

Ultrasound Guided Intervention in the Shoulder

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Current options for treatment of shoulder pain attributed to rotator cuff pathology/bursal pathology/long head of biceps tendon/joint arthropathy

Several treatment options available:

- NSAID
- Rehabilitation physiotherapy
- Pain relieving interventional techniques
- Surgery

When would interventional techniques be performed?

- To relieve pain in order to facilitate rehabilitation exercises
- To relieve pain if rehabilitation and other medication have been unsuccessful
- To relieve pain when physiotherapy is inappropriate e.g joint effusion
- As a pain relieving measure in patients who are not surgical candidates
- As temporary pain relief in patients awaiting surgery
- As a diagnostic tool - aspirate to assess underlying process.

Shoulder

- Subacromial bursa
- Acromioclavicular joint
- Aspiration
- Gleno-humeral joint
- Long head of biceps tendon sheath
- Lavage - calcific tendinopathy.

Why under ultrasound control?

- Ensures absolute accuracy of needle placement, so that if there is no symptomatic improvement, it eliminates the possibility that the injection was in the wrong place.
- AC joint, Peck (2010)
- Glenohumeral, Rutten (2009)
- Subacromial, Daley (2011)
- Bicep tendon sheath, Hashiuchi (2011)

Why under ultrasound control?

- Zingas C, Failla J, Van Holsbeck M et al(1998) reported that ultrasound guided injections into the tendon sheath for De Quervain's tenosynovitis had a significant benefit over landmark guided injections.
- In contrast, Kane D, Greaney T, Shanahan M(2001) found that landmark guided injection to be comparable with ultrasound guided injection for the treatment of recalcitrant plantar fasciitis

Why under ultrasound control?

- Naredo, Cabero, Beneyto et al (2004):
- Patients randomised for landmark guided or ultrasound guided injections of 20mg Triamcinolone acetonide by same physician
- Clinically assessed 6 weeks post injection-no physiotherapy in that 6 weeks-assessment based on visual analogue scale for pain(VAS) .
- VAS in the ultrasound guided injection group had score change of 35 compared to a score change of 7 for landmark guided injection.

Why under ultrasound control?

- Hall S, Buchbinder R(2004)- Extensive literature review
- ‘Fundamental issues relating to steroid injections still remain. Do radiologically guided corticosteroid injections confer any added clinical benefit over blinded injections in the short and long term? If there are added benefits, is the routine use of imaging to improve the accuracy of steroid placement, cost effective? Any answer to this debate relies on data provided by good, prolonged, controlled trials with long-term follow-up, of which not enough have been done to reach a conclusion.’

Why under ultrasound control?

Sibbet et al 2009:

- 148 painful joints randomised to landmark guided or USGI
- Procedural pain = 43% lower with US
 - (distraction due to interaction with operator, transducer pressure, cooling effects of gel)
- Pain scores at 2 weeks = 58.5% lower with US
- 200% increased detection effusion
- 337% increased volume fluid aspirated
- Avoiding neurovascular structures, tendons-creates less needle trauma-improves safety.
- 'Use of ultrasound guidance significantly improves outcomes'

Why under ultrasound control?

- Sibbet et al (2011)-244 patients with inflammatory arthritis.
- Randomised pts to LMG injections vs. US guidance- Sufficient reduction in injection pain and sufficiently superior pain relief to provide a 33% (\$64) reduction in cost/responder/year for a hospital outpatient.

Why under ultrasound control?

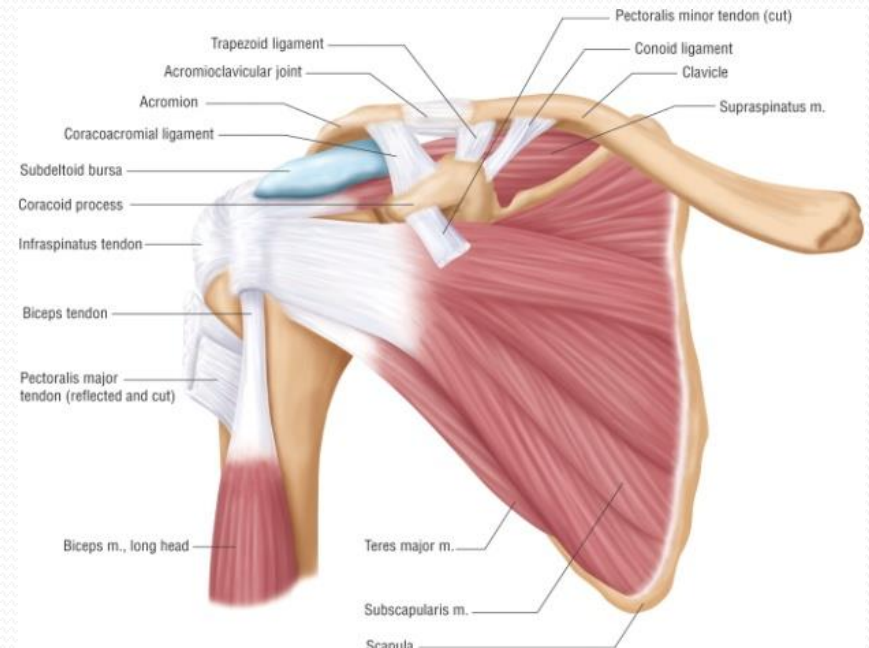
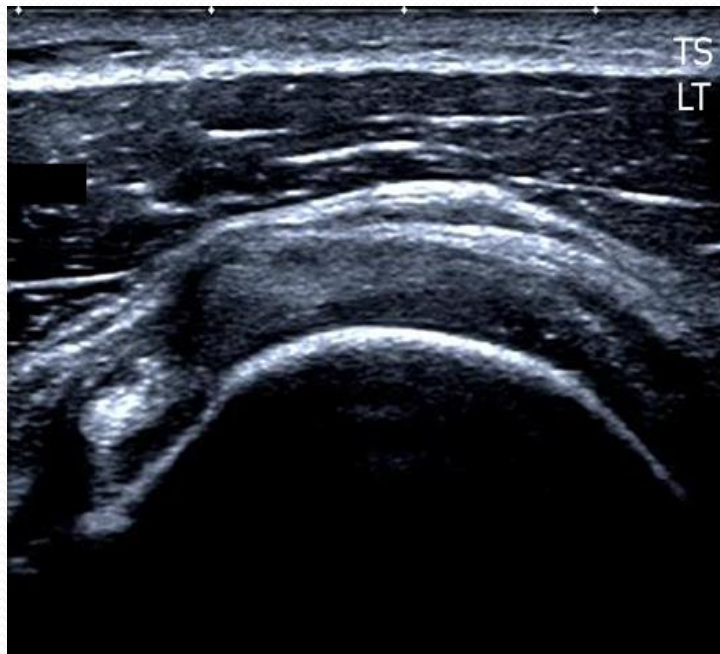
- Sage W et al-Rheumatology (2013) 52 (4): 743-751. -MEDLINE, AMED and Embase in addition to unpublished literature databases were searched from 1950 to August 2011.
- ‘There is a statistically significant difference in pain and abduction between LMG and USG steroid injections for adults with shoulder pathology. However, these differences are small and may not represent clinically useful differences. The current evidence base is limited by a number of important methodological weaknesses, which should be considered when interpreting these findings.’

