# Arthroscopic treatment of an unusual distal clavicle ostheochondroma causing rotator cuff impingement: case report and literature review

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## Abstract

Chronic shoulder impingement is one of the most common causes of shoulder pain. Intrinsic, extrinsic and secondary factors play a role in this syndrome; however the etiology of the pathology is still under debate. In rare cases, it can be caused by tumors, such as an osteochondroma. In the present study, a 49-year-old patient presented with shoulder pain for 6 months. Initially he underwent conservative treatment, without relief of symptoms. X-rays and MRI were then performed and showed the presence of an exostotic formation on the undersurface of the lateral third of the clavicle. The formation was arthroscopically removed. Histologic examination confirmed the diagnosis of osteochondroma. After surgery, the patient resumed fully activities with no symptoms within 3 months. At 1 year follow up, there are still no clinical or radiological signs of recurrence. This is, to our knowledge, the first case where an arthroscopic approach was used to remove an ostochondroma of the distal third of the clavicle.

## Introduction

Chronic shoulder impingement is one of the most common causes of shoulder pain. It was first described by Neer, in 1972, as a pathological reduction of the subacromial space, which can cause a degeneration of the structures contained within.[1] It accounts for 44% to 65% of all shoulder girdle disorders,[2,3] mainly occurring in overhead athletes and manual workers.[4] The etiology of this syndrome is still under debate, since various different factors may play a role. Ellman *et al*. classified these factors in intrinsic, extrinsic, and secondary.[5] Among intrinsic factors, the natural process of aging of rotator cuff tendons,[6] hypoxia, due to poor vascularity,[7] and damage with tensile or shear loads,[8,9] associated with overhead work and microtrauma, were found. On the other hand, extrinsic factors were linked to any morphological alterations, that causes a reduction in the subacromial space, and therefore compresses the supraspinatus tendon. Most common causes include: acromion morphology (especially Type III hooked described by Bigliani),[10] acromial angle and slope,[11] acromial tilt, anterior acromial spur (mainly due to coracoclavicular ligament ossification), and acromioclavicular joint osteophytes.[1] Other morphological alterations that may cause this mechanical conflict are prominence of the greater tuberosity, thickening of subacromial bursa or the presence of an os acromialis. Biomechanical factors, instead, underlie secondary impingement mechanisms: scapula-humeral dyskinesia, muscle performance deficits, pectoralis minor and posterior capsule stiffness, postural abnormalities.[12,13]

The aim of the present study was to describe a rare case of subacromial impingement, caused by an exostotic formation on the undersurface of the lateral third of the clavicle, which was treated arthroscopically.

## Case Report

F.S. was a 49-year-old male with a progressive worsening of right shoulder pain and limitation of range of motion for the last 6 months. The patient did not have any previous known pathologies or traumas related to the shoulder, nor was the patient involved in overhead activities for work or sport. He presented to our clinic in April 2019 with a diagnosis of subacromial impingement, asking for a second opinion. He already underwent multiple sessions of physical therapy for the last 3 months, together with a medical therapy based of NSAID drugs, with no benefit.

At the clinical evaluation, no atrophy, deformity or sign of scapula dyskinesia could be detected. Passive range of motion was complete, although he reported pain upon elevation of the arm at 90°. Active range of motion was limited by pain. Impingement tests (Neer and Hawkins) were positive. No strength deficit could be noticed. X- rays showed an exostotic formation on the undersurface of the lateral third of the clavicle (Figure 1). Magnetic resonance (MR) clarified that the osseous formation abraded supraspinatus muscle belly. A layer of fluid between the osseous projection and the rotator cuff was visualized. A thin rim of cartilage outlined the undersurface of the projection. The rotator cuff tendons were intact (Figure 2). Indication to an excisional biopsy was made. The procedure was performed arthroscopically. During surgery, no intra-articular pathology was found. In the subacromial space an abundant inflammatory bursitis was noticed. Rotator cuff tendons were intact. After bursectomy, the exostotic formation was found, consistently with the imaging, on the undersurface of the lateral third of the clavicle. It was arthroscopically resected to a level flush with the undersurface of the distal clavicle. After its removal, samples were sent for histology. Histologic examination confirmed the diagnosis of osteochondroma. After surgery, an immobilization sling was used for 7 days. Immediate passive range of motion was allowed. The patient resumed full activity, including sport, with no restriction or pain within 3 months after surgery.

Repeated postoperative imaging studies have revealed no recurrence at 6 and 12 months.

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## Discussion

Ostochondromas (OCs) account for 20-50% of all benign bony tumors, making it the most common among this class.[14] In most cases, the OC arises during childhood, with a male predominance, and 75% of patients are younger than 20 years of age. Both solitary and multiple OCs can be found, even though the former is much more common. Multiple OCs are typical of patients affected by Multiple Hereditary Exostosis (HME). The OC is a surface lesion, which can be either pedunculated or sessile, composed both of cortical and medullary bone. A pathognomonic feature is the presence of cortical and medullary continuity, together with a cartilaginous cap. It can develop from any bone undergoing an enchondral maturation, but it is more commonly found at the level of long bones, especially those around the knee. Also flat bones can be affected, mainly the ilium and scapula.[15]

Clavicular OCs are rare, making up 0.2-0.5% of all solitary OCs.[16] Only 11 cases of distal clavicle osteochondroma have been reported in the literature.[17-27] An open approach was usually used for the excision of the lesion. Of these, Galanapoulos *et al*,[22] Peidro *et al*,[18] Craig *et al*[20] and Fallon *et al*[21] coupled en bloc resection with a distal clavicle excision. Simonetti *et al*[27] tried an arthroscopic procedure, but, intraoperatively, due to the size of the lesion , decided to opt for an open surgery instead.

