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Original Research Article

A Prospective Comparative Assessment of Functional Outcome of Primary Total Knee Replacement in Severe Flexion Deformity and without Flexion Deformity

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Abstract

Aim: 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).

Methodology: This is a prospective comparative study of the patients with and without severe flexion deformity of knees underwent primary TKR. Total of 100 knees were taken for the study with 52 with FFD of more than 30 degree and 48 were without FFD which were kept as a control. 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 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.

Results: In 87 patients, there were 26 bilateral cases and 74 unilateral cases with a total of 100 knees. 66 knees were inflammatory arthritis and 34 with non-inflammatory arthritis. There were 40 females and 47 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.

Introduction:

Fixed flexion deformity is among the most challenging problems of total knee arthroplasty (TKA). When the flexion contracture is more than 40-degree patients usually are confined to a wheelchair; therefore, it is very important to avoid progression of flexion contractures. In rheumatoid knees, flexion contractures occur more frequently than extensor contractures [1]. In fixed flexion deformity on weight bearing, the quadriceps is forced to contract to prevent buckling. This results in considerable expenditure of energy by the quadriceps with increased forces across knee joint [2, 3]. Several studies have reported the natural history and outcomes of flexion contractures after TKA [4, 5].

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 [6]. Study has demonstrated that preoperative range of motion (ROM) was the strongest predictor of postoperative ROM [7]. The presence of fixed flexion deformities has been reported in up to 61% of knees undergoing primary TKA [8].

A range of 83–105 degrees flexion is required for normal daily activities and anything less severely affects a patient's quality of life [9, 10]. If the knee is unable to fully extend, increased demand is placed on the Quadriceps because they are required to stabilize the flexed knee at heel strike and during the stance phase [11-13]. Impaired function may result from increased energy requirements and earlier fatigue of the quadriceps, causing functional impairment, limping gait, decreased walking distance or problems with sporting or leisure activities [12, 13].

Trunk alignment may also be affected by a fixed flexion deformity, altering the kinematics of the spine [14]. 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 [15].

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 [16], if the lack of extension is greater than 15° three months post- operatively, it is likely to persist [17].

Aim:

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).

Materials and Methods

This is a prospective study of the Department of Orthopaedics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga,

Bihar, India for 1 year. patients with and without severe flexion deformity of knees underwent primary TKR. Total of 100 knees were taken for the study with 52 with FFD of more than 30 degree and 48 were without FFD which were kept as a control. 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 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.

Results:

In 87 patients, there were 26 bilateral cases and 74 unilateral cases with a total of 100 knees. 66 knees were inflammatory arthritis and 34 with non-inflammatory arthritis. There were 40 females and 47 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 1: Details of patients

Variables		Number	Percentage
Gender	Male	47	54.1%
	Female	40	45.9%
Mean age (in years)		59.6 (28-75 years)	
Mean follow-up (in years)		1.5 years (1-3 years)	
Surgery type	Unilateral	74	74
	Bilateral	26	26
Etiology	Inflammatory arthritis	66	66
	Non-inflammatory arthritis	34	34
Type of deformity	With FFD	52	52
	Without FFD	48	48

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. 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.

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

Discussion:

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 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 [19] confirmed that there was greater force placed on the contralateral knee if a flexion contracture persisted after TKA.

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 [20] 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 [21] 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 [22] and Firestone et al [5], virtually all improvement in 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 [23] 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 [24] 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.

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.

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