

Extracorporeal Shockwave Therapy for Acromion Pseudarthrosis: A Case Report

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Abstract

Fracture of acromion is uncommon because of its unique anatomical structure and location. Usually it heals by itself using conservative therapy intervention, and a subject's shoulder can get back to its functional performance without surgical approach. However, rare cases may not recover due to pseudarthrosis taking place, surgical avoidance plus using noninvasive tools to manage acromion pseudarthrosis with the application of extracorporeal shockwave therapy at medium to high intensity is the author's motivation to report this condition. Likewise, to our knowledge, there is no published literature using extracorporeal shockwave therapy specific to acromion. A case of 36 old male, active, and alert had been referred to the physical therapy outpatient clinic for high density extracorporeal shockwave therapy to manage the acromion pseudarthrosis after going on range of motion and strengthening rehabilitation program for seven months. After having six sessions of extracorporeal shockwave therapy, the acromion nonunion fracture unified, with complete patient recovery. The pain was stopped. The range of motion became full, with the restoration of the shoulder's functional abilities.

Keywords

Pseudarthrosis; Extracorporeal shockwave; Acromion

Introduction

The acromion is a large bony projection on the superior end of the scapula. Acromion fractures are rare injuries. They constitute 8%–16% of scapula fractures^[1,2]. Recently, they were observed to occur at the rate of 5%–6.9% as the complication of reverse shoulder arthroplasty^[3]. Acromion fractures may occur as a result of shoulder trauma and overuse injuries. Acromion fractures may occur with glenoid process, scapula or clavicle distal fractures and disruption of superior shoulder suspensory complex^[4]. There is no widely accepted treatment algorithm and fixation method of acromion fractures^[5]. We aim to present a case report that contributes to the diagnosis and

treatment of acromion fracture that does not healed by itself by applying noninvasive conservative treatment rather than by surgery. Predisposing factors, such as smoking, diabetes, vascular disease, or other comorbidities, or injury factors, such as high-energy trauma or significant soft tissue loss^[6]. Systematic reviews, examining the effect of smoking on non-union, have demonstrated that smoking is associated with the prolonged time to union, and smokers are at twice the risk of experiencing fracture non-union, especially in open fracture^[7,8]. The stimulation of bony union by means of various physical modalities^[9] has been widely used in clinical practice. Extracorporeal shockwave therapy (ESWT) offers the most promise^[10]. It is based on

the rationale that high speed sound causes lithotripsy. It was first used to crush kidney stones in the 1980s^[11]. In 1986, Valchanou and Michailov^[12] performed the first treatment of pseudarthrosis with ESWT. Their idea was to destroy the eburnated edges of the pseudarthrosis and, at the same time, keep the periosteum intact. That way, by preserving the osteogenic tissue in the periosteum, rapid vascularization and consolidation of the bone can be achieved. Meanwhile, an increased cortical volume and higher trabecular connectivity were observed after stimulation with ESWT, and that again, may lead to the improved biomechanics of the bone^[13,14]. Clinical applications followed successfully the experimental studies that showed osteoblast stimulation to osteogenesis^[15,16]. We present our personal experience in the treatment of acromion nonunion fracture with ESWT. The evolution of the results obtained over the past three decades provides important data regarding the indications, protocols of the therapy, prognostic factors, percentages of the successes, and future possible applications.

Case Presentation

A 36 years old male patient was driven to the emergency unit in our hospital due to being hit by a vehicle, when he was crossing the road while running. The patient was alert, oriented, and psychologically intact. He was a non-smoker without any medication dependencies at that time. He and his family did not have any genetic or inherited diseases. He had no neurovascular deficits. Upon radiographic examination, he had a left distal radius fracture with right acromion fracture that usually does not need any sort of fixation and heals by itself. The left arm completely had a cast with arm sling for 45 days. When the patient condition was stable, he was released from the hospital and was scheduled to have a routine appointment in an orthopedic outpatient clinic. In December 2017, the patient was referred to our physical therapy department after his cast was removed for the left wrist range of motion (ROM) exercises and the right shoulder ROM with shoulder girdle strengthening exercises. The patient was assigned to one of my colleagues for 6 visits. From his records, he was complaining of muscular spasmodic pain in both arm muscles, with pain at left wrist fracture site. He was treated by ultrasound therapy on his left wrist fracture to recall inflammatory mediators and fibroblast production to relieve pain and to enhance the healing process. In the meantime, the patient underwent a left wrist and a right shoulder ROM and strengthening exercises to boost the patient's