With the exception of two cases described by Alman *et al*,[26] where the patients, 6 and 7-year-old males, did not experience any pain, in the vast majority of studies, impingement symptoms and decreased ROM were the most likely findings, in line with a compression of the sovraspinatus tendon. Fallon *et al*.[21] highlighted not only compression, but also a full thickness rotator cuff tear.

A medial clavicular localization of OC was instead described by Al Qudah *et al*,[28] and Mallano *et al*,[29] nonetheless, both opted for an open procedure.

A painful symptomatology can be observed not only when the neoformation was found at the level of the clavicle, but also at the level of the scapula.[30-36] In fact, OCs have been found in this location in 3% to 4.6% of all cases.[37-39] The lesions arose from different areas, such as the acromion,[31-33,35,36] the coracoid, the superior part of the glonoid,[35] the costal surface near the superomedial angle of the scapula.[39] While Lopez Martin *et al*[30] and Hommadi *et al*[31] chose an open surgical treatment, Citlack *et al*[32] started with an arthroscopic approach, which had to be converted in mini-open, due to the size of the lesion. On the contrary, Lu *et al*[33] and Simon Thomas *et al*[34] used an arthroscopic procedure, avoiding the morbidity of an open resection. Main advantages of an arthroscopic approach are mainly related to avoidance of deltoid resection, decreased risk of infections,[33] together with an early functional recovery and cosmetic advantage.[38] In literature, just a few cases of shoulder OCs have been described. Although in most cases, the removal of the lesion was performed following an open approach, in this case study, instead, the lesion was completely removed arthroscopically, obtaining successful clinical results with no sign of recurrence at 1 year postop. The patient will be followed up in time to make sure to early diagnose an eventual recurrence of disease. Surgery in this case was mainly indicated due to failure of conservative treatments for impingement symptoms, rather than due to the risk of malignant transformation, which in this kind of tumor is low, of about 1% when the lesion is solitary.[14,40]

## Conclusions

In conclusion, taking into account the size of the lesion and surgeon's experience and preference, the arthroscopic approach can be considered safe, effective and a viable option compared to open surgery.

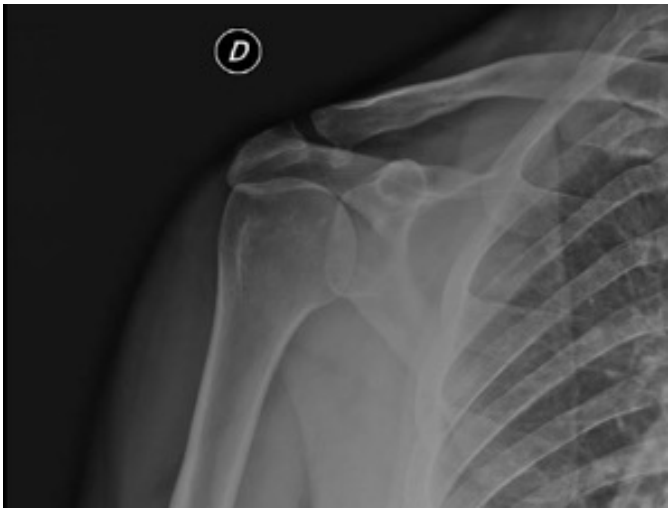


**Figure 1. X-rays, right shoulder antero-posterior view. An exostotic formation can be noticed on the undersurface of the lateral third of the clavicle.**

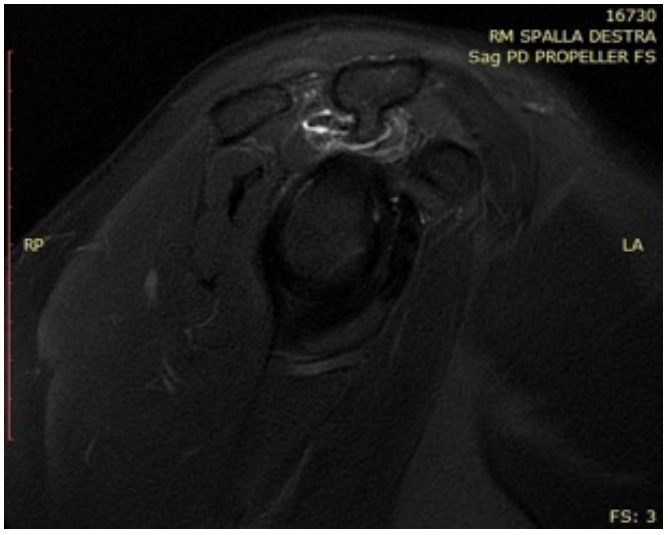


**Figure 2. Magnetic Resonance, right shoulder, sagittal view. A layer of fluid between the osseous projection and the rotator cuff can be visualized. A thin rim of cartilage outlined the undersurface of the projection.**

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