed catheter on 2nd postoperative day as soon the patients were ambulant.

One patient developed pressure sore on her heel as she kept herself confined to bed for most of the postoperative duration except for the time that she was walking. It developed after she was discharged and was noted during the follow up which she came for suture removal. She was treated with oral antibiotics and by educating her.

The major limitation of the this study was that it was not comparative. Hence, no conclusions could be made regarding the outcome. But this study confirms, 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 the overall health care expenses.

8. Conclusion

Single stage bilateral total knee replacement has a definitive advantage of reduced hospital stay, cost effective and early rehabilitation of patients suffering from bilateral osteoarthritis of knee. The mean postoperative oxford knee score in each follow up period at 3rd and 12th month and difference between the preoperative and postoperative period was satisfactory. Moreover in this study we haven't encountered any major complications. But we have to admit that our study has certain shortcomings like smaller study population, absence of control group, single centre study design and absence of cost evaluation. However like any surgical procedure, the ultimate result depends on expertise of the surgeon and the established pattern of preoperative medical evaluation and postoperative rehabilitation.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jajs.2019.01.010.

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