



## Subacromial osteochondroma and rotator cuff tear in a young adult with multiple osteochondromas



Milos Spasojevic, MD\*,  
 Samuel P. Mackenzie, MBChB, BSC (Med Sci) hon, FRCS (Tr & Orth),  
 Allan Young, MBBS, MSpMed, PhD, FRACS (Orth),  
 Benjamin Cass, MBBS, MS, FRACS (Orth), FAOrthA

Sydney Shoulder Research Institute, St Leonards, Australia

### ARTICLE INFO

#### Keywords:

Subacromial osteochondroma  
 Shoulder impingement syndrome  
 Rotator cuff tear

Level of evidence: Level IV; Case Report

We present a rare case of rotator cuff injury and biceps tendinitis due to multiple osteochondromas of the shoulder of a 20-year-old woman. The patient presented with longstanding atraumatic anterior shoulder pain and rotator cuff weakness. Magnetic resonance imaging (MRI) revealed multiple osteochondromas of the scapula with protuberances present on the body, underside of acromion and in the bicipital groove. Diagnostic arthroscopy demonstrated a severely narrowed subacromial space with bursal fraying of the supraspinatus tendon laterally and a musculotendinous tear medially. Arthroscopic subacromial osteotomy and mini-open bicipital groove osteoplasty successfully eliminated the patient's symptoms. Although true subacromial impingement is uncommon, particularly in this age category, persistent symptoms demand multiplanar imaging to rule out neoplastic causes of pain and functional deficit.

Osteochondromas are the most common benign musculoskeletal tumor and occur in adolescents and young adults.<sup>16</sup> Although most tumors remain asymptomatic and only require monitoring of cartilage cap growth as an indicator of rare malignant transformation, some grow in sensitive periarticular regions where they can disturb normal joint kinematics.<sup>1,7,14</sup> Symptoms vary from movement pain, local compression symptoms and joint angulation deformities to locking.<sup>11</sup> The most common location sites reported include the knee, proximal femur, and proximal humerus.<sup>5,16,17</sup>

Osteochondromas of the scapula are rare, and reports of symptomatic lesions are even more scarce.<sup>2,8,17</sup> In some cases, subacromial impingement has been an ongoing symptom requiring surgical intervention.<sup>6,13</sup> However, we found no reports of a scapular osteochondroma causing rotator cuff tear in young patients. We present a 20-year-old patient with 3 osteochondromas of the shoulder girdle causing subacromial impingement with a supraspinatus musculotendinous junction tear and biceps irritation.

### Case report

A 20-year-old woman presented with atraumatic shoulder pain particularly in overhead movements with associated clicking phenomena. The past medical history was unremarkable beyond a previous solitary osteochondroma of the wrist diagnosed in childhood; there was no personal or family history of hereditary multiple exostosis. Clinical examination revealed symmetrical posture, physiological scapular positioning, and full range of motion of the glenohumeral and scapulothoracic articulations. The patient complained of a classical painful arc 80 to 120°. Impingement provocation tests were positive, and in Hawkins test, a palpable click was felt inside the shoulder joint. Jobe's test was masked by pain and demonstrated 4/5 power, whereas the remaining rotator cuff examination revealed power comparable with the contralateral side. A small and tender mass was palpable in the bicipital groove, and biceps signs were positive. Plain radiographs were suggestive of a bony protuberance underneath arising from the acromion, but were otherwise unremarkable. MRI and computed tomography revealed an osteochondroma rising

Institutional review board approval was not required.

\*Corresponding author: Milos Spasojevic, MD, Sydney Shoulder Research Institute, Suite 201, 156 Pacific Highway, St Leonards 2065, Australia.

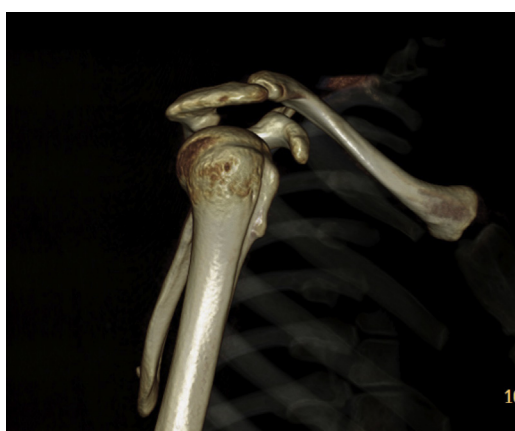
E-mail address: [milos.spasojevic.ortho@gmail.com](mailto:milos.spasojevic.ortho@gmail.com) (M. Spasojevic).

