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Original Research Article

A hospital-based outcome assessment of Primary TKR in Severe fixed flexion deformity of knee compared with TKR in knees without fixed flexion deformity (FFD): A comparative study

[1]Dr. Anurag Chandrakar, [2]Dr. Shashimant Chavan and [3]Dr. Rupesh Kumar Gupta

[1]Assistant Professor, Shri Shankaracharya Institute of Medical Sciences, Bhilai, Chhattisgarh, India
[2]Senior Resident, Shri Shankaracharya Institute of Medical Sciences, Bhilai, Chhattisgarh, India
[3]Junior Resident, Shri Shankaracharya Institute of Medical Sciences, Bhilai, Chhattisgarh, India

Corresponding Author:
Dr. Anurag Chandrakar

Abstract

Aim: The aim of the present study was to know the functional outcome of Primary TKR in Severe fixed flexion deformity of knee compared with TKR in knees without fixed flexion deformity (FFD).
Methods: This was a prospective study of the Department of Orthopaedics, Shri Shankaracharya Institute of Medical Sciences, Bhilai, Chhattisgarh, India for the period of 1 year. Patients with and without severe flexion deformity of knees underwent primary TKR. Total of 120 knees were taken for the study with 90 with FFD of more than 30 degree and 30 were without FFD which were kept as a control. This study includes both inflammatory and non-inflammatory arthritis.
Results: In 100 patients, there were 30 bilateral cases and 90 unilateral cases with a total of 120 knees. 66 knees were inflammatory arthritis and 34 with non-inflammatory arthritis. There were 45 females and 55 male patients. Average age of the patients was 59.6 years (28-75 years). Average follow up was 1.5 years (1-3 years). In Primary TKR in FFD - Average FFD was 44 degree, Pre-operative average KSS-pain score was 27.5 and functional score was 15, post operatively KSS pain score was 82.7 and function score was 79.1. In Primary TKR in no FFD - Pre-operative average KSS-pain score was 31 and functional score was 24, post operatively KSS pain score was 85.3 and function score was 80.2.
Conclusion: There was no significant difference in postoperative KSS- pain and functional score, in patients with no FFD was comparable with patients with FFD. TKA is successful in correcting flexion deformity, although the amount of correction obtained depended on the degree of preoperative flexion deformity.

Keywords: Fixed flexion deformity (FFD), arthritis, rheumatoid, knee

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Introduction

Fixed flexion deformities are a combination of ligamentous, capsular and bony deformity having an adverse effect on knee biomechanics, increasing the forces across the patellofemoral and tibiofemoral joints [1]. A range of 83-105 degrees flexion is required for normal daily activities and anything less severely affects a patient's quality of life [2-5]. This makes simple everyday tasks such as walking or climbing stairs difficult and tiring. These deformities can, in most cases, be corrected by a total knee arthroplasty. Pain relief and range of motion remain important outcomes variables post TKA. Previous research has demonstrated that preoperative range of motion (ROM) was the strongest predictor of postoperative ROM [6]. The presence of fixed flexion deformities has been reported in up to 61% of knees undergoing primary TKA [7].

Trunk alignment may also be affected by a fixed flexion deformity, altering the kinematics of the spine [8]. The use of computer navigation appears to be a more accurate method for assessing the degree of knee flexion, with a reduced range of error compared with clinical assessment [9].

Fixed flexion deformities are common in osteoarthritic knees that are indicated for total knee arthroplasty. The lack of full extension at the knee results in a greater force of quadriceps contracture and energy expenditure. It also results in slower walking velocity and abnormal gait mechanics, overloading the contralateral limb. Residual flexion contractures after TKA have been associated with poorer functional scores and outcomes. Although some contractures after TKR may eventually resolve [10], if the lack of extension is greater than 15° three months post- operatively, it is likely to persist [11].