Conclusions

- Landmark guided injections/intervention less accurate than u/s guided injection/intervention-data for improved accuracy with US guidance consistent.
 - Data for efficacy less impressive but...
 - Safety
 - Ability to visualize and successfully aspirate effusions
 - Certainty of eliminating the possibility that the injection was in the wrong place
 - Improved tolerance of procedure
- are incentive enough to embrace an ultrasound guided technique.

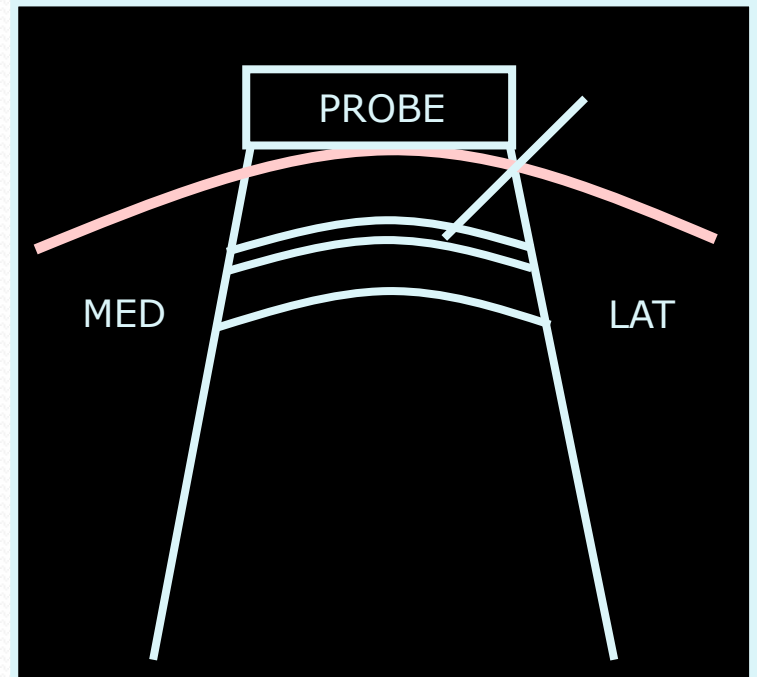
Sub-acromial bursal injection

- Most common shoulder injection- performed to relieve pain thought to be attributed to the rotator cuff and subacromial bursa.



Delivery Technique

- Need one hand to scan and one hand to inject
- Accurate and safe needle placement requires the operator to be able to visualise the needle from the point of skin puncture to when it reaches the target. This requires excellent 'hand-eye' coordination because the needle must remain within the beam width in order to be visualised.



Ambidextrous

This means that it is never necessary to alter machine, patient or operator position to accommodate one particular side, thus facilitating efficiency and speed of the procedure.

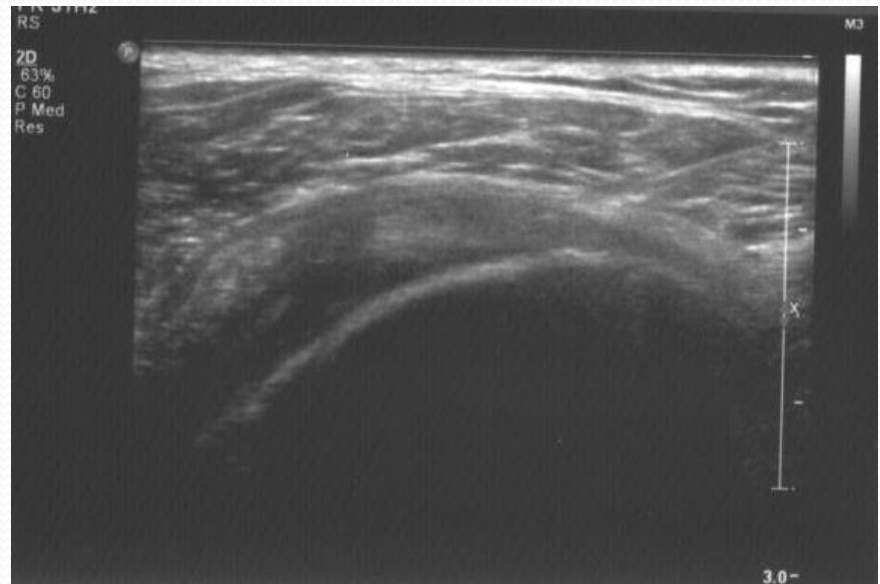


Technique - Aseptic/Sterile?

- General advice in literature varies
- In reality practice varies - historical
- Personally use aseptic technique:
 - Chlorhexidine skin prep-prefilled applicators
 - Sterile trolley
 - No probe cover
 - Pre procedural wipe of probe with Tristell Duo.
 - Sterile gel

