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The Pie-Crusting Technique Using Blade Knife for Medial Collateral Ligament Release is Unreliable in Varus Total Knee Arthroplasty: A Cadaveric Study

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Summary:
Gap increments after pie crusting with a knife were unpredictable and frequently led to early over-release, which indicates that its efficacy and safety as a technique for medial release is questionable

Abstract:
INTRODUCTION
Proper soft tissue balancing is essential for the functions and longevity after total knee arthroplasty (TKA). As most TKA candidates typically present with varus knee deformity, medial tightness which requires further medial soft tissue release for accurate balancing is commonly encountered. Traditionally, a gradual subperiosteal release of the superficial medial collateral ligament (MCL) has been carried out, however, use of this technique to achieve precise medial release in moderate varus deformity is technically demanding. Moreover, it can lead to over-release of the superficial MCL which might result in serious joint instability. Recent clinical series reported that the pie-crusting technique for medial soft tissue release, which makes multiple perforations in the superficial MCL using a # 11 blade was effective and safe for progressive correction of moderate varus deformity during TKA. However, the quantitative effect on medial gap increase and the safety of pie crusting have not been elucidated. Thus, we (1) determined the efficacy of pie crusting (2)investigated details related to the safety of the pie-crusting technique and the risk factors for early over-release.

METHODS
From ten pairs of cadaveric knees, one knee from each pair was randomly assigned to undergo pie crusting in extension (E group) or in flexion (F group). After performing bone resection, the medial extension and 90° flexion gaps were measured using a tensor device and scaled-force forceps. While the joint was distracted using the tensor device, pie crusting was performed in the MCL from the inside out at the joint line level, using a # 11 blade until over-release occurred. After every pie crusting, the amount of medial gap increase was recorded with a 200-N joint distraction force and the number of pie crusting required for 2- or 4- mm gap increase was assessed. Regression analysis was performed to identify predictors for over-release.

RESULTS
Both the medial extension and 90° flexion gaps in both groups increased steadily with each pie crusting, but the size of the gap increase compared with the previous pie crusting was inconsistent; it varied widely. In the E group, the extension gap increased from 0.8 to 5.0 mm, and the flexion gap increased from 0.8 to 3.0 mm, and in the F group, the extension gap increased from 1.0 to 3.0 mm and the flexion gap increased from 2.6 to 6.0 mm. In both groups, the numbers of pie crustings required to achieve a 2- or 4-mm increase in the medial extension and 90° flexion gaps were unpredictable and quite varied. The early over-release occurred in 70% of knees in each group. Pie crusting in a

90° flexed knee was identified as a predictor for early over-release.

DISCUSSION & CONCLUSION

Gap increments after pie crusting were unpredictable and frequently led to early over-release. Given the critical importance of the MCL in the replaced knee, these findings indicate that surgeons should decide carefully before using the pie-crusting technique with a #11 blade knife for MCL release in varus TKA.