It is recommended to limit bone resection with mandatory release of the posterior capsule and the collateral ligaments to get the knee straight in the operation and stable in the postoperatively in the most severe cases [12]. This study by Cheng *et al*. [13] concluded that patients with a preoperative fixed flexion deformity show continued improvement in their fixed flexion up to ten years' post arthroplasty and have similar outcomes to those with no preoperative fixed flexion. Muzaffar *et al*. [14] demonstrated that preservation of tibia with increased distal femur cut and upsizing of femur component may occasionally be required to achieve proper balancing the knee.

Study by Rao *et al*. [15] has demonstrated that severity of preoperative fixed flexion deformity is very significant factor influencing the development of recurrence of FFD of postoperatively. Chance of developing recurrence of FFD was more in non-obese patients compared to obese patients; postoperative restriction of flexion was not significantly associated with recurrence of FFD. Preoperative and postoperative coronal plane deformities were not significantly associated with recurrence of FFD.

The aim of the present study was to know the functional outcome of Primary TKR in Severe fixed flexion deformity of knee compared with TKR in knees without fixed flexion deformity (FFD).

Methods

This was a prospective study of the Department of Orthopaedics, Shri Shankaracharya Institute of Medical Sciences, Bhilai, Chhattisgarh, India, for the period of 1 year. Patients with and without severe flexion deformity of knees underwent primary TKR. Total of 120 knees were taken for the study with 90 with FFD of more than 30 degree and 30 were without FFD which were kept as a control.

Methodology

This study includes both inflammatory and non-inflammatory arthritis. We recorded the preoperative ROM, KSS-Pain and functional score of all patients; all patients were evaluated

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with radiographs of knee AP/lateral and whole leg (if patients were able to stand). Clinical measurement of FFD was done with goniometer one limb of goniometer along the long axis of tibia and another limb along long axis of femur directed towards greater trochanter.
All patients were started on preoperative physiotherapy for at least of 4 weeks (average 6 weeks), all the cases were operated by single surgeon with MBK (Mobile bearing knee) or FBK (Fixed bearing knee) and data was recorded at follow up at 6 weeks, 12 weeks, 6 months and then yearly. At every follow up, patient's KSS (Pain and functional score) were recorded.

Surgical Technique

All patients were operated by standard midline incision with medial parapatellar approach, FFD was corrected by removing posterior osteophytes, posterior capsular release, gastronemius release and additional distal femoral cut if required. Hamstring muscles were released in few cases. We tried to correct deformity completely on table. Navigation was not used in any of our cases. Drain was put in all the cases; Standard post TKR rehabilitation program was followed in all cases.

Statistical Analysis

Statistical analysis was done by paired T test for the normal variables and Wilcoxon signed rank test for the non-normal variables.

Results

Table 1: Demographic details

Gender in years	**N%**
Male	55 (55%)
Female	45 (45%)
Mean age (in years)	59.6 (28-75 years)
Mean follow-up (in years)	1.5 years (1-3 years)
Etiology	
Inflammatory arthritis	78 (65%)
Non-inflammatory arthritis	42 (35%)
Type of deformity	
With FFD	72 (60%)
Without FFD	48 (40%)
Type of surgery	
Unilateral	90 (75%)
Bilateral	30 (25%)

In 100 patients, there were 30 bilateral cases and 90 unilateral cases with a total of 120 knees. 66 knees were inflammatory arthritis and 34 with non-inflammatory arthritis. There were 45 females and 55 male patients. Average age of the patients was 59.6 years (28-75 years). Average follow up was 1.5 years (1-3 years).