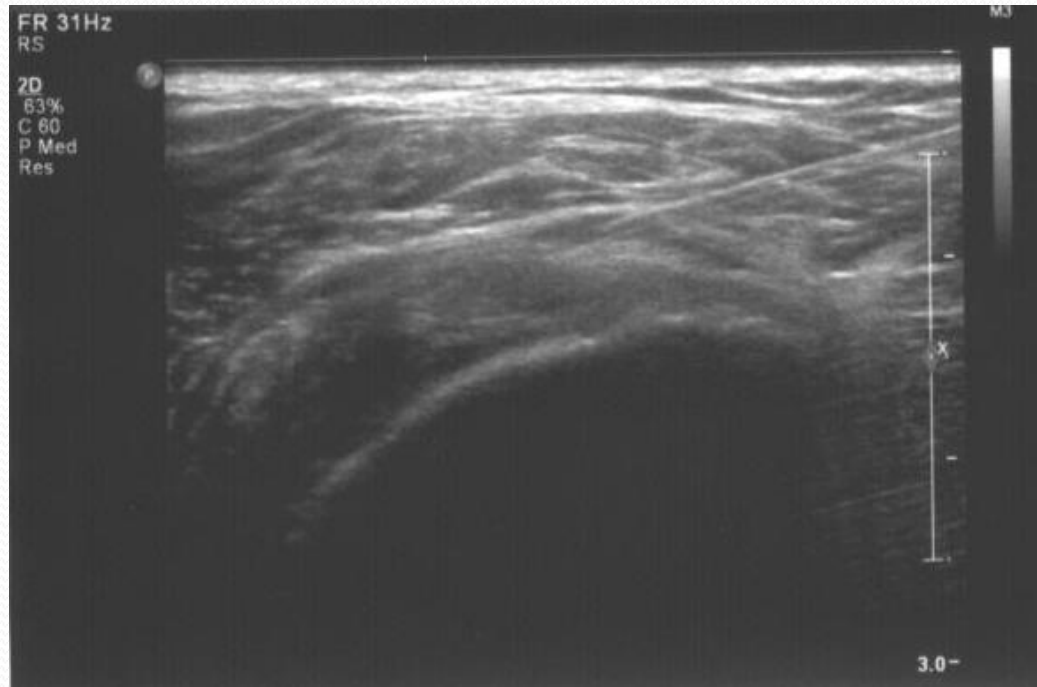
Delivery Technique Cont'd

- Prepare trolley- clean field. Administer up to 2ml Lidocaine subcutaneously with 21g x40mm length green needle.
- Wait - once patient relaxed, advance needle toward bursa.



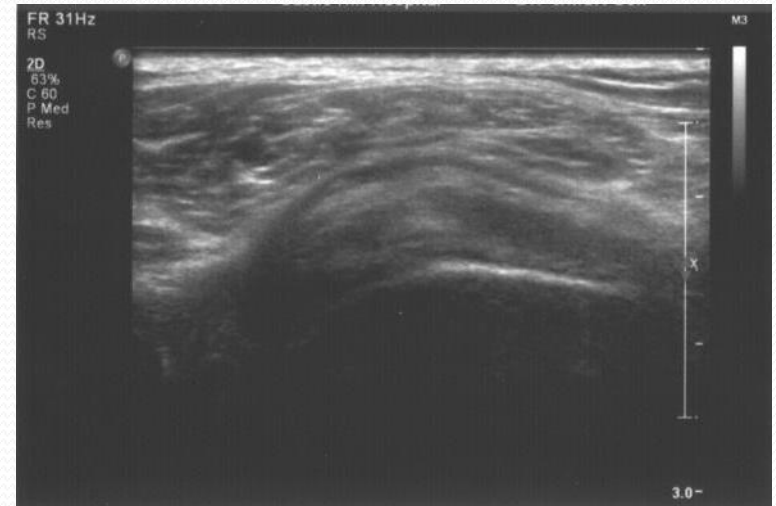
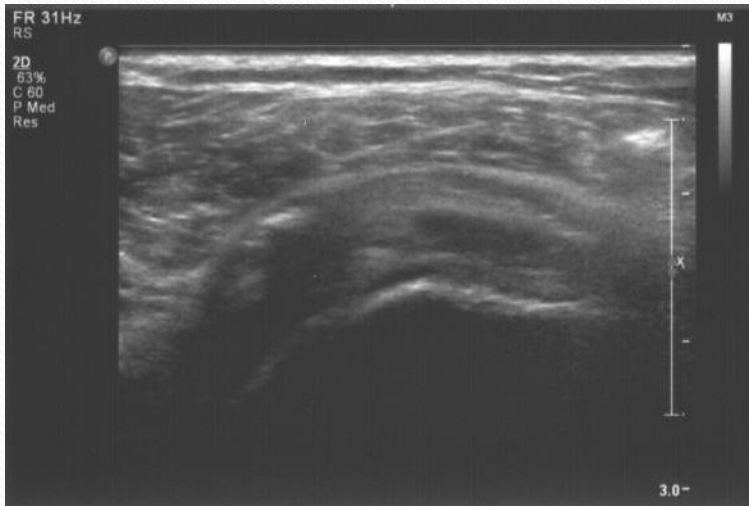
Delivery Technique Cont'd

- Once in bursa, inject another 1ml Lidocaine to confirm position:



Delivery Technique Cont'd

- Disconnect Lidocaine syringe and attach syringe of Kenalog, then Bupivacaine Hydrochloride
- Scan again-bursa should be expanded.



Drugs

DRUGS USED

- Lidocaine 1%
 - Subcutaneous infiltration. 3-5ml
- Bupivacaine Hydrochloride 0.5%
 - Pain relief for up to 6 hours. 1 ml
- Triamcinolone Acetonide 40mg (Kenalog)



Exclusion Criteria

- Local or systemic infection
- Documented hypersensitivity to steroids/local anaesthetic or any of their excipients
- Pregnancy
- Local unhealed fracture

Caution Used

- Diabetics - blood sugar levels
- Bleeding disorders - take advice from clinicians treating disorder and ensure any special arrangements are in place before injecting.
- Anti-coagulation therapy :
 - Warfarin-INR of 3 or less day previous to injection.
 - Apixaban/Rivaroxaban/Dabigatran/Edoxaban-longest half life is 12 hours so exclude dose the night before injection and morning of injection

Informed Consent

- Patient information leaflet sent out with the appointment.

INFORMATION FOR PATIENTS RECEIVING A STEROID INJECTION

Great Staff – Great Care – Great Future

INTRODUCTION

This leaflet has been produced to give you general information about your procedure. Most of your questions should have been answered by this leaflet. It is not intended to replace the discussion between you and your doctor, but may act as a starting point for discussion. If after reading it you have any concerns or require further explanation, please discuss this with a member of the healthcare team who has been caring for you.

WHY AM I HAVING THIS INJECTION?

Steroid injections can be a good way of giving pain relief when the tissue is inflamed or suffering from wear and tear.

WHAT IS IN THE INJECTION?

It contains local anaesthetic and corticosteroid:

- Corticosteroids have an anti-inflammatory effect
- Local anaesthetic is used to give a temporary numbing effect to make the procedure easier for you. The numbness may remain for up to six hours after the injection, to help with pain relief

WHAT IF I AM TAKING BLOOD THINNING MEDICATION?

