Does percutaneous cuff augmentation improve pain and shoulder function in rotator cuff disease?

Dr Arockia Doss MBBSインド, MRCP(UK) FRCCRLon FRANZCR
Image Guided Therapy Clinic®, Medlins, Western Australia, 6009

Introduction

Rotator cuff disease (RCD) is a complex disorder that presents as painful shoulder dysfunction from a combination of tendon degeneration, repetitive overuse and subacromial encroachment [Barr, 2004]. Some patients present from painful RCD despite physical therapy, medications, corticosteroids and injections. In patients who suffer recalcitrant pain despite such therapy or in those who refuse those options, an alternative treatment has been made possible by using autologous blood derived growth factors secreted from alpha granules in platelets and cytokines secreted by white cells [El-Sharawy, 2007]. A favourable pro-inflammatory healing environment is thought to provide a regenerative repair option. However, results thus far are conflicting [Cianci, Ris, 2013]. In addition, learnt pain may be lasting and these patients may not always be symptomatic [Reilly, 2006]. The aim of this study was to assess the safety and efficacy of using autologous blood derived growth factors directly into the symptomatic portion of rotator cuff tendons in RCD.

Materials and Methods:

Background: Standard clinical management of RCD at our tertiary referral centre was intuitive and included the following: 1) differentiating a symptomatic from an asymptomatic cuff; 2) percutaneous image guided intra-tenon needle tenotomy of the pain generating cuff with simultaneous injection of blood derived autologous growth factors. This was referred to as percutaneous cuff augmentation (PCA). 3) Post PCA immobilisation for 5-7 days in a sling was followed by exercises to remould the healing cuff.

Patient population & Procedures: This is a follow up observational retrospective study in consecutive patients, over a twelve month period. Patients who had failed physiotherapy, prior subacromial corticosteroid injection, refused corticosteroid injection or surgery were referred by their general practitioner to an outpatient interventional radiology (IR) clinic for management of RCD using image guided percutaneous regenerative techniques. These patients chose to undertake PCA. Pre and post procedural assessment included a detailed history, shoulder examination and shoulder function scores by the treating radiologist at IR clinic.

Statistical methods: Size of treatment effect (Cohen’s ‘d’) pre and post PCA was obtained by dividing the difference of the mean American Shoulder Elbow Surgeon Score (ASES), modified Constant and Pain scores by the respective standard deviation. P-value was set at 0.01 and a two tailed Student’s T test was used [1]. Coefficient of determination (r²) for linear correlation (r²) of patient age, size of lesions, imaging grade of RCD with pre and post treatment ASES, Constant and Pain scores were calculated using Pearson Correlation Coefficient [Socia Statistics internet tool]. Confidence intervals for a normal population were computed using the sample size, mean and standard deviation [Daniel Sharp interntool]. Minimal clinically important difference (MCID) from previous studies of rotator cuff surgery were used as cut off scores by the respective standard deviation. P value was set at 0.01 and a two tailed Student’s T test was used [2].

RESULTS: Out of 36 patients treated consecutively, 14 patients were lost to follow up. Data was available for 22 patients for twelve months. Out of twenty two patients, 10 patients had prior failed corticosteroid injection, 3 patients had prior failed arthroscopic surgery. Painful lesion size included the findings at PCA and the largest lesion dimension was range 4.0-7cm, mean 15.4mm, median 15.8mm. 50-60mm 90%. Two 50% lesions and 90% lesions were from anterior cuffs. Pain size 20-30% active/20-25% at rest. On the contrary, seven tears (31.8%) shown on prior imaging were not treated as they were deemed asymptomatic. 16% of patients both asymptomatic and treatment lesions were not shown on diagnostic imaging. Morphological findings from imaging reports do not differentiate between an asymptomatic degenerative cuff and a pain generating symptomatic cuff in RCD. The existence of incidental asymptomatic lesions in those with shoulder pain has been described in a prior study of asymptomatic and symptomatic infraspinatus, that showed a higher prevalence of tears in those with shoulder pain than the percentage of age related incidental lesions in cadavers [Reilly, 2005]. Therefore many cuff tears seen in patients with shoulder pain are not pain generating [Reilly, 2006]. In older individuals there is a higher prevalence of rotator cuff tendon tears that cause no pain or reduction in activities of daily living [Sibhim, 2004].

We performed a dermal augmentation of the cuff to exclude a pain generating lesion. In the present study, a strong linear inverse correlation between pain scores and ASES shoulder function before and after PCA was observed. It appears that pain as an entity is less in important role in RCD. Clinical radiological correlation to pinpoint the pain generating portion of the cuff seems to have played an important role in significant statistical and clinical improvements in ASES, Constant and Pain scores following PCA.

Reduced intraarticular reactivity of the rotator cuff muscle and capsule at follow up MRI (Figure 1a,b) is the result of an anti-inflammatory effect, presumably due to dexam regimen of inflammation gene expression [Andra, 2010]. Follow up MRI also showed restoration of fluidic tendon appearance suggesting a regenerative effect (Figure 1b). Reduction in inflammation improves pain and allows better range of motion and graded rehabilitation. This in turn enables mechanical restoration— mechanical activity that promotes structural change [Khan, 2010]. Mechanotransduction via a combination of range of motion and strengthening exercises was thought to improve tendon remodulation. Thus, a combination of anti-inflammatory and regenerative effect from intratendon delivery of growth factors followed by mechanotransduction from rehabilitation is hypothesised to restore tendon tissue structure, improve tendon tolerance, reduce tissue fatigue and account for the augmentation effect.

In this study there was a lack of correlation between patient age, number of tendons involved, size of tears against pain and shoulder function. More interestingly, contrary to prevalent expectations, tear size did not correlate with pain or shoulder function and suggest that there were no infections of injection, shoulder surgery or hospital related outcomes post PCA.

Conclusion:

1. PCA appears safe and effective in RCD if asymptomatic and symptomatic cuff lesions are differentiated.

2. In about a third of patients prior imaging showed asymptomatic cuff tears.

3. In another third of patients, prior imaging did not show treatment lesions.

4. In nearly one in five patients, diagnostic imaging failed to document a symptom generating lesion of the cuff, and instead documented asymptomatic lesions.

References


Figure 1a: MRI pre PCA STIR coronal image TR 3000.0ms TE 80.0ms shows reduced hyperintensity of the supraspinatus, infraspinatus, subscapularis muscles due to degenerative disease: a randomized controlled trial. Clin Rehabil. 2013 Feb;27(2):113-22. PubMed PMID: 22940353.

Figure 1b: MRI pre PCA STIR coronal image TR 3000.0ms TE 80.0ms shows reduced oedema of the infraspinatus, subscapularis muscles due to degenerative disease: a randomized controlled trial. Clin Rehabil. 2013 Feb;27(2):113-22. PubMed PMID: 22940353.

Figure 1c: MRI 11 months post PCA, STIR coronal image TR 3000.0ms TE 80.0ms shows reduced inflammation and some cuff thickening. Figure 1d: Axial T2W image shows low signal of a healed subscapularis tear in a lesion that was not shown on prior imaging. Figure 1e: MRI 11 months post PCA, STIR coronal image TR 3000.0ms TE 80.0ms shows reduced oedema of the infraspinatus, subscapularis muscles due to degenerative disease: a randomized controlled trial. Clin Rehabil. 2013 Feb;27(2):113-22. PubMed PMID: 22940353.

Figure 1f: MRI 11 months post PCA, STIR coronal image TR 3000.0ms TE 80.0ms shows reduced inflammation and some cuff thickening.