Impact of Fixed-Bearing and Mobile-Bearing Tibial Insert in Unicondylar Knee Arthroplasty

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Abstract

Introduction: The aim of the study is to investigate the impact of fixed or mobile-bearing tibial inserts on patellofemoral arthritis and evaluate which one to be preferred for patients with patellofemoral arthritis.

Methods: Operated in our clinic between January 2009 and February 2013, 33 with patellofemoral arthritis together with anteromedial compartment arthritis were included in the study. Patellofemoral joints of patients were evaluated according to the scoring system defined by Fulkerson-Shea.

Results: Unicondylar knee arthroplasty with fixed-bearing tibial inserts and 22 (66.6%) (male: 3, female: 19) and unicondylar knee arthroplasty with mobile-bearing tibial inserts 11 (33.9 %) (male: 2, female: 9) were implanted. Average knee flexion was found to be 116.5 (100-135) degrees in 22 patients with mobile-bearing tibial inserts, and 114.5 (95-135) in 11 patients with fixed-bearing tibial inserts.

Conclusion: Patellofemoral arthrosis is an important factor for unicondylar knee arthroplasty prognosis and one of the determinants of patient satisfaction. Significantly less patellofemoral complaints were seen with UKA with fixed-bearing tibial insert compared to mobile-bearing tibial insert.

Keywords: Unicondylar knee arthroplasty, patellofemoral arthrosis, fixed-bearing tibial inserts, mobile-bearing tibial inserts

Received: 19.01.2016 Accepted: 02.02.2016

Introduction

Unicondylar knee arthroplasty (UKA) is being used with increasing frequency in anteromedial compartment arthrosis (1,2). In one of the initial studies about UKA done in 1989, Kozinn et al. claimed that patellofemoral arthrosis formed a relative contraindication for UKA (3,4). In first years of its application, UKA was suggested for patients over 60 years, being not obese, with no resting pain, with at least 90 degrees of flexion range, 5 degrees or less flexion contracture and 15 degrees or less angular deformity (3,5-8). Arthrosis of patellofemoral joint or weight bearing area of lateral compartment, cruciate ligament injury and inflammatory joint disease formed definite contraindications for UKA (1). However, recent studies reveal that patellofemoral arthritis or patellofemoral symptoms do not form a contraindication for UKA or affect outcomes adversely (9-11).

Nowadays, with development of new designs and increasing patient compliance, UKA is being used in younger and more active, even mildly obese patients (10,12). Recent studies show that patellofemoral arthrosis does not form a contraindication for UKA due to usage of mobile-bearing tibial inserts, however, there are very limited number of studies about usage of fixed-bearing tibial inserts (13).

Patients undergone UKA with patellofemoral arthrosis were included in this study. The aim of the study is to investigate the impact of fixed or mobile-bearing tibial inserts on patellofemoral arthrosis and evaluate which one to be preferred for patients with patellofemoral arthrosis.

Materials and Methods

The medical files of patients with a diagnosis of 33 with patellofemoral arthrosis together with anteromedial compartment arthritis who underwent surgery January 2009 and February 2013 were screened retrospectively. Indications of all patients were confirmed with preoperative physical examinations, direct X-rays, stress X-rays and MRI images. None of the patients had anterior cruciate ligament injury clinically and radiological. All patients had 15 degrees or less varus deformities. Indications were also confirmed intraoperatively by evaluation of anterior cruciate ligament and other compartments of knee.

Patellofemoral joints of patients were evaluated according to the scoring system defined by Fulkerson-Shea (14). In this scoring system, conditions such as limp, mobility, aid dependency, stair climbing, squatting, insta-
bility, pain and swelling are scored and total result is obtained in order to evaluate the condition of patellofemoral joint. Surgeon A has operated mobile insert group and surgeon B has operated fix insert group. Minimally invasive skin incision was used in all patients. Patella was not dislocated in any of the patients. Extramedullary guide for tibial resection and intramedullary guide for femoral resection were used. Cement was used for implantation of every component. Zimmer (Warsaw, Indiana, USA) UKA with fixed-bearing tibial insert was used for 11 patients (%33,3) and Oxford (Biomet, Bridgend, UK) UKA with mobile-bearing tibial insert was used for 22 patients (%66,6). The same postoperative rehabilitation program was applied in both groups. Supine heel slides, gravity assisted flexion sitting at edge of bed, supine heel props for gravity assisted extension, hip flexion, ankle dorsiflexion and plantar flexion applied as range of motion exercises in both groups. Quadriceps set, ankle pumps, hip abduction, short arc quadriceps, standing hip active range of motion exercises was also applied as therapeutic exercises. This rehabilitation program was continued for six weeks. Patients were discharged from hospital on 3rd day post-operatively.

