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Original Research Article

TOTAL KNEE ARTHROPLASTY WITH FIXED BEARINGS VS. MOVABLE BEARINGS: A COMPARATIVE ANALYSIS

Sri Aditya B.[1], Sadhan Palakuri[2], P Prem Kumar[3], Sandeep Sriram[4], Umesh Sunkari[5]

[1]*Assistant Professor, Department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India.*
[2]*Assistant Professor, Department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India.*
[3]*Assistant Professor, Department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India.*
[4]*Assistant Professor, Department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India.*
[5]*Assistant Professor, Department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India.*

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Corresponding Author:
Dr. Sandeep Sriram
Assistant Professor, Department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India..
Email: sandeepsriram29@gmail.com

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ABSTRACT

Background: In the beginning of total knee arthroplasty, the procedure was typically reserved for people in their later years who were less active. New evidence suggests that total knee arthroplasty can benefit both younger, more active patients and the elderly. Comparing mobile bearing whole knee arthroplasty with posterior stabilised fixed bearing total knee arthroplasty was the primary goal of the study.

Materials and Methods: This study was conducted at the Department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India. This treatment was performed on 100 patients in total, all of whom were invited to the facility for follow-up. This study was conducted between the October 2022 to September 2023. Information about the patients' pre-operative condition was gathered from their outpatient and inpatient medical records.

Results: Twenty of the fifty patients had PFC systems and thirty had LCS whole knee systems. Of the patients, 17 had bilateral LCS and 5 had bilateral PFC. For this reason, 73 knees were examined in total. Due to his ineligibility to answer the subjective questions about each system, a patient who had bilateral total knee replacements with PFC on one side and LCS on the other was omitted from the study. Rheumatoid arthritis was identified in 6 cases, while primary osteoarthritis affected 45 patients. Around forty-nine knees were replaced on the left side, while thirty-four were replaced on the right. The average age of patients who had PFC complete knee arthroplasty was 60.46 years, whereas the average age of patients who had LCS whole knee arthroplasty was 57 years.

Conclusion: The results suggest that the range of motion after surgery for the LCS group is dependent on the flexion range before surgery, but the PFC group has better range if the joint line remains close to its preoperative status. Greater flexion is possible with a fixed-bearing complete knee replacement. Despite being smaller, PFC's American Knee Society score is superior.

Keywords: Total knee arthroplasty, fixed bearings, movable bearings.

INTRODUCTION

One of the most effective methods for repairing damaged knees is total knee arthroplasty. Since its beginnings, the procedure has gained widespread acceptance as a means to alleviate pain, restore range of motion, and function, and surgical outcomes, patient satisfaction, and implant survival have all improved consistently. Those in their later years who were less active were the typical candidates for total knee arthroplasty in the procedure's early years. Total knee arthroplasty has recently proven to be effective and long-lasting in both younger, more active patients and the elderly.[1-3]

The procedure of resection arthroplasty for arthritis of the knee. The first interposition arthroplasty of the

knee. To stop the resected tibia and femur from growing together, he implanted a joint capsule flap between them. In 1940, Campbell and Boyd tried mould hemiarthroplasty on the knee, Smith-Peterson did the same. Tibial plateau prosthesis from Mckeever and Macintosh also attempted tibial hemiarthroplasty. Like femoral prosthesis, these ones painfully loosened up early and didn't cover the whole surface of the arthritic knee joint, thus the unmodified surface still hurt.[4-6]

Severe pain and functional disability continue to be the primary reasons for total knee arthroplasty. A lack of mobility, instability, or deformity are relative symptoms. The patient should rule out other possible causes of their knee and leg pain, such as radicular pain from a spinal disorder, referred pain from the ipsilateral hip, peripheral vascular disease, meniscal pathology, or knee bursitis.[7,8]

It is recommended that all non-invasive treatment options, such as anti-inflammatory drugs, lifestyle changes, and walking with a cane, be tried first before considering surgery. However, younger individuals with limited function due to systemic arthritis affecting several joints are also clearly candidates for knee replacement, even though this procedure is typically reserved for elderly patients who lead less active lives.[9] In rare cases where full cartilage loss has not occurred, arthroplasty may be necessary to alleviate severe pain caused by chondrocalcinosis and pseudo gout in older patients. When the predicted outcome of an anticipated arthroplasty is threatened by the growth of a deformity, individuals with mild arthritis and varied levels of pain may have deformity as the major justification for the procedure. In extremely rare cases, arthroplasty may be warranted in older individuals with severe patellofemoral arthritis rather to patellectomy due to the superior expected outcome of the former procedure.[9-11]

