What Makes Suture Anchor Use Safe In Hip Arthroscopy? A Systematic Review Of Techniques And Safety Profile

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Investigation performed at McMaster University, Hamilton, ON, Canada
Disclosures

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Introduction and Background

- Arthroscopic repair of labral tears using suture anchors is shown to have good outcomes [1]

- Complications associated with aberrant suture anchor insertion include pain, mechanical symptoms, and revision arthroscopy [2,3]

- Objectives: to review factors related to suture anchor insertion (i.e.: insertion angle, portal, anchor size, patient factors) is warranted to ascertain the safety of this technique.
Introduction and Background

- Location along acetabular face denoted by “clock face” - midpoint of transverse acetabular ligament as 6-o’clock in 41.6% of studies [4]

- Safe drilling angle: between two straight lines from acetabular rim, touching subchondral bone and outer cortex [5]

- Anchors are polyetheretherketone (PEEK) or ultra-high molecular weight polyethylene (UHMWPE) all-suture anchors (ASA) [6]

- Common drilling portals are anterolateral (AL), mid-anterior (MA), anterior (ANT), posterolateral (PL), and distal anterolateral (DALA)
Methods

- Systematic search of Embase, MEDLINE, PubMed
- All results screened in duplicate at each stage
- Included: Human and biomechanical studies, all levels of evidence
- Excluded: non-operative studies, no suture anchor insertion details
- Study quality assessed using MINORS
## Results

<table>
<thead>
<tr>
<th>Demographic Data</th>
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<tbody>
<tr>
<td>Level of Evidence</td>
<td>Level IV (n=4), III (n=9), I (n=1)</td>
</tr>
<tr>
<td>MINORS (mean ± SD)</td>
<td>13 ± 1.15</td>
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<tr>
<td>QUACS (mean ± SD)</td>
<td>10.75 ± 1.58</td>
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<tr>
<td>Total hips (n)</td>
<td>651</td>
</tr>
<tr>
<td>Cadaveric hips (n)</td>
<td>123</td>
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<tr>
<td>% Male</td>
<td>46.0%</td>
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<tr>
<td>Mean age</td>
<td>38.5 years</td>
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</table>
Complications of Suture Anchors

1. Psoas Tunnel Perforation [2]
   a. Perforation causing abutment of iliopsoas tendon and neurovascular structures
   b. NV structures injured in 23.3% of free drill penetrations [7]

2. Cartilage Perforation [8]
   a. Anterosuperior (12 to 3-o’clock) locations most common
   b. “Ballooning” of cartilage was observed

- Perforation rate ranged from 4.0% to 18.2%
- Removal of the offending anchor did not always relieve pain
- Revision arthroscopy and arthroplasty required in 18% of patients
## Results

<table>
<thead>
<tr>
<th>Factors</th>
<th>Details</th>
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<tbody>
<tr>
<td><strong>Acetabular Characteristics</strong></td>
<td>• Bone was thinnest at 3 and 10-o’clock [9]</td>
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<tr>
<td></td>
<td>• Acetabular rim angle smallest at 3-o’clock [10]</td>
</tr>
<tr>
<td></td>
<td>• Articular involvement most common at 3-o’clock and 1-2 o’clock positions</td>
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<td>(approx. 4.48%; OR: 7.98) [3]</td>
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<td><strong>Drilling Techniques</strong></td>
<td>• Mean safe angle of anchor insertion was 27.6° [5]</td>
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<td>• Curved drill guides increase distance to articular cartilage [11]</td>
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</table>
## Results

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| Insertion Portals  | ● PL portal preferred for posterior repairs (8 to 11-o’clock) [9]  
  ● No difference between MA and DALA for anterosuperior (12 to 3-o’clock)                                                  |
| Suture Anchors     | ● Large (> 2.3-mm) anchors had more complications than small (< 1.4-mm) anchors at all locations [12]  
  ● Safe drilling angle inversely proportional to anchor size [5]  
  ● Drills < 3.0 mm recommended                                                                                             |
Discussion

Main Findings
- Anterior acetabular rim (3 to 4-o’clock) is a vulnerable site for suture anchor insertion
- Large diameter (> 2.3-mm) anchors had the highest incidence of perforation compared to small-diameter (< 1.8-mm) ASAs

Other Research
- The “psoas valley” at 3:20 (hr:min) of the pelvis has a bony depression [13]
- Matsuda et al [8] recommend inserting anchors at 2-o’clock instead of 3-o’clock if anatomically possible
- ASAs allow more anchors to be placed, with their small size useful in cases with limited safety angles [14,15]
Discussion

Recommendations

- Drills smaller than 3.0-mm are recommended at anterosuperior positions
- Both MA and DALA portals are safe at these positions
- Anchors should be placed with a distal-proximal trajectory to avoid intra-articular penetration
- Avoid excess rim trimming, as it may impair bony purchase
- Direct visualization of the articular surface is needed during drilling and anchor placement to confirm that cartilage is not penetrated
- Bone quality should dictate the size of the anchor used
- Nitinol wire may be passed through drill holes before anchor insertion to ensure that the joint and psoas tunnel have not been perforated
- Fluoroscopy can confirm that the articular space has not been violated
Conclusions

- Suture anchors at anterior acetabular rim positions (3 to 4-o’clock) should be inserted with caution.
- Large diameter (> 2.3-mm) suture anchors increase the likelihood of articular perforation.
- Direct arthroscopic visualization, fluoroscopy, distal-proximal insertion, and the use of nitinol wire can help prevent articular violation.
References


