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Effect of balanced gap total knee arthroplasty on intraoperative laxities and femoral component rotation.

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Abstract

The gap technique could lead to undesirable rotation of the femoral component in some knees. Using a navigation system, femoral component external rotations and varus-valgus laxities at 0° and 90° of flexion were measured intraoperatively in 44 patients. Significant improvements were observed at a minimum follow-up of 4 years with regard to clinical and radiologic outcomes. The balanced gap technique in total knee arthroplasty provided good intraoperative alignments and laxities of knees at 0° and 90°. However, increased femoral component external rotation was found to be correlated with increased varus alignment at 90° of knee flexion. This study shows that excessive external rotation of the femoral component during flexion gap balancing using the balanced gap technique in total knee arthroplasty can be avoided by additional soft tissue balancing guided by navigation.

Introducció

- Two surgical techniques to determine FCER
 - Measured resection technique
 - Balanced gap technique
- Landmarks
 - Transepicondylar axis
 - Anteroposterior line
 - Posterior condylar line

Introduction

- Measured resection technique
 - Trapezoidal flexion gap
 - Regardless of ligament tension
- Balanced gap technique
 - Cut parallel to the proximal tibial cutting
 - Better flexion stability
 - Better patellar tracking
 - Depends on soft tissue balance
 - Could lead to undesirable implantation

Purposes

- Determine femoral component rotations and laxities using a navigation system during CR TKA using balanced gap technique
- Evaluate the effects of femoral rotation on knee function

Materials and Methods

- Prospective study
- 47 patients
- Exclusion criteria:
 - Open knee surgery
 - Severe deformity ($>20^{\circ}$ varus or $>30^{\circ}$ flexion)
 - Other than osteoarthritis
- Follow-up 54,5 months (48-68)
- 4 men and 40 women
- Mean age 68,8 years (56-79)

Surgical Technique

- Medial parapatellar approach (Patellar eversion)
- OrthoPilot navigation system
- Proximal tibial cutting 0°
- PCL was preserved
- Tensioning device for extension gap
- Release medial structures if necessary
- 4-in-1 cutting block parallel to the tibial resection plane
- External rotation range 0-7° (Patellar tracking)

Surgical technique

- Not allowed internal rotation
- ER $>7^{\circ}$ release anterior fiber of SMCL
- Cemented Aesculap TKA
- Patella was not resurfaced
- Posterior slope 3°

Materials and Methods

- Clinical outcomes
 - Same physician assistant (not involved)
 - HSS, WOMAC, Rmotion, FT angles, Posterior femoral condyles offset, radiolucent lines
 - 3 and 12 months and annually
- Statistics
 - Paired Student t test
 - Pearson regression analysis
 - SPSS
 - Distributions were normal

Results

- Mean ER femoral component **3,8** +/-2,4°
- Mean knee mechanical alignments:
 - 0° flexion: 0,6 +/-1,1° of varus
 - 90° flexion: 1,4 +/-2,6° of varus
- Positive correlation (r:0,70 p<0,01) between FCER and varus alignment at 90° flexion
- 8/14 with >6° ER: more than 3° varus
- 2/30 with 0-5° ER: more than 3° varus

90°

Results

- Mean vr-vl laxity greater at 90°
 - 90°: 5,8 +/-1,9°
 - 0°: 4,4 +/-1,4°
- HSS and WOMAC improved
- FT angles improved
- Radiolucent lines 9/47

Discussion

- BG technique good alignments and stability
- More FCER, more varus knee at 90° flexion
- No correlation between FCER and preoperative mechanical angle
- Hanada et al: Substantial varus alignment at 90° flexion
 - Cadaver without soft tissue release
 - Did not set femoral external rotation

Discussion

- Limitations
 - Intraoperative laxity testing manually
 - Alignment was measured under non-weight-bearing conditions
- Conclusion
 - Excessive FCER can be avoided by additional soft tissue balancing, and prevents varus malalignment