The use of total knee arthroplasty cannot be justified in cases of recent or active sepsis. Inadequate covering of the knee joint's soft tissues, with or without poor vascularity concomitant, is another absolute contraindication. Patients with significant peripheral vascular disease or poor limb perfusion are also not good candidates for joint arthroplasty. Conditions such as arthrodesis knee and neuropathic arthropathies are relative contraindications.[12,13]

The researchers aimed to compare the efficacy of two complete knee arthroplasty techniques, one utilizing movable bearings and the other employing posterior stabilisation and fixed bearings.

MATERIAL AND METHODS

This study was conducted at the Department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India. This treatment was performed on 100 patients in total, all of whom were invited to the facility for follow-up. This study was conducted between the October 2022 to September 2023. Information about the patients' pre-operative condition was gathered from their outpatient and inpatient medical records.

Inclusion Criteria

- Rheumatoid arthritis
- Impairment resulting from primary osteoarthritis

Exclusion Criteria

- Patients with incapacitating polyarthritis
- Revision complete knee replacement;
- Patellar replacement;
- Bilateral total hip replacement.

RESULTS

The LCS and PFC devices were used to replace the knees of 100 patients. There were 100 patients who met both the inclusion and exclusion criteria once they were applied. A follow-up appointment was scheduled for these patients. The data for 51 patients came from the recordings made during the follow-up period. None of the others were located through subsequent inquiries. We anticipate such a high rate of attrition because our hospital serves as a tertiary referral institution, drawing patients from all throughout the nation.

Twenty of the fifty patients had PFC systems and thirty had LCS whole knee systems. Of the patients, 17 had bilateral LCS and 5 had bilateral PFC. For this reason, 73 knees were examined in total. Due to his ineligibility to answer the subjective questions about each system, a patient who had bilateral total knee replacements with PFC on one side and LCS on the other was omitted from the study. Rheumatoid arthritis was identified in 6 cases, while primary osteoarthritis affected 45 patients.

Range of movement

The PFC group had an average range of motion of 111.53°±20.4° before the operation. Following the operation, there was an improvement to an average flexion of 113.26°±13.9°. The average range of motion before surgery in the LCS group was 94.68°±29.3°. After the operation, the average flexion improved to 98.2°±14.8°.

Functional score

In the PFC group, the average Oxford Knee Society Score was 17.46±1.6, while in the LCS group, it was 17.91±2.1. There was no statistically significant difference in the scores of the two groups. As far as the American Knee Society Score is concerned, 29 patients fell into Category A and 22 into Category B. Results showed that the PFC group had an average American Knee Society Score of 94.15±3.9, while the LCS group had an average score of 90.61±3.6. This disparity, which flavoured the PFC system, was determined to be minor but statistically significant. After the operation, all of these scores were determined.

Radiographic results

According to the Figgie method, the average change in joint line for the PFC group was 2.28±0.94 mm, whereas for the LCS group it was 3.63±1.74 mm. A

statistically significant difference was discovered. There was a correlation between the range of motion after surgery and the shift in the joint line for every subject. Any major change to the joint line affected the range of motion after surgery, as shown by the substantial correlation in the fixed bearing group. It was found that there was no link between the change in the joint line and the post-operative range of movement in the LCS group.

Complications

Infection

After using antibiotics and anti-inflammatory medicine, one patient in the PFC group was able to clear up a superficial skin infection. A patient experienced severe bone loss due to a deep infection. After her joints were debrided, she had revision surgery that included bone grafting. In the LCS group, two individuals developed severe infections. Removing the implant, cleaning the area, and inserting antibiotic spacers were all necessary procedures for one patient. Debridement and tibial insert exchange were performed on the second patient.

Death

Due to polyarticular involvement, one RA patient's mobility was severely limited. She died of pulmonary embolism six months after surgery due to deep vein thrombosis. The death of one patient, who suffered a myocardial infarction two years following surgery, cannot be considered a post-operative consequence.

Other complications

Implant failures, wound dehiscence, spin-offs of the insert, broken inserts, patellar clunk syndrome, mid-swing instability, subluxations, or dislocations were not seen in this series.