Results

Of 33 patients included, UKAs with fixed-bearing tibial insert sand 22 (66,6%) (Male: 3, Female: 19) and UKAs with mobile-bearing tibial inserts 11 (33,9 %) (Male: 2, Female: 9) were implanted. Average age was 57,2±9,2 (38-70) in fixed-bearing group and 55,2±6,5 (45-69) in mobile-bearing group. Average follow-up duration was 34±16,8(14-58) months in fixed-bearing group and 38± (19-64) months in mobile-bearing group.

At last control, average knee flexion was found to be 116,5 (100-135) degrees in 22 patients with mobile-bearing tibial inserts, and 114,5 (95-135) in 11 patients with fixed-bearing tibial inserts.

Data of patients with pre-operative and post-operative evaluation of patellofemoral joints according to Fulkerson-Shea’s functional knee scoring system is presented in Table 1.

Infection, pulmonary embolism and neurovascular injury were not seen in any of the patients. One patient with UKA with mobile-bearing tibial insert underwent revision surgery with total knee arthroplasty after insert luxation.

Discussion

At the times when unicondylar knee arthroplasty became widely used, it was thought that patellofemoral arthrosis formed a contraindication (3,4). However today, patellofemoral arthrosis is thought not to become an obstacle for UKA (10,11,15). Recently, it is reported that UKA with

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mobile-bearing insert should be used for patients with patellofemoral arthrosis. There are very limited numbers of studies about using UKA with fixed-bearing insert for patients with patellofemoral arthrosis (16).

A large number of studies report wearing at late period for UKA with fixed-bearing insert and insert luxation at early period for UKA with mobile-bearing insert (17-19). Patellofemoral joint is not mentioned sufficiently despite a change in indications. Major goal of unicondylar knee arthroplasty is to fill osteochondral defects while preserving the shape and measure of femoral condyle and to reconstruct the joint surface of affected compartment (16,20,21). Despite the fact that actual affected compartment is the medial one, there are various degrees of degenerative findings at the patellofemoral compartment. At that point, answers for some questions have to be investigated while defining indications for UKA:

1) Does the degree of patellofemoral arthrosis affect prognosis?
2) Does the choice of fixed or mobile-bearing insert have a negative impact on patellofemoral joint?
3) If the impact of being fixed or mobile-bearing on patellofemoral joint varies, which one has better results?
4) Does being fixed or mobile-bearing influence long-term results?

Especially while applying new generation UKA with mobile-bearing insert, a separate resection is performed for avoiding contact of the insert with femoral condyle and impingement (Figure 1). This resection is done to the surface of femoral condyle which bears weight and forms joint with patella after 90 degrees of flexion.

This defective area contacts with patella while degree of flexion increases. Especially after 90 degrees of flexion, the defective totally contacts with medial joint surface of patella, increasing chondral erosion of this area (Figure 2).

Climbing stairs, pain and total score is found to be worse in mobile-bearing UKA group than fixed-bearing UKA group according to Fulkerson-Shea functional scoring system.

In fixed-bearing UKA, insert does not contact with femoral condyle in any degrees of joint motion. Hence, there is no impingement nor a need for resection for avoiding impingement. Femoral component of UKA covers entire anterior cortex. Thus, there is no defect at condyle in any degrees of flexion that patella contacts with femur (Figure 3).

There are less mechanical factors causing wear of patellofemoral joint surface in any degrees of flexion (Figure 4).

According to Fulkerson-Shea’s scoring system, less patellofemoral complaints are seen with fixed-bearing than mobile-bearing UKA.

Patellofemoral arthrosis is an important factor for UKA prognosis and one of the determinants of patient satisfaction. Having mobile-bearing insert causes the insert to be free and comply with the sliding-rolling motion of femur on tibia. This free insert may cause impingement in femoral condyle at the end of extension. Especially in new generation UKA, extra resection, in order to overcome this impingement, causes mechanical erosion of the medial facet of patellofemoral joint and aggressive progression of existing arthrosis. Existing patellofemoral complaints of the patient do not increase in fixed-bearing UKA because no resection of femoral condyle distorting the patellofemoral joint is done. Investigating existing data about the long term results, wearing problem becomes prominent in fixed-bearing UKA.

Figure 1. a) Impingement of mobile-bearing insert with femoral condyle while in extension, b) Resection of anterior femur avoiding insert impingement, c) Patellofemoral joint in 90 degrees of flexion after resection, d) Intra-operative photo of resection.
Figure 2. Contact of the defect with patella after femoral resection in different degree flexion.

Figure 3. a) Femoral condyle – insert relation in fixed-bearing UKA in full extension, b) Patellofemoral joint in fixed-bearing UKA in 90 degrees of flexion.

Figure 4. Patellofemoral joint of fixed-insert UKA in different degrees of flexion.
References


