



Review

Current knowledge on evidence-based shockwave treatments for shoulder pathology

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HIGHLIGHTS

- We present the current knowledge on shockwave treatments for shoulder pathology.
- ESWT is an efficient tool for the treatment of rotator cuff calcifications.
- The clinical efficacy of ESWT in non-calcific tendinopathies is controversial.
- Promising results have been reported on other shoulder pathologies.

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ABSTRACT

Shoulder pain is one of the most common musculoskeletal pathologies. Treatment by ESWT (extracorporeal shockwave therapy) has emerged as an alternative when conservative treatment fails in rotator cuff calcific tendinopathy, prior to invasive procedures. The clinical efficacy of ESWT in non-calcific tendinopathy remains controversial. The good results in the treatment of rotator cuff calcifications, have led to indications of ESWT being expanded to other shoulder pathologies. We review the current state of indications and evidence based practice.

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1. Introduction

Shoulder pain is one of the most common musculoskeletal pathologies. Its prevalence in the general population ranges between 4 and 26%, according to age and the existence of associated risk factor [1]. In approximately 75% of cases, symptoms originate in the subacromial space [1] but can also be a referred pain from various conditions such as cervical spine, abdominal viscera, lung apex and even accompanying myocardial ischemia. Therefore, it is essential to not just treat the symptoms of “shoulder pain” but establish a precise diagnosis to indicate the appropriate treatment.

We will analyze the main indications for ESWT in the field of

shoulder pathology and present the evidence in the literature.

A. Shoulder tendinopathy

1.1. Rotator cuff (rc) calcific tendinopathy

Rotator Cuff (RC) calcifications are a relatively common disease of unknown cause, characterized by the presence of calcium hydroxyapatite crystal deposition in tendons that can be multifocal. Over a varied period of time, it can evolve into spontaneous resolution and eventual repair of the compromised tissue.

The most common site of this calcium deposit is at the supraspinatus tendon [2] (80%), followed by infraspinatus (15%), teres minor and subscapularis tendon in approximately 5%. Diagnosis is reached through clinical, radiology, with ultrasound being the most effective, sensitive and inexpensive; and magnetic resonance

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imaging (MRI) to complete the study and rule out associated pathologies.

Although the natural history can evolve to spontaneous resolution, the cycle can stagnate at any stage. Therapeutic approach depends on the intensity of symptoms, developmental stage and response to previous treatments.

The initial treatment of choice is conservative, typically including rest, analgesics, nonsteroidal anti-inflammatory drugs, rehabilitation and corticosteroid injections, with favorable results in 90–99% of cases, considering surgery as an exceptional indication [2–4]. De Palma [5], however, clarifies that in many cases this initial improvement deteriorates and the patient becomes a chronic carrier similar to patients showing subacromial impingement symptoms.

Gschwend [6], states that invasive procedures would be indicated when three conditions are met: symptomatic progression; constant and intractable pain and/or failure of conservative treatment. In this situation one can opt for surgical treatment, either open or arthroscopic and more recently injection under ultrasound guidance is being also performed, and still under investigation.

1.1.1. Extracorporeal shockwave therapy (ESWT) in rotator cuff calcific tendinopathy

Treatment by ESWT has emerged as an alternative when conservative treatment fails and prior to invasive procedures (Figs. 1–3). Its use in shoulder tendinopathy is mentioned in the literature from about 20 years ago [7] and its efficacy and low morbidity is well-demonstrated [2,7–12].

The application of ESWT is usually considered when conservative treatment has failed for 6 months [3,11], especially in deposits in stages I and II Gärtner (stage III calcifications have high chances of disappearing spontaneously).

The mechanism of calcium absorption post ESWT has not been fully elucidated. Brañes, Guiloff et al. [13] were able to demonstrate the presence of neo-lymphangiogenesis phenomena from biopsies taken from RC repair surgery, previously treated with ESWT (one session) with 2 different types, electrohydraulic and electromagnetic, a similar dose (0.33 and 0.35 mJ/mm² of energy, respectively). Their hypothesis was that new lymphangiogenesis is related to improved calcium reabsorption observed after ESWT treatments.

Clinical-radiological dissociation is not uncommon, and

although the persistence of calcification may be associated with a good clinical outcome, complete resorption, statistically has better results than the partial disappearance or persistence of calcification.

According to ESWT efficacy, in a study over 30 months, Wang [12] prospectively compared two groups: the ESWT group had 90.9% excellent or good results, 3% regular and 6.1% bad; and complete disappearance of calcification in 57.6% of patients. The ESWT-placebo group showed 16.7% regular results, 83.3% poor results, and disappearance of calcification in 16.7% of these.

Rompe [11] compared the results of surgery with ESWT, finding no difference in outcomes at one year, with improvement in patients treated with ESWT at two years.

Gerdesmeyer [2] in a randomized clinical trial of 144 patients reported better results in patients treated with ESWT, both low energy and high energy, compared to placebo. Hearnden [7] in a prospective, single blinded, randomised control trial of 20 patients found a statistically significant result with shockwaves over the placebo group but reported that half of the patients failed to achieve a satisfactory outcome and required surgical excision. Hsu [8] in a prospective study with a control group achieved 87.9% good and excellent results with high energy.

Rebuzzi [3] compared the results of arthroscopic surgery treatment with low-energy ESWT in homogeneous calcification of the supraspinatus. Even as the rate of complete disappearance of most calcification associated with surgery (86.35%) compared with ESWT (58.33%) at two years, there were no significant differences in clinical and functional assessment according to the UCLA scale.

The authors conclude that they prefer using ESWT as the first therapeutic option because it is a non-invasive method.

The absence of a dense calcification rim around the RC is a good predictor of treatment outcome with ESWT [11,14]. It has also been postulated that the results of ESWT are higher in non-homogenous deposits while some authors expect better results from surgery in homogeneous deposits [11].

The usual methods to target the shockwaves on the calcification are: topographic anatomy landmarks, feedback from the patient maximum tenderness using palpation, ultrasound and radiology. ESWT application on calcification by fluoroscopy is more effective than if performed on the distal area of the supraspinatus tendón [15]. While the use of ultrasound has been advised [16,17],



Fig. 1. A. 42 years old female. Gärtner type 1 calcification. B. After just one session with an electrohydraulic focused device (2000 pulses, 0.32 mJ/mm²) the patient underwent an acute and painful resorption. X-ray was taken 1 month after the session showing complete resorption.

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