Table 2: Preoperative and postoperative pain and functional score in FFD knee and in without FFD knee

Type of deformity	**Preoperative**		**Postoperative**	
	KSS pain score	**Functional score**	**KSS pain score**	**Functional score**
With FDD	27.5	15	82.7	79.1
Without FDD	31	24	85.3	80.2

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In Primary TKR in FFD - Average FFD was 44 degrees, pre-operative average KSS-pain score was 27.5 and functional score was 15, post operatively KSS pain score was 82.7 and function score was 79.1. In Primary TKR in no FFD - Pre-operative average KSS-pain score was 31 and functional score was 24, post operatively KSS pain score was 85.3 and function score was 80.2. There was significant difference in pain score and patient's satisfaction in patients with inflammatory arthritis (though the number were less) than non-inflammatory arthritis. The postoperative KSS- pain and functional score, in patients with no FFD was comparable with patients with FFD and there was no significant difference.

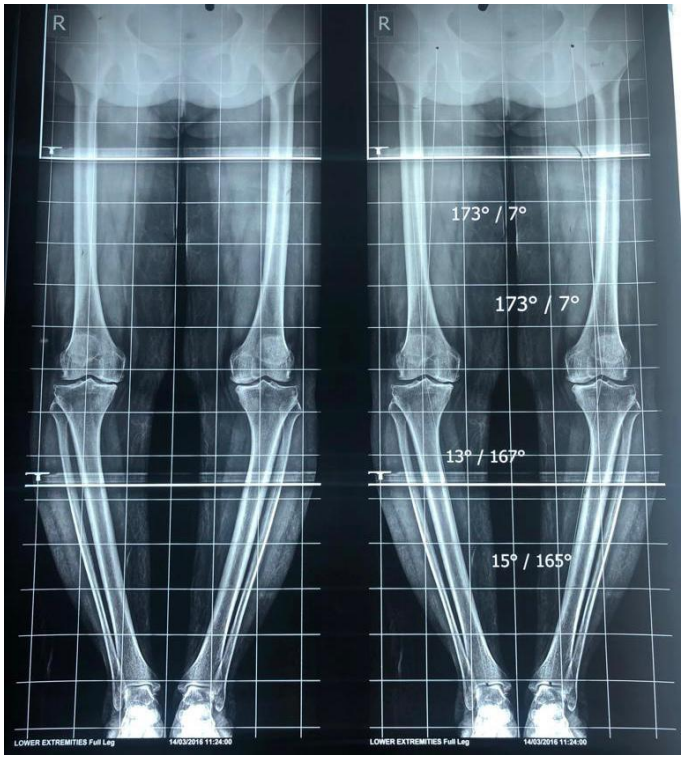

Fig 1: Preoperative scanogram

Fig 2: Intraoperative image of knee with flexion Deformity and bone loss

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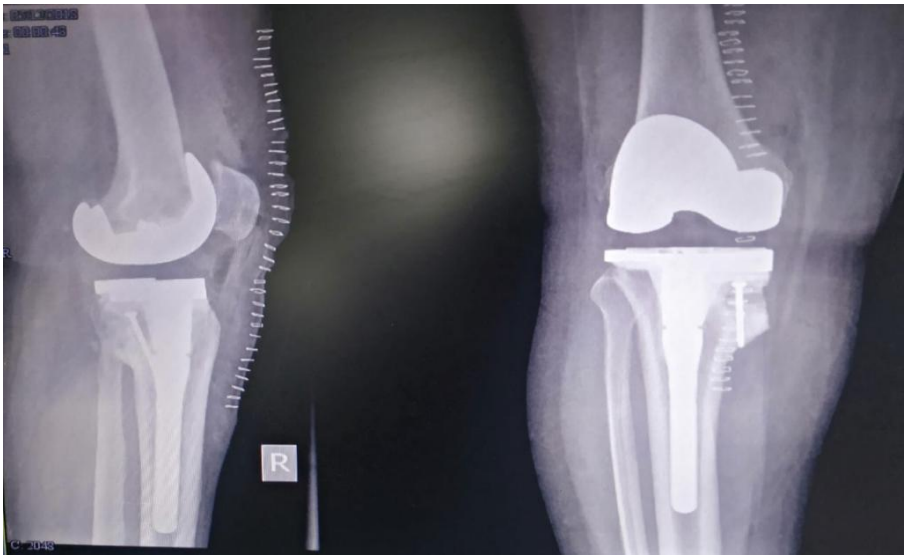

