

# Radial Shockwave Therapy Combined with Low Level Laser Therapy in a CrossFit Athlete with Chronic Shoulder Impingement Syndrome: A Case Report

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## ABSTRACT

**Objective:** The purpose of this case study is to discuss a positive outcome following the use of radial shockwave therapy and cold laser in the treatment of a CrossFit athlete with chronic right shoulder impingement.

**Clinical Features:** A 31-year-old male presented to an outpatient chiropractic teaching clinic with chronic right shoulder pain. The pain was described as dull and radiating into the right arm. Radiographs revealed mild osteoarthritis of the right acromioclavicular joint. There was a decrease of active abduction and internal rotation range of motion due to pain, with point tenderness over the acromioclavicular joint. The Mumford procedure was the recommended medical treatment.

**Intervention and Outcome:** The patient received chiropractic adjustments and mechanical massage therapy to his right shoulder region with slight improvement. Shockwave therapy combined with cold laser was introduced at reevaluation. The patient was advised to rest and/or limit his workout regime. The patient was compliant with the recommended treatment intervals, but did not limit his activity as directed. The patient was treated at a frequency of one or two days per week over the course of 16 weeks for a total of 28 visits, during which time there was a 50% reduction of pain, improved range of motion, and

improved ability to perform his activities of daily living. Outcome assessment tool scores showed 63% improvement.

**Conclusion:** This case report suggests that in this patient, Shockwave therapy in combination with cold laser therapy and manipulative/manual therapies may result in improvement of pain and functional limitations due to chronic shoulder impingement and may offer a conservative option for similar patients.

## INTRODUCTION

Shoulder pain is frequently encountered in primary care and is a common presentation seen in a chiropractor's office.<sup>1,2</sup> Through a systemic review it was found that the estimated prevalence of shoulder complaints is about 7-34% in the general population, with shoulder impingement syndrome (SIS) accounting for 44-65% of all shoulder complaints.<sup>1</sup> SIS is typically seen in patients over age 40 and is a progressive painful syndrome resulting from entrapment of soft tissue most commonly in the subacromial space when the arm is elevated.<sup>3,4</sup> Shoulder impingement is classified into four types (**Table 1**) depending on where the soft tissue entrapment occurs within the shoulder joint with further classification as external or internal impingement.<sup>1,3</sup>

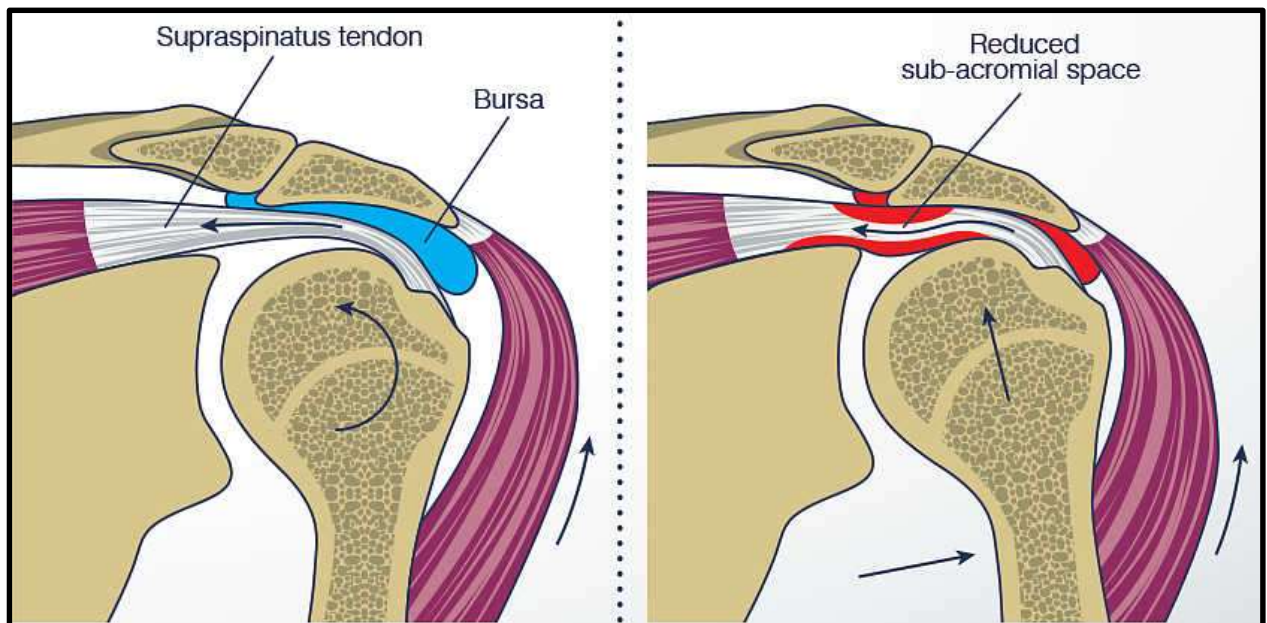
Table 1

Types of Shoulder Impingement
1. Subacromial impingement – External
2. Anterosuperior inner impingement – Internal
3. Posterosuperior inner impingement – Internal
4. Subcoracoid impingement

External impingement, also known as subacromial impingement/shoulder impingement, includes pathology or structures that encroach upon the subacromial space resulting in narrowing of the space which contains the subacromial bursa and the rotator cuff.<sup>1,3</sup> Internal impingement refers to any pathology that affects structures within the glenohumeral joint space.<sup>1</sup> The subacromial impingement is the most common form of impingement seen in practice, and is composed of primary and secondary forms. The primary form is due to

structural changes that mechanically narrow the subacromial space while the secondary form is from a functional disturbance of centering of the humeral head within the glenoid fossa.<sup>3</sup>

Common symptoms reported by the patient include pain on elevating the arm (between 70° and 120°, commonly known as the ‘painful arc’), on forced movement above the head, and when lying on the affected side.<sup>3</sup> The pain is often described as being located over the lateral acromion and is frequently accompanied by radiation into the lateral upper arm area.<sup>4</sup> Other symptoms can include stiffness, loss of motion, weakness, and loss of arm function on the affected side.<sup>1,4</sup> This condition is generally diagnosed by history taking and examination with a diagnostic sensitivity of 90%.<sup>3</sup> Orthopedic tests commonly used to diagnose SIS are Hawkin’s Test, Neer’s Test, Empty Can Test, and a painful arc of motion. Plain radiographs may be useful initially for differential diagnosis and to exclude any arthritic changes or calcific tendonitis.<sup>3</sup>



(Searched free to share and use) espacio-subacromial-hombro-Efe-Salud.jpg (835×409) (almeriaisdifferent.com)

Treatment with good outcomes for SIS can be found through conservative and/or surgical methods with the goals of restoring joint function and eliminating pain.<sup>3</sup> Without known structural damage conservative therapies for SIS may include immobilization, NSAIDs, exercise, cortisone injections, ultrasound, manual therapy, therapeutic tape, heat, electrical muscle stimulation, acupuncture, low-level laser, and shockwave therapy.<sup>3,4,5</sup> If conservative care fails to provide significant improvement, surgical intervention may be considered as a treatment option. The most common shoulder surgery for shoulder impingement is arthroscopic subacromial decompression (ASD) with the goal of increasing the subacromial space.<sup>1,6</sup> However, in 2018 a clinical trial comparing the ASD surgery with diagnostic arthroscopy, a placebo surgery, found no clinically relevant benefit with the ASD surgery over the diagnostic arthroscopy even with the same post treatment protocols.<sup>6</sup> This

case report describes a patient with chronic shoulder impingement with disabling pain and the conservative treatment that allowed for a positive outcome.

## CASE PRESENTATION

A 31-year-old male presented to an outpatient chiropractic teaching clinic with chronic right shoulder pain. The patient is a veteran of the United States Marine Corps with a previous right shoulder injury 10 years ago while in military. The patient's current episode began approximately one year ago with no direct mechanism of injury but mentions it may have occurred after a kettlebell swing workout during his CrossFit training. His pain was worsening due to overuse from his CrossFit workouts in preparation for a competition. Prior to his appointment at the clinic the patient had been treated for this current flare up through a Veterans Affairs (VA) facility at which time he was reportedly diagnosed with shoulder impingement. He was referred to physical therapy which he reports did not help. A right shoulder radiographic study including AP and lateral views was performed revealing mild acromioclavicular joint osteoarthritis. The patient was recommended to have the Mumford Procedure performed on his right shoulder, which he declined and opted to try conservative chiropractic care. The Mumford Procedure is a surgical procedure, either open or arthroscopic, that is performed to remove the distal portion of the clavicle to reduce pain.<sup>7,8</sup>

During his initial examination, the patient described the pain as dull with occasional sharp radiating pain into the right proximal aspect of the arm at 6/10 with rest and 9/10 with activity on the Visual Analogue Scale (VAS). Pain was present throughout the day and would flare up with provocative activities that would last 1-2 hours, which caused him to decrease the frequency of his CrossFit workouts from 5x/week to 2x/week. Aggravating factors included lifting, reaching, performing housework chores, driving, exercising, and sleeping. He reported that he was able to sleep only approximately three hours per night due to pain. Heat, ice, rest, and prescribed medical marijuana alleviated his symptoms. Initial differential diagnosis included supraspinatus tendinopathy, rotator cuff tear, and subacromial bursitis.

The patient reported a history of significant trauma during his time in the military, at which time he suffered a shoulder injury and a traumatic brain injury (TBI) with post-concussion syndrome as a result of direct trauma to the facial and upper torso region from a tire explosion. Patient was at high risk for chronic pain and disability with complicating factors such as depression with past suicide attempts, post-traumatic stress disorder (PTSD), and a current smoker.

Vitals, visual inspection, palpation, upper extremity motor, sensory, and reflex function, and right shoulder orthopedic tests were performed at his initial examination. Inspection revealed a bony protuberance and swelling over the right acromioclavicular joint region, and pinpoint pain over the right acromioclavicular joint. Upper extremity neurologic evaluation revealed hypesthesia to light touch at C5-T1 levels on the right side. Dugas Test, Lift Off Test, Impingement Sign, Speed's Test, Empty Can Test, and Painful Arc reproduced the patient's familiar right shoulder symptomatology. Palpation findings revealed thoracic spine segmental dysfunction. The patient's Upper Extremity Functional Index (UEFI) score was 33/80 with a fair prognosis.

His initial treatment plan consisted of mechanical massage therapy with range of motion exercises, thoracic spine adjustments as needed, and cold laser therapy at a recommended frequency of one to two treatments weekly for eight weeks, with initiation of shockwave therapy at week six. Self-care instructions consisted of lifting restrictions at work, no overhead reaching, and no excessive CrossFit workouts.

After eight weeks of care, a re-examination was performed. The patient described his shoulder pain as “about the same” with better range of motion. He reported the pain as dull with occasional sharp radiating pain into the right proximal arm at 5/10 with rest and 8/10 with activity on the Visual Analogue Scale (VAS). Pain was constant throughout the day and would flare up with provoking activities that would last one to two hours. Aggravating factors included lifting, reaching, performing housework chores, driving, exercising, and sleeping. Heat, ice, rest, and prescribed medical marijuana alleviated his symptoms.

Re-examination consisted of vitals, visual inspection, palpation, upper extremity neurologic evaluation, right shoulder range of motion (ROM), and right shoulder orthopedic tests. Inspection revealed a bony protuberance over the right acromioclavicular joint region with observed swelling and pinpoint pain over the right acromioclavicular joint. There was hypesthesia at the C5-T1 levels on the right side. Passive range of motion revealed flexion, extension, external rotation, abduction, and adduction caused pain. Active range of motion revealed observed mildly decreased internal rotation with pain and moderately decreased abduction with pain. The following shoulder orthopedic tests were positive: Apley’s Scratch Test, Codman’s Drop Test, Dawbarn’s Test, Lift Off Test, Neer’s Test, O’Brien’s Test, and Painful Arc. Palpation findings revealed thoracic spine segmental dysfunction at levels T1, T2, and T6, right acromioclavicular (AC) joint, and right scapula dysfunction. The patient’s Upper Extremity Functional Index (UEFI) score was 32/80.

This case report focuses on the second course of treatment with a continued frequency of one to two times/week for eight weeks with a total of 17 treatments. Treatment included alternating cold laser therapy (MR4 LaserStim) and radial shockwave therapy (The Miracle Wave), along with spinal and right shoulder adjustments as needed. Due to the patient’s CrossFit training alternating therapies were applied according to his training schedule. Shockwave therapy was not performed on days the patient trained because this therapy fatigued his shoulder. Patient self-care instructions were to ice the shoulder, perform appropriate warm up and cool down with physical activities, and he was advised to stop CrossFit training. The patient was non-compliant with the recommendation to discontinue his training.

At re-examination, vitals, visual inspection, palpation, upper extremity neurologic evaluation, right shoulder ROM, and right shoulder orthopedic tests were performed again. The bony protuberance over the right AC joint region was still observed with mild tenderness over the subacromial bursa. Motor, sensory, and reflex function was found to be within normal limits. Passive range of motion of flexion, extension, external rotation, abduction, and adduction were performed with no pain. Active range of motion with internal rotation remained the same but with no pain, and abduction range of motion moderately improved. The patient was able to abduct his shoulder from an initial observed range of motion of approximately 90° to 150° with little pain. Only the Dawbarn’s Test was positive.

He had a 63% improvement with the UEFI and a 50% improvement on the VAS. The patient self-discharged and was lost to care.

## DISCUSSION

Shoulder pain is a very common complaint seen in clinical practice with shoulder impingement being one of the most common causes of this pain.<sup>5</sup> Being a multiaxial joint capable of complex movements, it should not come as a surprise that shoulder complaints are the third most common musculoskeletal complaint in primary care.<sup>2,9</sup> Multimodal conservative treatment should be the first step and can yield very good results.<sup>3</sup> However, there is currently no standard treatment protocol for shoulder pain.

For this patient, conservative therapy provided significant relief and improved function to the extent that the patient could avoid surgery. When comparing the first and second treatment plans, the second demonstrated that combining the low-level laser and radial shockwave therapies improved and expedited patient results. Treatment showed improvement even with hindering factors such as continued CrossFit training, psychosocial concerns, and his daily smoking. A major strength of this case was that the patient was compliant with the recommended frequency of treatment and had a positive outlook.

Shockwave therapy research is expanding each year, but research seems to be limited with regard to the combination treatment of shockwave and low-level laser therapy, and even less so specifically addressing SIS.

A meta-analysis performed in 2017 that evaluated the effectiveness of conservative interventions for shoulder impingement that included shockwave therapy and cold laser reported that these therapies were superior to sham for pain, but showed non-significant results or consisted of low level evidence.<sup>10</sup> These therapies were not performed in combination but as stand-alone therapies.<sup>10</sup> A study in 2020 evaluating functional results after using shockwave therapy on patients with shoulder injuries had similar results to this current case report. That study showed improvement with pain, range of motion, and functional scores after the use of shockwave therapy.<sup>11</sup> A review of current knowledge on evidence-based shockwave treatments for shoulder pathology concluded there is evidence to support the use of shockwave therapy.<sup>12</sup>

On the contrary, a systematic literature review examining the effectiveness of conservative physical therapy treatments for subacromial shoulder pain indicated that the evidence does not support the effectiveness of shockwave therapy.<sup>13</sup> Much of the research reviewed states there is not enough evidence to form a consensus for the use of shockwave therapy for shoulder injuries, or research with significant results consisted of low level evidence.<sup>10,13,14,15</sup> Higher quality evidence is also needed for research evaluating the efficacy of cold laser and the development of optimal treatment protocols.<sup>16,17</sup>

In conclusion, no consensus has been formed with regard to efficacy or protocols for either shockwave or low-level laser therapies for the treatment of shoulder impingement. Further research with higher quality evidence is needed to provide this information.

## CONCLUSION

This case shows that this particular individual experienced improved outcomes such as improved shoulder range of motion, decreased pain, and improved function with activities of daily living after receiving the recommended treatment. The positive outcome with this case establishes that shockwave therapy combined with cold laser therapy may be a viable option for treating chronic shoulder impingement.

## LIMITATIONS

This case report does have a limitation due to the use of other treatments such as thoracic spine and right acromioclavicular joint and/or scapula adjustments. This case report was focused on the second course of care with a total of 17 treatments where thoracic spine adjustments, right shoulder adjustments cold laser, and shockwave were used at varying intervals. The combined treatments can make it difficult to definitively conclude that any one treatment or combination of treatment modalities were responsible for the positive outcome in this patient. Furthermore, due to the fact that this is a single-patient case report, the results of this report may not be generalizable to other individuals presenting with similar conditions.

## CONSENT

Written informed consent was obtained from the patient for publication of this case report. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

## COMPETING INTERESTS

The author declares no competing interests.

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