IF YOU ARE ON WARFARIN:

If your INR (International Normalised Ratio – a laboratory test measure of blood coagulation) level is always reliably below 3

then all you need to do is to get your INR level checked the day before the appointment with us and bring along your INR record so we can confirm your results.

If your INR level sits at 3 or above, please ring our secretary on (01482) 622046 **as soon as you get this letter** as you will need special instructions before you come for your injection.

IF YOU ARE TAKING ANY OTHER BLOOD THINNING MEDICATION:

Please ring our secretary on (01482) 622046 at least 2 days before your appointment for advice about what you need to do.

Also, please ring our secretary on (01482) 622046 if any of the following apply:

- You are pregnant
- You are epileptic
- You are on antibiotics at the time of the scan

WHAT SHOULD I EXPECT FOLLOWING MY INJECTION?

It can take several days before any improvement is noticeable. During this time you may experience an increase in pain in the injected area as the tissues can be irritated. This should only last for 48 hours.

DO I NEED TO DO ANYTHING AFTER MY INJECTION?

- To give the injection the most successful chance of working we recommend that you rest the region that has been injected for 24 hours.
- Look out for any obvious sign of infection in the injected region and if you suspect one, report it immediately to your GP.

Informed Consent

- The following are still discussed with the patient prior to injection being performed and chance for any questions given.
- Nature of condition
- Details of treatment
- Nature of drugs
- Possible side effects
- Likely benefits
- Planned aftercare

PATIENT ID:

Radiology Safety Checklist

Procedure: (Including Site, Side and Level)

1: Sign In	Yes	No, N/A	Comments
Does the patient have a known allergy?			
Have risk factors for bleeding been checked?			
Have risk factors for renal failure been checked?			
Have 3 out of 4 safety indicators been checked? (Request form, Prior Imaging, Patient, Notes/EPR) 'No' can only be ticked in life or limb emergency or OP USS			
Prophylactic antibiotics given?			
Has side specific marking been undertaken? This does not apply to certain named interventional procedures.			

2: Procedural Pause	Yes	No	Comments
Have all team members introduced themselves by name and role?			
Team have confirmed patient's name and procedure, including site, side and level?			
Has the patient confirmed consent? If no please share reason with the team.			
Are essential devices/equipment available?			
Is there critical information the team needs to be aware of ?			

3: Sign Out	Yes	No N/A	Comments
Have the name and side of the procedure been recorded?			
Have all implanted devices been recorded?			
Have the specimens been labelled?			
Have post-procedural care and instructions been agreed?			
If the patient is on Metformin has this been stopped?			
Has the procedure been booked in correctly?			

Comments:

Responsible Practitioner:

Signature:

Date:

The "Responsible Practitioner" is the individual undertaking/leading the procedure

Team Member:

Signature:

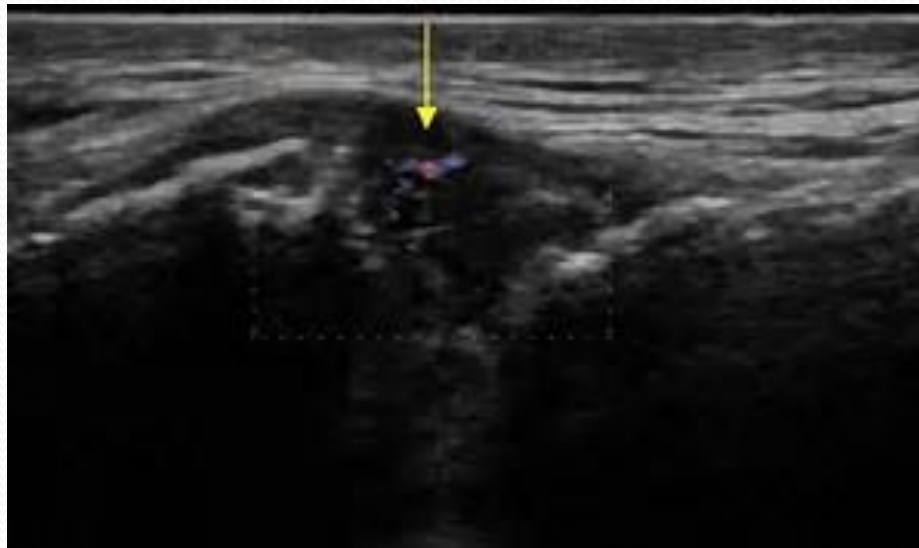
Date:

Aftercare

- Retain in department for 10 mins.
- Describe symptoms of local infection and advise the patient to see GP if they occur.
- Warn about post-injection tissue flare.
- Advise relative rest for 24 hours.

Acromio-clavicular Joint injection

- Performed for pain relief in the presence of arthropathy of the joint-sometimes done as diagnostic measure.



Delivery Technique

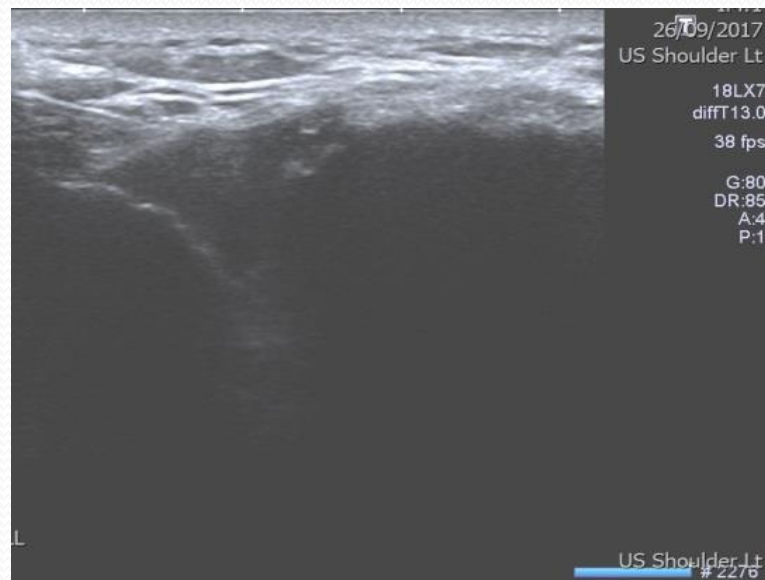
- Mark up –patient seated facing away from operator.
- Prepare trolley- Clean field
- Inject local anaesthetic- orange needle 25g /16mm length -1ml Lidocaine 1%



