Assessing Patellar Tracking During Total Knee Arthroplasty: A Technical Note

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Abstract

Achieving proper patellar tracking is one of the most important goals of total knee arthroplasty, as postoperative patellar complications are common. Patellar tracking is influenced by several factors, including component positioning and tightness of the lateral retinaculum. Various techniques such as the no thumb and towel clip tests have been described to assess adequacy of intraoperative patellar tracking. We propose a novel technique, the vertical patella test, which is a simple and reliable technique to assess the tightness of the lateral retinaculum. This method should be used in addition to the currently used techniques and needs to be validated in a prospective comparative study.

Basic principles of total knee arthroplasty (TKA) involve performing proper bone cuts and achieving appropriate ligamentous balancing. Proper patellar tracking is one of the most important goals of TKA to avoid extensor mechanism complications and ensure good functional outcome. Several factors have been shown to influence patellar tracking: Q angle, lateral retinacular tightness, mechanical alignment, femoral component design, patellar component positioning, patellar height, femoral and tibial sizing, alignment, and rotation of components.[1-5] Patellar maltracking can result in increased postoperative contact pressures, which in turn lead to accelerated wear of patellar component, patellar tilt, patellar subluxation, or dislocation.[1-3,6,7] Extensor mechanism–related problems are some of the most common complications following TKA.[1,4,8-10] Another problem relates to the fact that isolated patellar component revision has less than optimal outcome according to some studies.[11,12] Intraoperative assessment of patellar tracking is, therefore, of critical importance in order to avoid postoperative patellar complications.

The objective of this study was to present a novel technique that has been used by the senior author (JP) to assess the adequacy of patellar balancing during TKA.

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Intraoperative Techniques to Assess Patellar Tracking

No Thumb and Towel Clip Test

Two commonly described techniques are used to assess intraoperative patellar tracking during TKA are the "no thumb test" and "towel clip test." The no thumb test involves flexing the knee from 0º to 90º without any lateral force applied by the surgeon's thumb to prevent the patella from subluxating laterally.[13] With a properly tracking patella, the component should maintain contact with the medial femoral condyle throughout the range of motion; any noticeable elevation of the medial edge of the patellar component, subluxation, or dislocation constitutes a positive test. The towel clip test is done by re-approximating the vastus medialis and medial retinaculum to the medial border of the patella using a towel clip or a stitch.[14] The knee is again taken through a range of motion. Any elevation of the medial edge of the patella is considered a positive test.

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A positive no thumb test or towel clip test is suggestive of a tight lateral retinaculum in the setting of a properly aligned knee and well positioned tibial, femoral, and patellar components. Patellar maltracking is then addressed by performing a lateral retinaculum release. This should be done with careful attention to preserve the superior lateral geniculate artery as lateral release has been associated with decreased patellar blood flow and wound healing.[15,16] The release should be performed at 1-2 cm from the lateral border of the patella using the inside-out technique after isolating and protecting the aforementioned artery found distal to the lower border of the vastus lateralis.

Archibek and colleagues[14] performed a comparative study of these 2 tests in 200 consecutive primary TKAs. They found a positive no thumb test in 39% of the knees and a positive towel clip test in 6.5% of knees. The authors used the positive towel clip test as

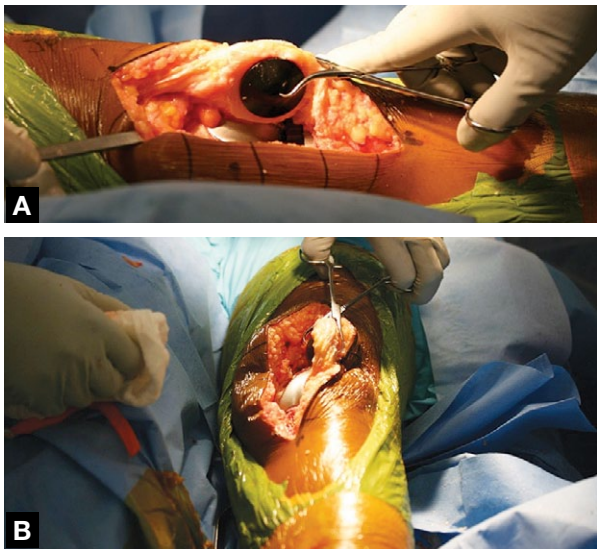

Figure. The vertical patella test: (A) a towel clip is used to evert the patella to 90º in relation to the femoral component, and (B) the patella is then translated medially so that its lateral border is past the middle of the intercondylar groove of the femoral component. The inability to translate the patella past to the midpoint of the intercondylar groove constitutes a positive test and is suggestive of a tight lateral retinaculum.

an indication for a lateral release. At 6-months follow-up, none of the patients had any significant patellar tilt, lateral displacement, subluxation, or dislocation both clinically and radiographically. They concluded that the no thumb test had a high rate of false positives 65 of 78 (83%) and therefore overpredicted the need for retinacular release. They recommended the use of the towel clip test for determining the need for lateral retinacular release.

The Novel Vertical Patella Test

The "vertical patella test" is a novel technique that we have been using to assess the tightness of the lateral retinaculum in addition to the 2 methods described above.

To perform this test, the patella is initially everted to 90º in relation to the femoral component (Figure A). It is then translated medially so that its lateral border is past the middle of the intercondylar groove of the femoral component while still in the everted position (Figure B). The inability to translate it past the midpoint of the intercondylar groove of the femoral component while everted constitutes a positive test and is suggestive of a tight lateral retinaculum.

This new technique has a very high correlation with the towel clip test based on our experience on 820 consecutive primary TKAs. All of these primary TKAs were done using a posterior cruciate substituting total knee prosthesis. In these operations, a towel-clip test was used in conjunction with the vertical patella test to assess the patellar tracking. In nearly all cases where the towel clip test demonstrated tilting of the patellar edge or subluxation (ie, a positive test), the vertical patella test also was positive, indicating an inability to translate the patella medially past the midpoint of the intercondylar groove of the femoral component. In the 21 cases with a positive towel clip test, the vertical patella test was positive in 86% (18 of 21), indicating a high correlation.

Conclusion

Assessing intraoperative tracking during a TKA is important to avoid postoperative patellar complications. We introduced the vertical patella test, which is a novel technique to assess the lateral retinaculum tightness. This method should be used in addition to the currently used no thumb and towel clip tests. We feel that the vertical patella test may be more specific to lateral retinacular tightness and femoral component medial/lateral positioning as a cause for patellar maltracking. This method may also aid in the diagnosis and correction of patellar maltracking during revision TKA in situations when the exact cause of the patellar subluxation is often unclear. A prospective comparative study is needed to validate this novel technique.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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