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Conflict of interest

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We have no financial conflict to disclose.
Introduction

◆ Proper placement of the ACL graft tunnel
  → Crucial for a successful ACL reconstruction

◆ Anteromedial (AM) portal technique
  → Alternative to the traditional transtibial (TT) technique for placing the graft anatomically

◆ New surgical technique → Inevitably follow a learning curve

◆ Several useful tools have been proposed for surgeons
  → Improve the tunnel positioning in learning period
Introduction

◆ Femoral bony landmarks
  (Lateral intercondylar and bifurcate ridge)
  → Difficult for a novice surgeon who has minimal arthroscopy experience

◆ Arthroscopic ruler
  → Improved accuracy and precision, but also requires the arthroscopic identification of bony landmarks

◆ Intraoperative fluoroscopy and navigation
  → These methods still require further investigation before their efficacy can be confirmed
Introduction

- No published study has yet investigated whether or not the use of a femoral offset guide by a novice surgeon in ACL reconstruction aids in accurate and precise femoral tunnel placement, which would benefit these surgeons.

Purpose

- To compare the accuracies and precisions of the femoral tunnel placements with the use of an offset guide in single-bundle ACL reconstructions through the AM portal between expert and novice surgeons.
Materials and Methods

◆ March, 2017 ~ January, 2018 : 83 single bundle ACL reconstruction (Expert: 55 cases, Novice: 28 cases)

◆ 1 : 1 Propensitiy Score Matching → 25 : 25
  : Age, Sex, BMI, Operation side, Combined procedure

◆ Expert surgeon
  ➢ More than 50 ACL reconstructions annually for over 18 years

◆ Novice surgeon
  ➢ Completed basic four-year residency & Two year fellowship
  ➢ Participated in about 50 ACL reconstruction using AM portal as an assistant
  ➢ No experience performing any ACL reconstruction using AM portal as an operator
Materials and Methods

◆ Surgical procedure

- AM portal technique with single bundle technique
- Independent femoral tunnel through the accessory AM portal in an inside to outside manner
- Femoral tunnel position with guide pin using a 7 mm femoral offset guide (Acufex, Smith and Nephew, Andover, MA, USA) in the 90° knee flexion position
- Target point: the center of the direct femoral attachment site of ACL
Materials and Methods

◆ Outcome variables

◆ The coordinates of the center of the tunnel (By Kawaguchi et al.)
  ✓ 32.4 % from proximal margin in the proximal–distal direction
  ✓ 31.7% from the Blumensaat’s line in the anterior–posterior direction

◆ Postoperative 3D CT (Bernard and Hertel grid method)
  ✓ Proximal to the distal distance
  ✓ Anterior to posterior distance
## Demographics after Propensity Score Matching

<table>
<thead>
<tr>
<th></th>
<th>Expert surgeon (n=25)</th>
<th>Novice surgeon (n=25)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)*</td>
<td>30.0 ± 7.6</td>
<td>33.0 ± 11.3</td>
<td>0.274</td>
</tr>
<tr>
<td>Gender (Female, %)</td>
<td>7 (28.0%)</td>
<td>8 (32.0%)</td>
<td>0.758</td>
</tr>
<tr>
<td>BMI (kg/m²)†</td>
<td>25.3 ± 3.4</td>
<td>27.0 ± 4.6</td>
<td>0.399</td>
</tr>
<tr>
<td>Operation side (Left, %)</td>
<td>10 (40.0%)</td>
<td>13 (52.0%)</td>
<td>0.395</td>
</tr>
<tr>
<td>Time to operation from injury (weeks)</td>
<td>13.4 ± 11.8</td>
<td>12.7 ± 11.1</td>
<td>0.835</td>
</tr>
<tr>
<td>Concomitant operation</td>
<td></td>
<td></td>
<td>0.915</td>
</tr>
<tr>
<td>None</td>
<td>15 (60.0%)</td>
<td>14 (56.0%)</td>
<td></td>
</tr>
<tr>
<td>Meniscectomy</td>
<td>3 (12.0%)</td>
<td>4 (16.0%)</td>
<td></td>
</tr>
<tr>
<td>Meniscus repair</td>
<td>7 (28.0%)</td>
<td>7 (28.0%)</td>
<td></td>
</tr>
</tbody>
</table>
### Femoral tunnel position & Absolute distance from the tunnel center to the ACL insertion center

<table>
<thead>
<tr>
<th>Quadrant method (%)*</th>
<th>Expert surgeon (n=25)</th>
<th>Novice surgeon (n=25)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proximal to distal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mean distance from parallel to Blumensa at line)</td>
<td>30.5 ± 4.6</td>
<td>32.5 ± 3.7</td>
<td>0.095</td>
</tr>
<tr>
<td><strong>Anterior to posterior</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mean distance from perpendicular to Blumensaat line)</td>
<td>32.6 ± 4.3</td>
<td>31.6 ± 4.6</td>
<td>0.410</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quadrant method (%)*</th>
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<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proximal to distal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mean distance from parallel to Blumensaat line)</td>
<td>3.8 ± 3.1</td>
<td>2.9 ± 2.3</td>
<td>0.231</td>
</tr>
<tr>
<td><strong>Anterior to posterior</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mean distance from perpendicular to Blumensaat line)</td>
<td>3.3 ± 2.8</td>
<td>4.1 ± 1.9</td>
<td>0.278</td>
</tr>
</tbody>
</table>
Position of the intra-articular femoral tunnel in the two groups

Mean distance from the femoral tunnel center to the center of ACL footprint

→ 5.6% in the expert

Mean distance from the femoral tunnel center to the center of ACL footprint

→ 5.4% in the novice
**Conclusion**

- A novice surgeon could achieve accuracy and precision similar to those of an expert in making the femoral tunnel by using a femoral offset guide in ACL reconstruction through the AM portal.

- Recommend the use of a femoral offset guide during the learning period of a novice surgeon for tunnel placement in order to reduce the learning curve required to perform an accurate and reproducible ACL reconstruction.