Delivery Technique

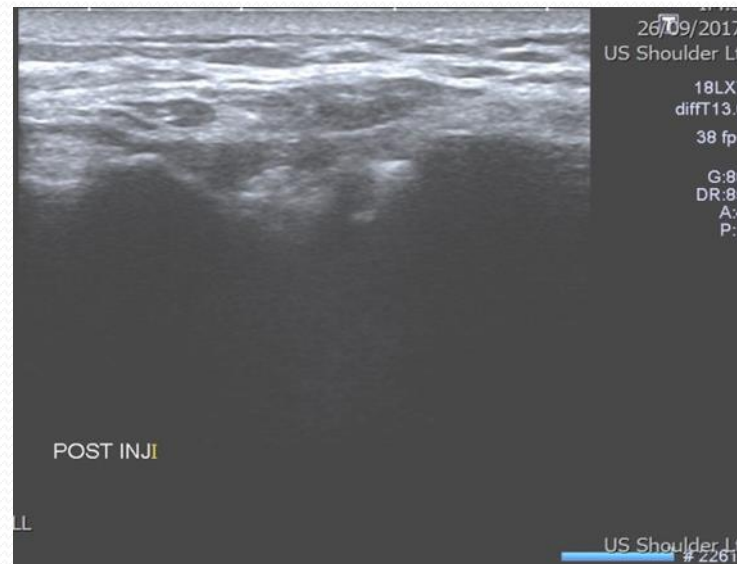


- One hand to scan, one to advance the needle. Insert green 21g /40mm length needle-visualise the needle from the point of skin puncture to when it reaches the target.



Delivery Technique

- When in the joint, inject 20mg Kenalog and 0.5ml Bupivacaine Hydrochloride– easy to have needle at favourable angle as superficial structure- no problem with needle visualisation



Drugs

DRUGS USED

- Lidocaine 1%
 - 1ml subcutaneous infiltration .
- Bupivacaine Hydrochloride 0.5%
 - 0.5ml- pain relief for up to 6 hours.
- Triamcinolone Acetonide (Kenalog)
 - 20mg (small joint)

Other considerations

- Same aseptic technique, informed consent, exclusion criteria and cautions apply as for subacromial bursal injection.

Long Head of Biceps tendon sheath injection

- Biceps tendon disease can be divided into tendinopathy and tenosynovitis. The latter refers to an inflamed tendon sheath and is more responsive to non-operative management including steroid injection. However, tendinopathy is more recalcitrant to conservative therapy.(Peng P 2013)

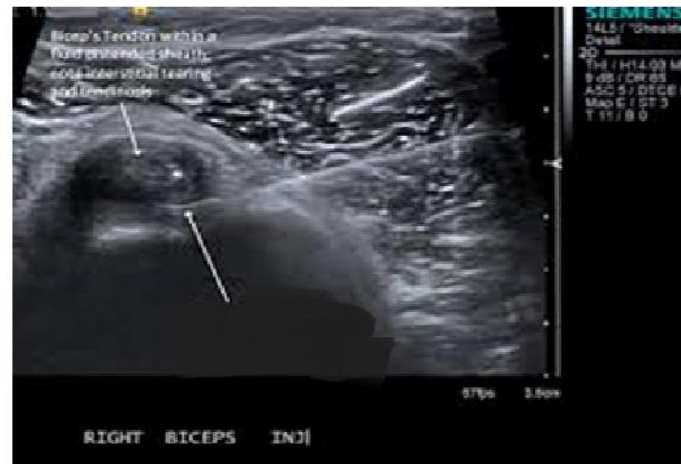
Long Head of Biceps tendon sheath injection delivery technique

- Mark up- patient is supine
- Prepare trolley –clean field
- Administer 1ml Lidocaine 1% subcutaneously via orange 25g/16mm needle.



Long Head of Biceps tendon sheath injection delivery technique

- One hand to scan, one to advance the needle. Insert green 21g /40mm length needle- visualise the needle from the point of skin puncture to when it reaches the target.



Drugs

DRUGS USED

- Lidocaine 1%
 - Subcutaneous infiltration. 1ml
- Bupivacaine Hydrochloride 0.5%
 - Pain relief for up to 6 hours. 1 ml
- Triamcinolone Acetonide 40mg (Kenalog)

Other considerations

- Same aseptic technique, informed consent, exclusion criteria and cautions apply as for subacromial bursal injection.

Glenohumeral joint injection

- Used in the conservative management of osteoarthritis and adhesive capsulitis.
- While the use of corticosteroids in the conservative management of osteoarthritis and adhesive capsulitis is widespread, its basis rests on limited evidence.

Glenohumeral joint injection

- Gross et al 2013- performed a comprehensive review of the available literature on glenohumeral injections to help clarify the current evidence-based practice and identify deficits in our understanding.
- There is little scientific support in the literature for the use of intra-articular corticosteroid injections to treat glenohumeral arthritis. The use of intra-articular corticosteroids for adhesive capsulitis has inconsistent patient-oriented evidence but better literature support than for glenohumeral arthritis.

Glenohumeral joint injection

- Hydrodilatation of the joint capsule in treatment of adhesive capsulitis gaining in popularity- has been shown in some studies to give good results (Yoong P 2015)
- Harpal S (2015) A systematic review of current treatments for adhesive capsulitis reviews the evidence base behind physiotherapy, both oral and intra articular steroid, hydrodilatation, manipulation under anaesthesia and arthroscopic capsular release. Most efficacious treatments are still largely unclear.

Glenohumeral joint injection

- Glenohumeral joint injection can be done using the anterior rotator interval approach or the posterior approach technique. Both techniques are generally well tolerated by the patients. The posterior approach avoids the potential risk of accidental puncture or injection into the axillary neurovascular structures.

