Enhanced Arthrocentesis of the Flexed Knee with Pneumatic Compression


Background

- Standard anatomic approach for arthrocentesis of the effusive knee is the extended knee anterolateral access port (1).
  - This approach is highly accurate in the setting of a large joint effusion (2).
  - Limitations with this approach are when there is minimal joint fluid, or if the patient wishes to remain seated, has flexion contractures of the knee, is confined to a wheelchair, or cannot lie supine (3)(4).
- Modified arthrocentesis with a flexed knee in a seated position has been shown to have equal synovial fluid returns as the extended knee (5).
- Meehan et al have demonstrated that external compression of the knee can shift small volumes of synovial fluid into anterior knee access points (6).
- We hypothesize that highly controllable pneumatic compression of suprapatellar bursa and patellofemoral joint of the flexed knee would also provide similar improved arthrocentesis success as the extended knee position.

Methods

- Eighty-two patients with effusive osteoarthritic knees were included.
- Presence of a knee effusion was determined clinically.
- Inclusion criteria
  1) the presence of a clinically palpable knee effusion,
  2) indications for therapeutic-diagnostic arthrocentesis
  3) formal signed consent of the patient to undergo the procedure
- 41 patients underwent arthrocentesis with the knee in the extended position without compression, and then mechanical compression using an elasticomeric brace was applied and arthrocentesis resumed.
- 41 patients underwent arthrocentesis with the knee in the extended position without compression, and then mechanical compression using pneumatic compression was applied and arthrocentesis resumed.

Outcome Measures

- Patient pain was measured with Visual Analogue Pain Scale, prior to the procedure, during arthrocentesis, and immediately post procedure (post-procedural pain).
- Aspirated fluid volume was quantified in milliliters (mL) for pre and post compression.
- Pain or severe arthritis.

Results

<table>
<thead>
<tr>
<th></th>
<th>Extended Knee</th>
<th>Extended Knee with Compression</th>
<th>Flexed Knee</th>
<th>Flexed Knee with Compression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>Age</td>
<td>62.0±11.3</td>
<td>62.0±11.3</td>
<td>66.8±12.1</td>
<td>66.8±12.1</td>
</tr>
<tr>
<td>Preprocedure Pain</td>
<td>7.7±1.1</td>
<td>7.7±1.1</td>
<td>7.9±1.5</td>
<td>7.9±1.5</td>
</tr>
<tr>
<td>Procedure Pain</td>
<td>2.4±1.5</td>
<td>2.4±1.5</td>
<td>4.4±2.2</td>
<td>4.4±2.2</td>
</tr>
<tr>
<td>Post-Procedure Pain</td>
<td>1.3±2.0</td>
<td>1.3±2.0</td>
<td>1.4±1.7</td>
<td>1.4±1.7</td>
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<tr>
<td>Diagnostic Arthrocentesis</td>
<td>80% (33/41)</td>
<td>100% (41/41)</td>
<td>85% (35/41)</td>
<td>100% (41/41)</td>
</tr>
<tr>
<td>Synovial Fluid Yields (mL)</td>
<td>12.4±12.9</td>
<td>25.2±13.4</td>
<td>21.6±17.6</td>
<td>38.8±27.7</td>
</tr>
</tbody>
</table>

Discussion

- Based on our findings, there is a significant quality improvement in arthrocentesis fluid yield and diagnostic success from compression of the knee similar.
- Compression of the effusive flexed knee with a suprapatellar pneumo cuff markedly improves the success and fluid yield of arthrocentesis and is non-inferior to standard extended knee arthrocentesis with or without compression.
- Arthrocentesis of the flexed knee with pneumatic compression is especially useful in patients who wish to remain seated or who cannot extend their knee due to flexion contracture, wheelchair confinement, pain or severe arthritis.

References