

Percutaneous Fluoroscopic Synovial Biopsy as a New Diagnostic Test for Periprosthetic Infection after Shoulder Arthroplasty: A Feasibility Study



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Disclosures



- Neither I nor my immediate family members have a financial relationship with a commercial organization that may have direct or indirect interest in the content.



Purpose



- 1) To describe a novel technique (percutaneous fluoroscopic synovial biopsy) of diagnosing post operative shoulder infections
- 2) To report preliminary data on use of this technique



Background



- Reported infection rates in TSA are 0.4-3.9%; Reverse TSA 5.1%; Hemi-arthroplasty 1.0%
- Devastating complication requiring prolonged antibiotics and further surgery
- Functional outcomes are diminished after infection is treated
- 15-29% rate of unexpected positive cultures at time of revision surgery



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Singh, J.A., et al., *Periprosthetic infections after total shoulder arthroplasty: a 33-year perspective*. J Shoulder Elbow Surg, 2012. **21**(11): p. 1534-41.

Background



- *Propionibacterium acnes* is the most prevalent organism in post-operative shoulder infections (36-70%)
- *P. acnes* preferentially colonizes shoulder surgical sites compared with the hip and knee.
- Clinical presentation lacks classic signs/symptoms of infection
- 10-50% reported detection rate of *P. acnes* with joint aspiration

Background

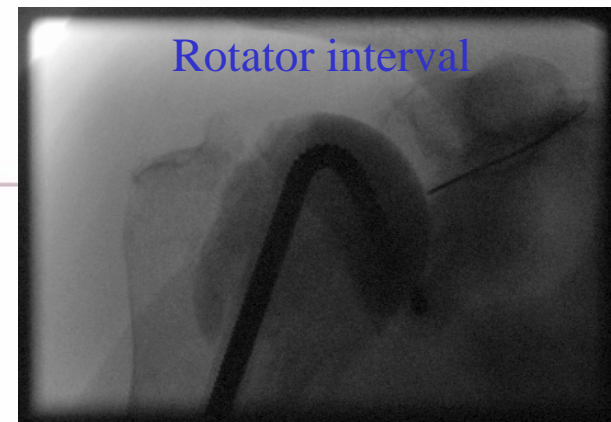
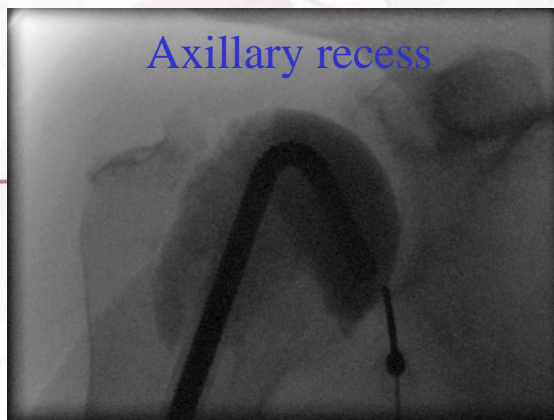


- CRP and ESR have low sensitivity for diagnosis of shoulder arthroplasty infection when compared to hip, knee and spine
- Current gold standard is open (intra-operative) tissue sampling
- Need for a pre-operative test to diagnose infection
- Synovial biopsy has been shown to be superior to aspiration and CRP in diagnosis of peri-prosthetic hip and knee infections

Synovial Biopsy Technique



- Performed by MSK Radiologist in **fluoroscopy** suite
- Patient positioned supine
- Sterile technique (disinfect skin, drape)
- 1% Xylocaine infiltrated at two sites
- 18-G spinal needle advanced to axillary recess of glenohumeral joint (3 samples) and rotator interval (2 samples)
- If fluid is present, an aspirate is obtained



Synovial Biopsy Technique



- **22-G Chiba biopsy needle** used to obtain samples
- Sent in sterile saline as one specimen to microbiology for analysis; aspirate sent separately if available
- A small amount of contrast injected confirming intra-articular positioning after aspiration and synovial samples taken as contrast can be bacteriostatic



Methods



- Prospective series of 14 patients undergoing workup for chronic glenohumeral infection
 - humeral head replacement (4), TSA or rTSA (4), shoulder arthroscopy for biceps tenodesis or cuff repair (4), Latarjet procedure (1), ORIF proximal humerus fracture (1)
- Patients had pain and/or stiffness without other identifiable cause (i.e. loosening, implant failure, fracture)
- 6 females, 8 males, Mean age 61
- All patients underwent percutaneous synovial biopsy (pre-op) and intra-operative biopsy (gold standard)
 - One MSK radiologist performed all of the synovial biopsies.
 - One orthopedic surgeon performed all of the open biopsies.

Results



- 4/14 = 29% positive (open biopsy) out of all clinically suspicious presentations
 - All infections occurred in arthroplasty patients
- Cultures kept for 5-16 days with average time to positive culture of **6 days**.
- Confirmed infections: 3 *P. acnes* (75%) and 1 coagulase negative staph aureus (25%)
- Mean time from index surgery: 33 months (range 0.5 to 204 months)

Results



- 3/14 had positive percutaneous fluoroscopic synovial biopsy, all of which grew the same organism at the time of OR
- In 75% of infections, synovial biopsy accurately identified the infection pre-operatively
 - Sensitivity 75%, Specificity 100%
- No complications or morbidity associated with synovial biopsy



Limitations



- Standardized culture time of 14 days required to reliably grow *P. acnes*
- 5 separate samples should be standard for synovial biopsy as well as for OR
- Limited ability to compare to aspirate, as most often, no fluid is present



Discussion



- Synovial biopsy can accurately diagnose post-operative shoulder infection.
- No morbidity associated with the procedure
- Significant morbidity associated with uncertainty of diagnosis (i.e. multiple revision surgeries)
- Limited clinical ability to predict positive infection pre or intra operatively



Discussion



- Need for standardized protocol and collection of more data
- Small numbers due to low incidence of post-operative shoulder infection
 - Additional surgeons or centers required for recruitment



Conclusion



- Synovial Biopsy can be used as a non-invasive means to diagnose shoulder infection
- Synovial biopsy had a high concordance rate of 75% compared to open biopsy
- Lower cost of percutaneous biopsy vs. intra-operative
- Shoulder synovial biopsy is a novel technique not previously described in the literature.
- This pilot study allows us to plan a multi-center study in order to validate this diagnostic test



Thank you



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