Glenohumeral joint injection

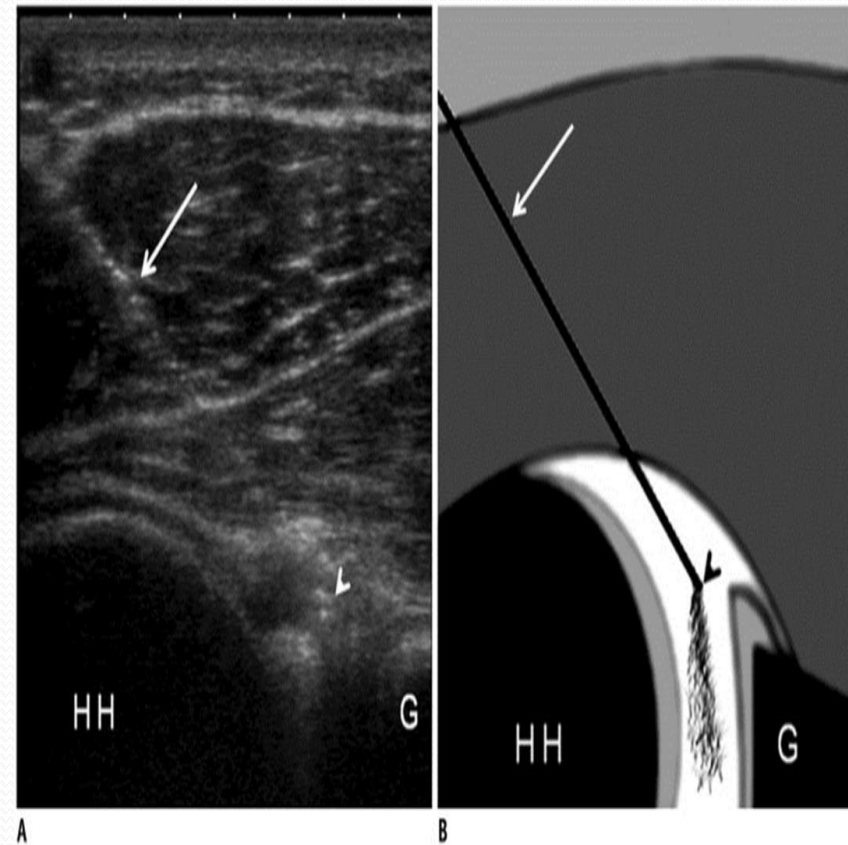
- For the posterior approach, the patient is placed in either the sitting or lateral decubitus position with the ipsilateral hand placed on the contralateral shoulder. A linear probe of frequency 6-13 MHz is usually used unless the patient is of very high body mass index or strong muscular build. The key structures to identify are humeral head, labrum, infraspinatus muscle, and joint capsule.

(Peng P et al)



Glenohumeral joint injection

The target for the posterior approach is between the free edge of labrum and the cartilage of humeral head underneath the capsule.



(Peng P et al)

Drugs/other considerations

- Quantity of drugs used varies in literature as does preference for needle choices- personal preference
- Aseptic/ sterile technique.

Aspiration

Diagnostic:

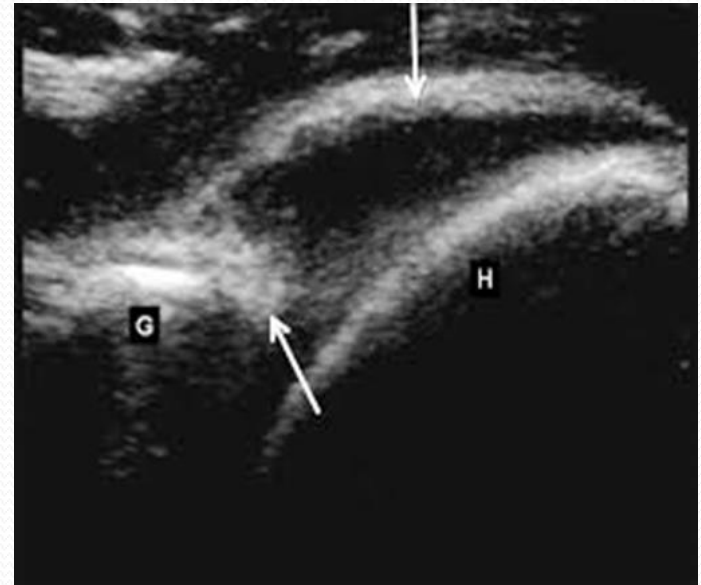
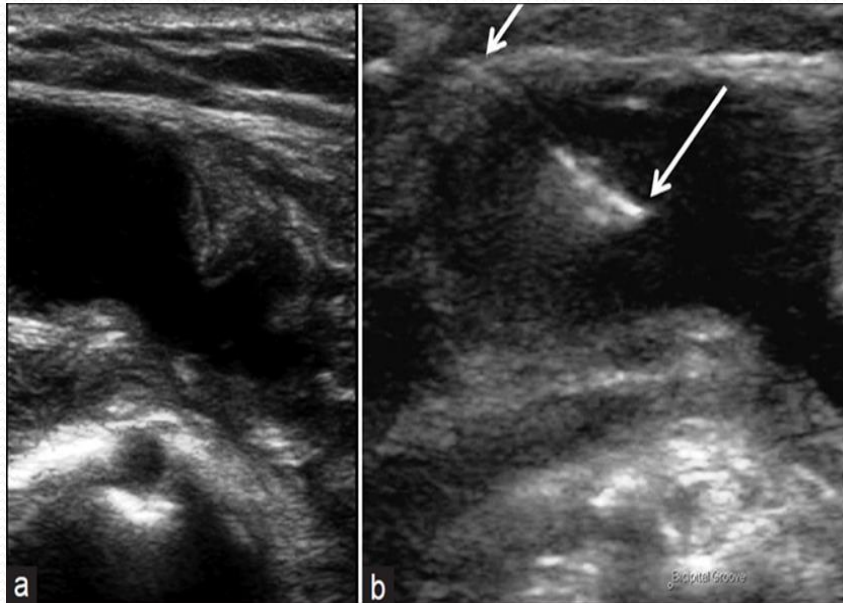
- Joint effusion of unknown origin
- Suspected septic arthritis
- Crystal arthritis e.g gout
- Chronic arthritis – inflammatory/noninflammatory

Therapeutic:

- Reduction of intraarticular pressure e.g remove exudate from a septic joint
- Relieve pain in a swollen joint.

Aspiration

- Same essential technique as a glenohumeral or subacromial bursal injection but instead of injecting, aspiration is performed. If being performed therapeutically, once all fluid has been aspirated, you may inject steroid/ local anaesthetic into the joint /bursa to assist with pain relief.