DISCUSSION

At ten to fifteen years of follow-up, the prosthesis survival rate ranges from 95% to 97%, thanks to the long-term fixation given by fixed bearing prosthesis. Results in terms of performance and survival for both mobile bearing and fixed bearing prostheses have been shown to be equivalent in a number of independent studies comprising 62 to 473 knee arthroplasties. The total revision rates for both types of implants are around 1% per year. In terms of clinical function and longevity, no prior comparative studies have demonstrated any benefit of mobile bearing over fixed bearing. No research has been conducted comparing the range of motion after mobile bearing and fixed bearing complete knee arthroplasties, or comparing the change in joint line to this range of motion after surgery.[14-16]

Patients primarily hail from North India and the surrounding nations. Their average age is close to sixty-five. Travelling and getting older make it difficult for many of them to keep their scheduled follow-up appointments. Ignoring these limitations, almost 65% of patients still showed up for follow-up, and even after excluding those who didn't meet the criteria, 51% still got updates.[17,18]

The cultural and socioeconomic origins of many of our patients put them in situations that require them to bend their knees extremely. Sitting in the "padmasana" posture is necessary for most of our patients to conduct poojas. When they do 'namas,' many of our patients kneel with their knees bent at an angle. The majority of our women undertake housework, such as washing clothing and scrubbing floors, while seated on the floor. Even when seated on a chair, they maintain their habit of sitting cross-legged. Consequently, the Indian knee can hyperflex through a vast range of motion.[19-21]

The Oxford Knee Society score did not reveal a significant difference between the mobile bearings and fixed bearing total knee arthroplasty, likely due to the fact that the majority of our patients were advised against squatting. We did not have any dislocations or spinouts, even though a couple patients persisted in squatting despite our best efforts to discourage them.[22,23]

There was a sex and follow-up duration matching between the PFC and LCS groups of patients. Just a hair older was the PFC group. The first operation in this series did not occur until the year 2000, making a survival study impossible. When choosing implants for their patients, cost was not an issue. As an example, one surgeon focuses solely on the PFC system, while another is dedicated to the LCS system. If the patient has a significant deformity, ligament instability, or bone insufficiency, the third surgeon will use the PFC method, even though the LCS system is their preference.[23,24]

Both the PFC and LCS groups' preoperative range of motion was the most critical factor in determining their postoperative range of motion. The range of motion was either maintained or improved in 63% of participants in the PFC group following surgery. During this follow-up time, 44% of patients in the LCS group demonstrated a reduction in their range of motion following surgery. This caused a statistically significant split between the two sets of data when the American Knee Society Score was applied.[25,26]

The average Oxford Knee Society Score for patients in the PFC group was 17.46, whereas those in the LCS group scored 17.91. All of our patients had very high satisfaction levels, according to this objective scoring system. They claimed to have done a good job with the most of their responsibilities. Scores of 90.61 and 94.15 were recorded by the LCS group and the PFC group, respectively, when the American Knee Society System was used. This system evaluates the knee function separately from the patient's total function. We discovered that the PFC group fared far better when using this approach.[26,27]

Prior to surgery, a large number of our patients lacked standardised radiographs. The difficulties in precisely evaluating the bony landmarks were exacerbated by joint abnormalities and bone deficits.

Consequently, three distinct approaches were employed to discern the alterations in the joint line prior to and following the operation. Patients in the LCS group demonstrated a post-operative range of motion that was unrelated to changes in the joint line, in contrast to the PFC group who demonstrated a strong association between joint line change and post-operative function. Additionally, we discovered that the joint line change was lower in the PFC group compared to the LCS group, at 3.631.74. Although we already established that this disparity was statistically significant, we also established that the LCS group's mobility was unaffected by the shift in joint line.[26-28]

CONCLUSION

The flexion range before surgery determines the range of motion after surgery. The average change in joint lines has no bearing on the range of motion that the LCS group experiences after surgery. By keeping the joint line close to its preoperative state, the PFC demonstrates a better range of motion. When compared to mobile bearing total knee replacement, the range of motion for fixed bearing posteriorly stabilised total knee replacement is substantially greater. The joint line is better preserved with measured resection compared to gap resection. The two implant designs had identical Oxford society scores. In comparison to LCS, PFC's American Knee Society score was slightly higher, but still significantly higher.

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