Fig 3: Post-operative Radiograph of Operated Knee with Deformity

Discussion

The definition of a knee flexion contracture is a knee that is unable to fully extend to 0°, either actively or passively. The etiology of a pre-operative fixed flexion deformity is multifactorial; bony impingement, posterior capsular contracture, hamstring shortening, and ligament contracture all contribute to the inability to fully straighten the knee. Residual flexion contractures after TKA can create similar problems and forces upon the contralateral limb. Using gait and force plate analysis, Harato *et al.* [16] confirmed that there was greater force placed on the contralateral knee if a flexion contracture persisted after TKA.

A flexion deformity results from combined ligamentous, capsular, and bony deformity [18]. In flexion contracture, periarticular muscle spasm and pain contributes significantly to the deformity. Correct measurement of flexion contracture can only be done in the operating theater, after anesthesia halts the muscle spasm and pain. Computer navigation is a helpful additional tool to assess the alignment of the lower limb. In our opinion the most useful computer-assisted cuts are proximal tibial and distal femoral. Fixed flexion deformity is a common accompaniment in advanced arthritis of the knee joint, which severely affects the activities of daily living of a person. Severe flexion deformity occurred for a number of reasons, the most important being osteoarthritis and rheumatoid arthritis.

The goal of any knee arthroplasty is to achieve a stable and well-balanced knee in a full arc of motion. In patients with fixed flexion deformity, the flexion gap is more than the extension gap, and this is caused by tight posterior soft tissue structures. This includes contracted capsule, muscular attachments, fascia, and even skin, in severe cases. Mihalko *et al.* [18] suggested that a contracted collateral ligament is the most likely primary structure whose effective release allows correction of the flexion contracture in most patients who have a TKA. Study by Rao *et al.* [15] has demonstrated that severity of preoperative fixed flexion deformity is very significant factor influencing the development of recurrence of FFD of postoperatively. Chance of developing recurrence of FFD was more in non-obese patients compared to obese patients; postoperative restriction of flexion was not significantly associated with recurrence of FFD. Preoperative and postoperative coronal plane deformities were not significantly associated with recurrence of FFD.

According to Scheurman *et al.* [20] and Firestone *et al.* [19], virtually all improvement in

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flexion contracture occurred at the time of surgery only. We have found that up to 15 degree of residual flexion contracture corrected fully at the end of 12th months. Study by Cheng *et al*. [21] concluded that patients with a preoperative fixed flexion deformity show continued improvement in their fixed flexion up to ten years' post arthroplasty and have similar outcomes to those with no preoperative fixed flexion. After TKR, residual flexion contractures are associated with poorer clinical scores and greater forces upon the contralateral knee. Clearly, flexion deformities must be corrected post- TKR and the correction maintained in order to maximize functional results after surgery. The algorithm for correcting a fixed flexion deformity begins with the recognition of the problem pre-operatively. A significant interaction between the groups was observed for fixed flexion, total range of movement and Knee Society scores at the one year. This suggests that those with a preexisting FFD demonstrated a greater improvement in the first year, which could be explained by the fact that this group started off worse and improved significantly due to the correction of their fixed flexion deformity.

Conclusion

Our study has shown that the there was no significant difference in outcomes of knees with severe FFD and knees without FFD, there was significant improvement in functional outcome of patients with FFD as the preoperatively KSS -functional score was very low as compare to the knees without FFD. Patient with inflammatory arthritis had better satisfaction score compared to the non-inflammatory arthritis. There was no significant difference in postoperative KSS- pain and functional score, in patients with no FFD was comparable with patients with FFD. TKA is successful in correcting flexion deformity, although the amount of correction obtained depended on the degree of preoperative flexion deformity.

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