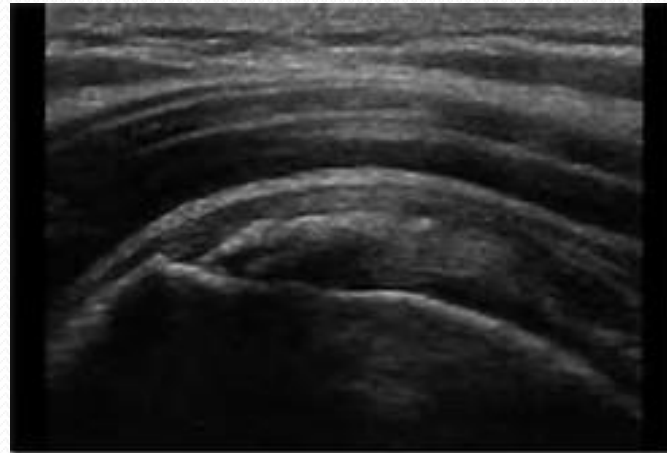


Lavage for Calcific Tendinopathy

- Lavage therapy is an established technique for the treatment of calcific tendinopathy of the rotator cuff. It has been shown to be much more effective than steroid injections, with over 70% improvement in pain (de Witte et al 2013)



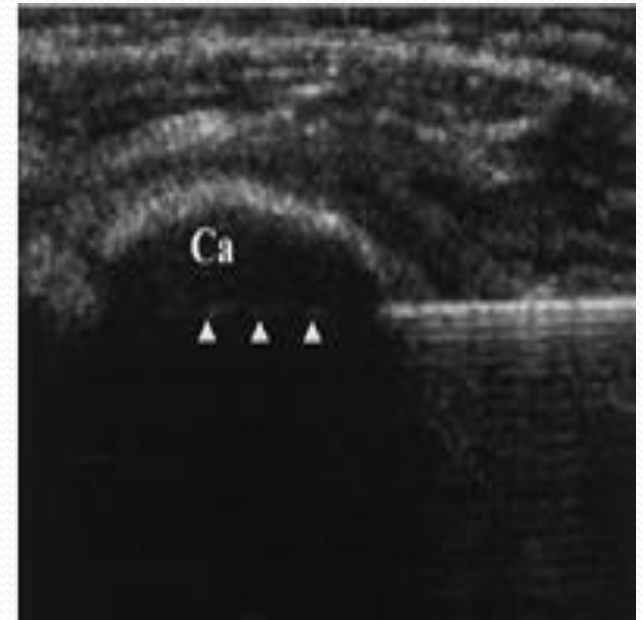
(Form-allreview.rhcloud.com)



(Ultrasoundcases.info)

Lavage for Calcific Tendinopathy

- Patient semi- reclined in a supine position- arm behind the back. The skin is sterilized and local anaesthetic is given- 25g /16mm orange needle- Lidocaine 1% 1ml.
- Under ultrasound control , the needle (18gauge 40mm) is guided into the calcification . The needle is directed as cranially as possible to allow gravity to assist with aspiration of the calcific debris.



(Funk L)

Lavage for Calcific Tendinopathy

Lavage works by repeated injection and aspiration of small volumes of fluid into the calcification to break it up from the inside. Once the needle tip is positioned within the calcific deposit, continuous small pumps of the syringe plunger are applied, causing breakdown of the calcification due to dissolution and pressure waves from the injected fluid. Between each pump, the build up of backpressure pushes fluid and calcific debris back into the syringe without the operator needing to actively aspirate.

Periodically check the syringe for calcific debris and switch syringes if there is build up.



(Funk L)

Lavage for Calcific Tendinopathy

- Rather than attempt to fenestrate the calcification, the needle tip is buried in the centre of the calcific deposit with a single pass, which allows for greater build up of internal pressure from the pulsatile injection resulting in improved probability of disrupting the calcific deposit (Blaichman J et al 2010)

Lavage for Calcific Tendinopathy



Ultrasoundcases.info

The deposit has been disrupted from the inside with an “exploded” appearance and hypoechoic fluid (white asterisk) now in its centre. It is not necessary to aspirate all the calcium, as disrupting the deposit will incite an inflammatory reaction that can results in resorption of most remaining calcium. Following the lavage inject a mixture of steroid and local anesthetic into the subacromial bursa to decrease symptoms from bursitis incited by the procedure.

Reporting

- It is important to document that an ultrasound guided injection has been performed.

‘Following subcutaneous infiltration of 3 ml Lidocaine 1%, 40 mg Kenalog and 1 ml Bupivacaine Hydrochloride were injected into the subacromial bursa under ultrasound control. No immediate complications. Procedure performed as per PGD. Procedure was explained to the patient, including potential for and symptoms of infection. Verbal consent obtained.’

- Log batch numbers, expiry dates and quantities of drugs used.

Clinical Governance

- Patient Group Directive:
 - Allows practitioner to administer doses of medication, without prescription, according to details held in the document- very specific.
- Detailed Clinical Guidelines:
 - Written following advice from local orthopaedic surgeons, based on how they prefer patients to be managed re injection therapy.
 - Facilitates standardisation of practice.

Clinical Governance

- Regular peer review
- Annual competency review by MSK radiologist.