upper limbs function. After three weeks from his last visit of physical therapy, the patient still had residual pain that was fixed on his upper right shoulder as 8/10 visual analogue scale (VAS). In addition to the feeling of weakness in his right arm with pain while lifting objects, the patient recalled that, when his son was laying down on his right arm, the pain became worse on the same site as the acromion site, which referred down to his arm. Upon radiographic examination, the finding referred to the nonunion of the acromion fracture (Fig. 1). On July 23, 2018, the patient was referred to our physical therapy department again for a focused extracorporeal shockwave therapy (Fig. 2). The patient complained of pain, weakness, and discomfort feeling in his right shoulder and arm. The pain was at 8/10 VAS, especially with lifting. Upon physical examination, the right shoulder muscle power scored (3+). The ROM was full with no neurovascular deficits. The only complaint

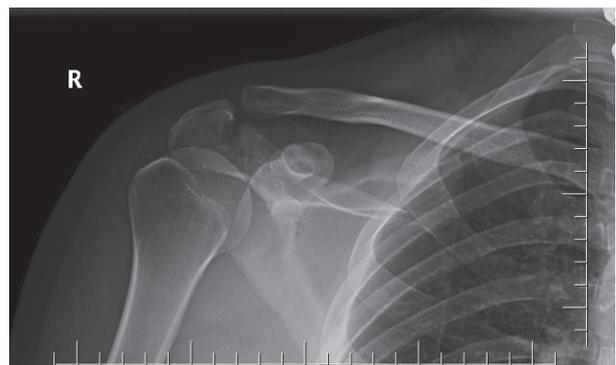


Figure 1. The acromion nonunion fracture or pseudarthrosis seen by X-rays.



Figure 2. The contact point between the focused extracorporeal shockwave therapy head and the acromion pseudoarthrosis to enhance vascularization and consolidation with osteoblast stimulation to osteogenesis.

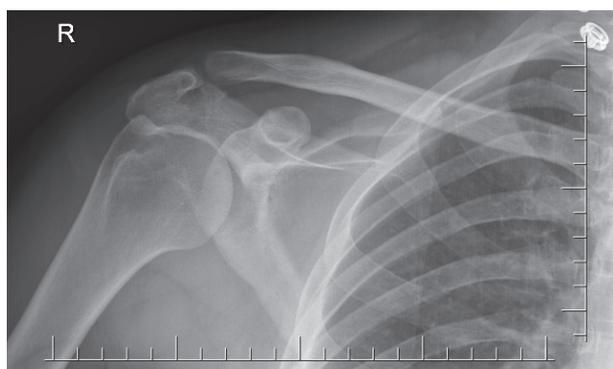


Figure 3. The healed acromion pseudarthrosis that shows gapping reduction and callus formation.

