Stability of Total Knee Arthroplasty Performed Using Measured Resection Versus Gap Balancing Methods

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Introduction:
Controversy persists regarding the best method to determine femoral component rotation during total knee arthroplasty (TKA). Our objective was to compare flexion gap stability in TKAs performed using a measured resection technique in which bone landmarks (femoral epicondyles, anteroposterior axis, and posterior condylar axis) are the primary determinants of femoral component rotation with a group performed using a gap balancing methodology in which the femoral component is positioned parallel to the resected tibia with each collateral ligament equally tensioned.

Methods:
60 TKAs were performed by a single surgeon. A measured resection technique was used in 40 (20 PCL-retaining [PCR] and 20 PCL-substituting [PS]) and a gap balancing technique was used in 20 TKA (PS). All subjects were analyzed fluoroscopically while performing a deep knee bend and the incidence of femoral condylar lift-off (flexion instability) determined using a 3-D model fitting technique.

Results:
The incidence of lift-off greater than 0.75mm was 80% (maximum 2.9mm) and 70% (maximum 2.5mm) for the PCR and PS TKAs performed using measured resection vs. 35% (maximum 0.88mm) for the gap balanced group. The lift-off incidence greater than 1.0mm was 60% and 45% for the PCR and PS TKAs performed using measured resection vs. 0% for the gap balanced group.

Conclusion:
Recent research has documented that accurate surgeon identification of bone landmarks is not frequently obtained which can result in femoral component malrotation and flexion gap asymmetry1,2,3. Rotation of the femoral component using a gap balancing technique resulted in better flexion stability, which should reduce long term polyethylene wear. Use of a gap balancing technique requires an accurate proximal tibial resection and integrity of collateral ligamentous stabilizing structures.

References: