Joint Injection and Aspiration

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Problem Identification and Needs Assessment

Identification of targeted learners
Orthopedic surgery entry level PGY1 residents.

Identification of need or problem for targeted learners
Many entry t residents have never been taught basic needle and syringe handling skills. Although basic musculoskeletal anatomy has been taught, hands on application of the anatomy in aspirating and injecting joints has been limited with few opportunities to demonstrate hands on skills.

Current educational approach to address need or problem
Currently most orthopedic surgery residency programs are teaching diagnosis and treatment with joint aspiration and injection using clinical cases.

Ideal educational approach to address need or problem
Ideally, entry level orthopedic residents would demonstrate adequate medical knowledge and patient care skills for diagnosis and treatment in a simulated setting, prior to their orthopedic rotations, so that learning and technical skill development occurs prior to patient care.

Goals and Objectives

Specific educational goals
- To demonstrate skills for use of a needle and syringe in preparing medications for injection;
- To demonstrate anatomic landmarks for joint aspiration (subacromial, elbow, wrist, knee, ankle);
- To demonstrate joint aspiration and injection techniques.

Specific cognitive, affective, psychomotor task objectives
- To learn the indications for joint aspiration.
- To learn the indications for joint injection.
- To set up the syringe, needles, and medication in preparation for an aspiration or injection.
- To demonstrate knowledge and drawing of anatomic landmarks for the shoulder, elbow, wrist, knee and ankle.

Syllabus Development

Assumptions
Most residents have learned basic joint anatomy in medical school, including palpable and visible topical landmarks.

Suggested readings

Description of laboratory module
The first portion of the module involves practicing the set-up for joint injection. The second portion involves drawing appropriate landmarks and injecting joints either on a simulated model or simulating on a human partner.

Description of techniques and procedures
Set-up. The resident will demonstrate use of a syringe with a larger gauge needle (such as an 18 gauge) to draw saline or a simulated medication into the syringe, then switching safely to a smaller gauge needle (such as a 22 gauge) for joint injection/aspiration.
Subacromial Shoulder injection: Landmarks are palpated and drawn including the scapular spine, the acromial arch, the deltoid, and (by rotation of the arm) the humeral head. The "soft spot" of the shoulder can be felt 2 cm inferior and 1 cm medical to the posterior lateral corner of the acromial arch. The needle is placed perpendicular to the posterior chest wall and aimed toward the coracoid process. Using a Sawbones simulator, an audible buzz is heard when the appropriate space is reached.

Elbow Joint: With the elbow in a 90 degree position of flexion, the lateral epicondyle, the radial head, and the posterior olecranon are palpated and drawn as topical landmarks. The "soft spot" of the elbow is palpated in the center of the triangle of these three landmarks. The needle is aimed towards the center of the elbow joint.

Knee: With the knee in a slightly flexed position, the topical landmarks of the knee are palpated and drawn, including the quads, the patella, the patellar tendon, the tibial tubercle, and the medial and lateral joint lines. The lateral patellar approach is used most commonly, particularly when an effusion is present as this increases the space between the patella and the femur. The needle is aimed behind the patella with the entry point on the lateral side of the patella and the needle oriented 90 degrees to the long axis of the limb. Alternatively, the needle can be placed at the inferior pole of the patella, just lateral to the patellar tendon, aiming medially towards the trochanteric notch. Using the Sawbones Knee Injection Simulation model, an audible signal will be heard, and a pop felt, when the needle enters the synovial cavity from either entry point.

Similar simulation exercises can be developed for any of the following possible injection/aspiration scenarios:

1. Acromioclavicular Joint Injection
2. Shoulder Joint Injection
3. Tennis Elbow Injection
4. Carpal Metacarpal (CMC) Joint Injection
5. Carpal Tunnel Injection
6. deQuervain's Tenosynovitis Injection
7. Metacarpal Phalangeal (MP) Joint Injection
8. Trigger Finger Injection
9. Dorsal Wrist Ganglion Aspiration
10. Wrist Joint Injection
11. Hip Joint Injection
12. Trochanteric Bursa Injection
13. Ankle Joint Injection
14. Plantar Fascia Injection
15. Morton’s Neuroma Injection

Common errors and prevention strategies

Error 1

The joint space is not entered. If a hard resistance is felt, this is most commonly bone. Repositioning of the needle may be necessary for entrance into the joint. The medication should inject without much resistance as confirmation that the needle is within the joint space.

Demonstrate expert performance

Recommendations for motor skills practice

Continued review of the visible and palpable landmarks for each injection will continue to familiarize the resident with basic principles for joint injection.

Supplies and station setup

Injection aspiration equipment: syringe, needles, gloves, alcohol swabs, marking pen.

Simulation models available (can be used multiple times for each model):

www.sawbones.com
#1509-1 Shoulder $498.00,
#1510-3 Elbow $424.10
#1511-5 Wrist $445.50
#1516-2 Hip $585.30
#1517-1 Knee $484.50
#1518-1 Foot/ankle $445.00

Suggested duration for completion of module

After a 20-30 minute orientation, each resident would spend approximately 15 minutes practicing at each station for set up and for each simulated joint.
Assessment of Competency for each joint: 15 minutes with verbal feedback.

**Estimated budget**

Cost of syringes, needles, and saline.
Cost of simulation models as above.

**Learner Evaluation and Feedback**

**Methods of performance assessment**

<table>
<thead>
<tr>
<th>Resident's Name</th>
<th>Date:</th>
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</thead>
<tbody>
<tr>
<td>Technique</td>
<td>Yes/No</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
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<tr>
<td>Selects and prepares appropriate equipment for procedure</td>
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<tr>
<td>Response criteria:</td>
<td></td>
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<tr>
<td>• Verbalizes appropriate patient position</td>
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<tr>
<td>Response criteria:</td>
<td></td>
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<tr>
<td>• Patient sits with supported elbow bent at 90° and forearm extended to side the table. Dose of EPID can be adjusted to the position just above the lateral approach.</td>
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<tr>
<td>• Selects appropriate injection site</td>
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<tr>
<td>Response criteria:</td>
<td></td>
</tr>
<tr>
<td>• Identifies landmark on lateral approach.</td>
<td></td>
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<tr>
<td>• Competently administers local anesthetic and corticosteroid injection</td>
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<tr>
<td>Response criteria:</td>
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<tr>
<td>• Insert needle in line with palpated landmark perpendicular to the skin until it reaches bone. Solution is introduced to needle as if into all areas of the tendon.</td>
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<tr>
<td>• Verbalizes potential adverse outcomes to patient</td>
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<td>Response criteria:</td>
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<tr>
<td>• Corticosteroid: 10 mg of prednisolone acetate, saline, lidocaine, injection, along with sodium chloride to follow subcutaneous infiltration of the extensor, leading to a deep puncturing depression in skin.</td>
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<tr>
<td>• Verbalizes appropriate aftercare/injected instructions</td>
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<td>Response criteria:</td>
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<tr>
<td>• It is essential that the patient rest for at least 24 hours. All lifting or carrying must be done with the arm opposite to the side of the injection. After the needle is withdrawn, a small, subcutaneous infiltration of fluid is given and a strengthening program started when the patient is able to use it. If the needle is not used, the weight should be reduced for 3 days.</td>
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**Suggested proficiency benchmarks**

- Safe needle handling
- Appropriate landmarks palpated and drawn
- Appropriate injection site and angle

**Methods for learner debriefing and feedback**

The resident is given opportunity to provide feedback about this module and suggest process improvement.

**Periodic Curriculum Review, Evaluation, Validation, and Refinement**

Programs should use resident feedback to validate this curriculum, add and refine proficiency benchmarks, and develop program-specific objective criteria.