was the pain at the acromion site plus the shoulder muscle weakness. According to Morreti *et al.*,^[9]. "In the treatment of the pseudarthrosis, we used a range of energy flow density between 0.22 and 1.10 mJ/mm² as tolerated, and we applied 4,000 pulses using an electromagnetic device (Minilith® SL1, STORZ MEDICAL AG, Tägerwilten, Switzerland)". Based on this and after taking clear verbal and written patient consent, the first visit ESWT parameters were 0.45 mJ/mm², which is a high density energy (focused) and 1,500 pulses with 4 Hz frequency. The patient was released from the clinic with instructions to not carry heavy weights and to not perform free activity exercises of the shoulder. The second visit, the energy flow density was raised to 0.55 mJ/mm² and the pulses to 2,200 to enhance more vascularization and consolidation in fracture site. The patient's pain was less on the second visit, and was reduced from 7/10 VAS to 5/10 in the acromion site. Also, the patient was able to use his arm in his basic life activities without disabling pain. From the third to sixth sessions, our parameters were 0.55 mJ/mm² with 2500 pulses and 3 Hz frequency. The patient's pain subsided to 2/10, then to 1/10 VAS during the sixth session. The patient was significantly cured and released from that stressing pain. Patient had his own routine follow up appointment with his orthopedic physician, who had ordered X-ray imaging in order to inspect how much the callus formation had been built and how much the fracture gap had resolved. Amazingly, the pseudarthrosis was totally healed (Fig. 3), with no gapping recorded, which ranked ESWT as the number one intervention to treat delayed nonunion fractures and pseudarthrosis.

Discussion

Focused ESWT intervention is a number one treatment option to heal pseudarthrosis. The case presentation had been a successful progression of outcomes by applying ESWT to treat acromion pseudarthrosis, a condition that usually heals spontaneously without any interventions. However; some cases might not be due to mechanical and physiological limitations. Based on the case presentation, the patient's chronological referrals are reasonable and evidence-based after engaging the patient in ROM and strengthening exercises for about two months, then discharged him to return back to his normal life activities. He came back with a right shoulder pain in the acromion site that had been nonunion for about six months since the initial physical therapy visit. We applied ESWT for six visits with great pseudarthrosis healing, and the patient's recovery had good outcomes. We aimed to activate vascularization and consolidation processes that enhanced pseudarthrosis unity. The pain subsided from 8/10 to 0/10. The functional performance of the patient's right shoulder went normally back without relapse or recurrent incidence after a routine follow up appointment within two months from his discharge date. Also, there had been no complications reported with the use of ESWT, which ranks ESWT as the best noninvasive approach in managing nonunion pseudarthrosis fractures.

Conclusion

Focused ESWT is definitely the first choice treatment to acromion pseudarthrosis, which activates vascularization and consolidation, enforcing fracture healing, then returning back to active rehabilitation program, thereby allowing different patients to resume their usual lifestyle or sports activities.

Conflicts of Interest

The author has no conflict of interest.

Disclosure

The author did not receive any type of commercial support either in the form of compensation or other finances for this study. The author has no financial interest in any of the products devices, or drugs mentioned in this article.

Ethical Approval

Obtained.

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الموجات الصدمية لعلاج الكسور الغير ملتئمة

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قسم التأهيل والعلاج الطبيعي
مستشفى القطيف المركزي
القطيف - المملكة العربية السعودية

المستخلص. كسور Acromion غير شائعة بسبب تركيبها التشريحية الفريدة وموقعها، وعادةً ما تلتئم من تلقاء نفسها بتدخل العلاجات المحافظة وسيعود كتف الشخص إلى أدائه الوظيفي دون نهج جراحي؛ ومع ذلك، فإن حالات نادرة لن تتعافى بسبب حدوث تنكس الكاذب، والتجنب الجراحي بالإضافة إلى الأدوات غير الموسعة لإدارة المكورات العصبية الوخز بالابر مع تطبيق العلاج بالموجات الصدمية خارج الجسم من منخفض إلى متوسط الكثافة هو حافزي للإبلاغ عن هذه الحالة. بطريقة مماثلة؛ لم أصادف مؤلفات منشورة باستخدام علاج الموجات فوق الصوتية خارج الجسم لعلاج الأخرم على وجه التحديد. أُحيلت حالة تبلغ من العمر ٣٦ عامًا نشطًا في حالة تأهب إلى عيادة العيادات الخارجية للعلاج الطبيعي للعلاج من الموجات الصدمية خارج الجسم التي تدير المكورات العصبية الوخز بعد إجراء عملية جراحية مدمجة وتقوية إعادة التأهيل لمدة ٧ أشهر.