Lateral release widens the patellofemoral joint during total knee arthroplasty

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Introduction

Lateral release of the patellar retinaculum is usually performed in order to obtain aligned patellar tracking during total knee arthroplasty (TKA). The patella shifts medially after the lateral release and lateral subluxation/dislocation of the patella is avoided. However, the effect of the lateral release on the joint gap distance of the patellofemoral (PF) joint is still obscure. In this study, the joint gap distance of the PF joint was measured by means of a tensor before and after the lateral release, and the effect of the lateral release was assessed.

Methods

A specially designed tensor was created to distract the PF joint (Fig. 1). The concept of the tensor is the same with the tensor of the femorotibial joint. The upper arm has concave dish to hold the patella, while the lower arm has convex dish to fit the patellar groove of the femoral component. Thirty inch-pounds were applied to distract the PF joint. Between the upper and lower dishes, the distance of the patellofemoral joint was measured.

Posterior stabilized TKA was performed in 43 osteoarthritic knees in 43 patients. This study was approved by our institutional review board. All patients were informed that data from the subjects would be submitted to the society, and gave their consent. Midvastus or parapatellar approach was used as surgical exposure. After all the femoral and tibial cuts were made, trial components were inserted. The joint capsule was sutured firmly, leaving the capsule open minimally at the distal medial side for the insertion of the upper and lower arms of the PF tensor. The PF joint was distracted with 30 inch-pounds in full extension, and the joint gap distance was measured in millimeters. Under the distraction, an extrasynovial lateral retinaculum release was performed, and the joint gap distance was measured (Fig. 2 and 3). The joint gap distance of the PF joint with 30 inch-pounds distraction was compared before and after the lateral release in full extension. The measurement was also performed at 30˚ flexion.

**Fig. 1: Scheme of a tensor of patellofemoral joint**

Result

The distance of the PF joint in full extension was 20.6mm ± 4.7mm (mean ± standard deviation) and 24.3mm ± 4.5mm before and after the lateral release. The difference was statistically significant (p<0.0001). The lateral release significantly widened the PF joint. The distance of the PF joint at 30˚ flexion after the lateral release was 20.1mm ± 3.7mm, and was significantly narrower than that in full extension (p<0.001). In full extension, because the PF joint was distracted, the effect of the lateral release can visually be recognized (Fig. 2 and 3). After the lateral release, the lateral capsule was opened. The width of the widow was more than 5mm in all cases.

Discussion

It is essential to obtain the proper patellar tracking for successful TKA. Some efforts such as a slightly lateral femoral component positioning, proper rotation of the tibial component have been reported to avoid patellar subluxation, patellar dislocation, patellar instability or PF pain. However, for stable tracking, the PF joint relies mainly on soft-tissue constraints. Tight lateral retinaculum may induce lateral subluxation of the patella relative to the patellar groove of the femoral component. Therefore, lateral release is necessary in order to align the patella within the patellar groove of the femoral component.

There are abundant studies about the three dimensional movement of the patella and contact area and pressure between the PF joint before and after the lateral release during TKA or using cadaver specimens. To our knowledge, however, this is the first study to clarify the effect of the lateral release on the joint gap distance of the PF joint. It is widely accepted that the contracture of the extensor mechanism disturbs deep knee flexion. The flexibility of the patella relative to the femoral component in the sagittal plane may influence the joint gap of the femorotibial joint and therefore may influence the flexion angle of the knee after TKA. There are many factors to influence the flexion angle after TKA; those are flexion angle before TKA, design of the tibial and femoral component and tibial articular surface, cruciate retaining or posterior stabilized, alignment of the femoral and tibial components, posterior condylar offset, posterior tibial slope, shift and tilt angle of the patella and postoperative physical therapy. However, the flexibility of the patella has not been assessed for one factor that may influence the flexion angle. The joint gap of the PF joint under distraction conditions may be used to represent the flexibility of the patella in the sagittal plane. The results of this study clearly showed that the lateral release widened the PF joint and increased the flexibility of the patella in the sagittal plane. Therefore, the lateral release may improve the maximum flexion angle of the knee after TKA. In order to clarify the effect of the lateral release on the maximum flexion angle after TKA, further investigation including multivariate analysis is necessary. The parameter of the patella flexibility in the sagittal plane under distraction condition would be one factor to influence the maximum flexion angle after TKA. The optimal flexion angle to assess the PF joint gap distance is still obscure. The PF gap was significantly narrower at 30˚ flexion than that in full extension. Because the distance between the femoral component and the patella becomes wider in flexion, the assessment of the PF gap is hard to do by means of the current PF tensor. Further investigation is necessary.

**Fig 2: The lateral capsule was tensed using a patellofemoral tensor, and lateral release was performed.**

**Fig 3: After the lateral release, the patella moved anteriorly relative to the femoral component, and the lateral capsule was opened widely.**