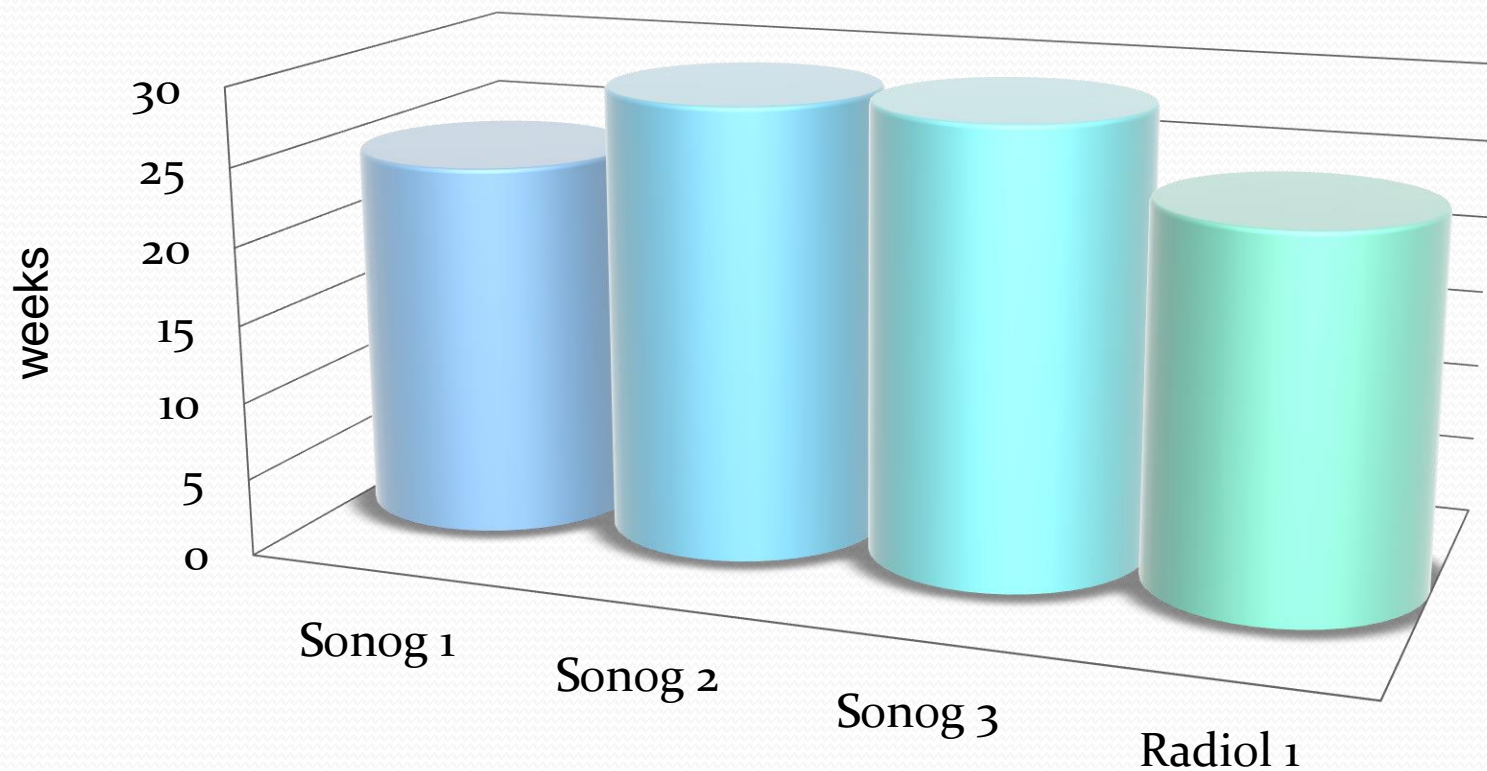
Pain Relief Audit

Imperative:

- Visual analogue scale (VAS) for pain prior to and post procedure
- Longevity of pain relief
- Any complications
- Positive results in relation to the VAS and longevity of pain relief, indicates acceptable technique AND statistics to share with subsequent patients, many of whom are keen to know how successful the injection is likely to be and how long the pain relief may last. Conversely, poor results may highlight an issue with technique.
- Complications are usually minimal, but it is again useful to have statistics regarding any complications that may have arisen. If the complication rate is minimal it provides reassurance to both the operator and patients.

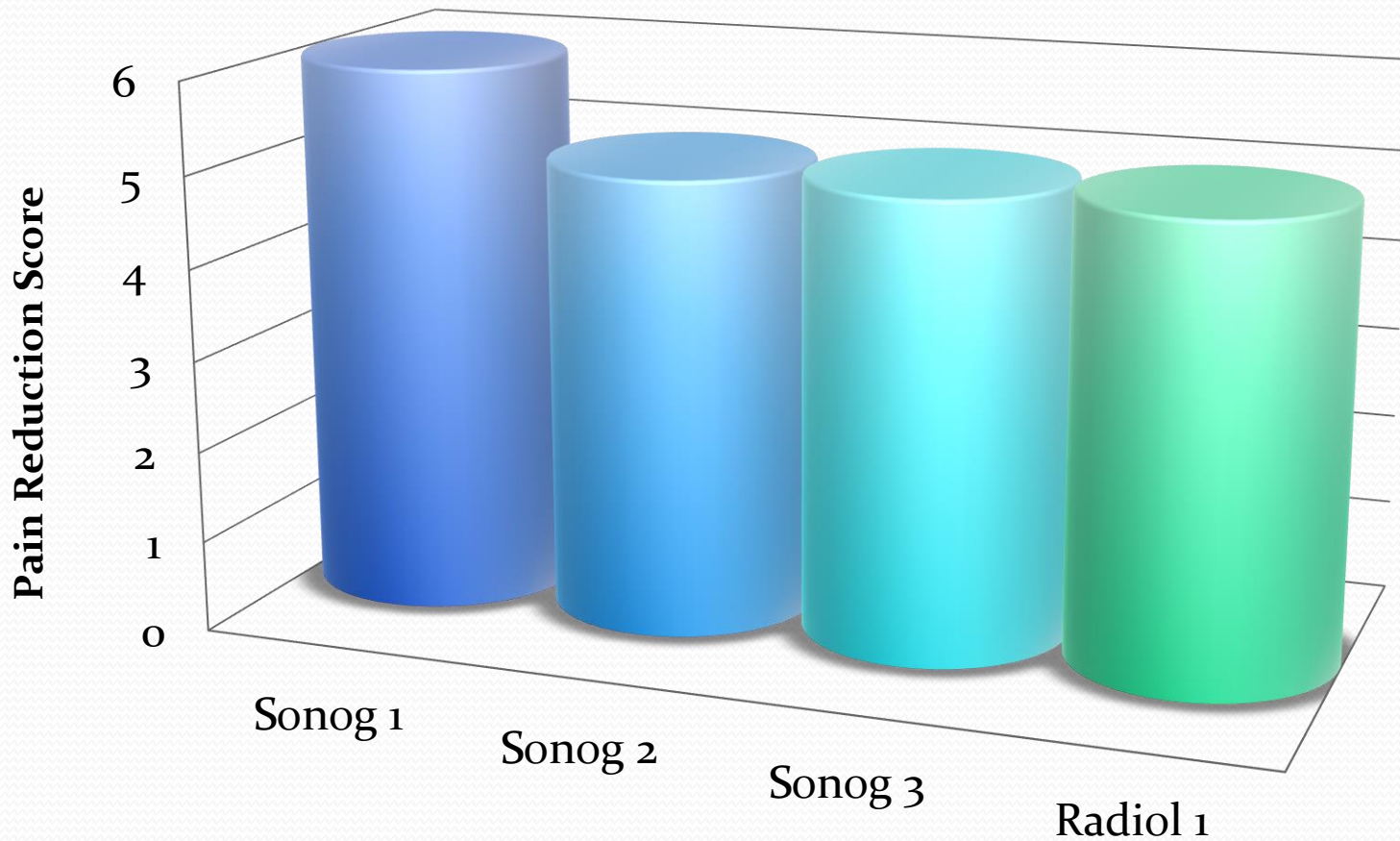
The Statistics

Average Relief (Zero Benefit Data Omitted)



The Statistics

Post Procedural Pain Relief



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Rating: (o ratings) This article has not been rated yet [*ASRA News, Volume 13, Issue 2, pp 9-12 \(May 2013\).*](#)

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Thank you