INTRODUCTION

An increased lateral lateral force vector produced by the quadriceps muscle or tight lateral tissue are considered to be a major reason for lateral patellar hyperpressure and anterior knee pain [1,2]. Therefore, as a potentially small operative procedure with short time of recovery, a lateral retinacular release was recommended to reduce the lateral force vector on the patella. The aim of this in-vitro study was to measure changes of the patellofemoral pressure after lateral retinacular release and after producing complete medial and lateral patellar instability compared to physiologic knee conditions during dynamic knee extension motions. We hypothesized a significant medialized center of pressure of the patella with a significant decrease of patellofemoral pressure after lateral release, whereas under complete medial and lateral instability center of pressure should be significantly lateralized with increased patellofemoral pressure.

METHODS

Eight fresh frozen right knee specimens (mean age 62, range 52-75 years) were mounted in a specially designed knee simulator in which isokinetic flexion-extension motions under physiologic loading were simulated (Fig. 1). Extension cycles were simulated from 120° flexion to full knee extension with an extension moment of 31 Nm. The amount of patellofemoral contact pressure and the retropatellar pressure distribution were measured using a pressure sensitive film (Tekscan®, Boston), which was attached to the retropatellar cartilage surface with several surrounding sutures after opening the knee joint by a lateral parapatellar incision. During the first three test cycles the amount of patellofemoral pressure and the center of pressure were measured under intact knee conditions after closure of the knee joint. Then each single suture of the lateral parapatellar incision was re-opened to create a lateral retinacular release and measurements were done again. Finally, an additional medial parapatellar cut of similar length as lateral produced medial and lateral deficient knee conditions and the measurements were repeated. The amount and the center of retropatellar contact pressure were investigated relatively to intact knee conditions, after a lateral retinacular release and a release of the medial and lateral retinaculum to simulate deficient knee conditions.

RESULTS

Following the lateral retinacular release the center of patellar contact pressure was significantly medialized up to 56° knee flexion compared to physiologic conditions with a maximum of 1.7 mm (SD 1.4 mm, p= 0.04) at 100° knee flexion (Fig. 2). With further knee extension the center of pressure changed to a lateralized position with a maximum of 1.0 mm (SD 1.4 mm, p= 0.10). Following lateral retinacular release the amount of patellofemoral pressure did not change significantly compared to intact knee conditions, showing a maximum of 4.6 MPa (SD 1.9 MPa, p= 0.46) at full flexion (Fig. 3). The center of the patellar contact pressure of the deficient knee was significantly lateralized through the entire extension cycle with a maximum of 4.2 mm (SD 3.8 mm, p= 0.02) at 62° knee flexion. The amount of patellofemoral contact pressure did not significantly change, but showed a trend towards increased pressure at 10° knee flexion (4.2 MPa, SD 1.4 MPa, p=0.08).

DISCUSSION

This study showed significant changes of the center of patellar contact pressure after lateral retinacular release especially in knee flexion, where the amount of patellofemoral pressure was measured to be at maximum in the physiologic knee and after lateral retinacular release. Even in the presented knee specimens without pathologic alterations of the lateral retinacular soft tissue, the center of patellar pressure was significantly medialized during flexion above 60°. In contrast, with deficient knee conditions, the center of pressure was significantly lateralized with a trend towards higher contact pressure. Therefore, the results of the presented study suggest that lateral retinacular release could have a significant unloading effect in cases of anterior knee pain due to overload of the lateral patellar facet in knee flexion.

LITERATURE

1. Larson et al., CORR 1978
2. Panni et al., Arthroscopy 2005