<https://doi.org/10.1016/j.xrrt.2021.09.008>

2666-6391/© 2021 The Authors. Published by Elsevier Inc. on behalf of American Shoulder & Elbow Surgeons. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



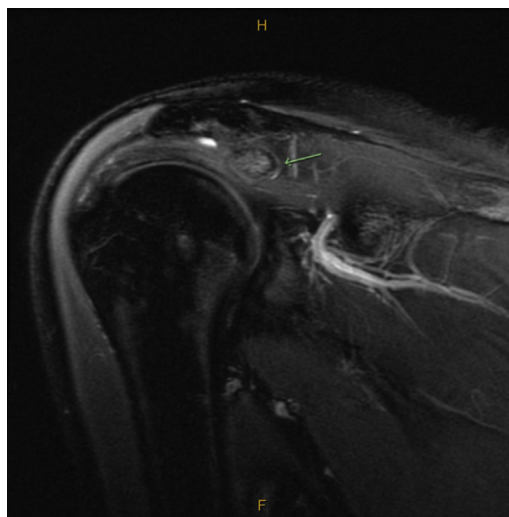
**Figure 1** 3D reconstruction computer tomography. 3D, three-dimensional.



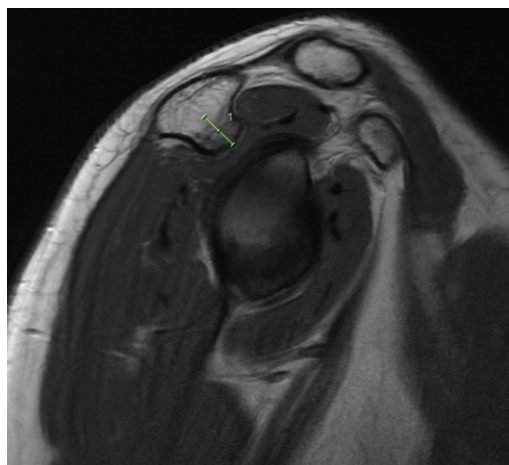
**Figure 2** 3D reconstruction computer tomography lateral. 3D, three-dimensional.

from the basi-acromion to meta-acromion junction displacing and compressing the supraspinatus muscle causing tendinosis (Figs. 1–4, Video 1). A second small osteochondroma arose from the medial edge of the bicipital groove to compress the long head of biceps. A third osteochondroma was seen arising on the inferior scapular pole (Fig. 5, Video 1).

Because of the clear correlation between the imaging and clinical features, the patient underwent arthroscopic shoulder examination. During surgery, compression of the supraspinatus tendon against the glenohumeral joint was confirmed from an intra-articular posterior viewing portal (Fig. 6, Video 1). Marked inflammation of the subacromial bursa was evident as was bursal-sided fraying of the supraspinatus tendon (Fig. 7, Video 1). Passing the shoulder through a range of rotation and abduction demonstrated impingement and extension of the bursal fraying into the musculotendinous junction of the supraspinatus and a resultant full-thickness longitudinal tear. A lateral subacromial viewing portal was created, and an osteotomy was performed via the posterior portal followed by burring of the posterolateral acromion undersurface (Figs. 8 and 9, Video 1). The decompression allowed for smooth tendon passage under the acromion (Figs. 10 and 11, Video 1). The medial position and longitudinal orientation of the tear meant the tear did not require repair. A mini-open delto-pectoral approach to the bicipital groove was then performed. The distal position of the osteochondroma allowed mobilization and retraction of the long head of biceps tendon with minimal dissection. The integrity of the transverse humeral ligament and sheath was maintained. The osteochondroma was carefully osteotomized to restore the distal medial bicipital groove.



**Figure 3** T2 parasagittal MRI right shoulder, the ← points to subacromial osteochondroma with visible impinging of supraspinatus onto the glenohumeral joint. MRI, magnetic resonance imaging.



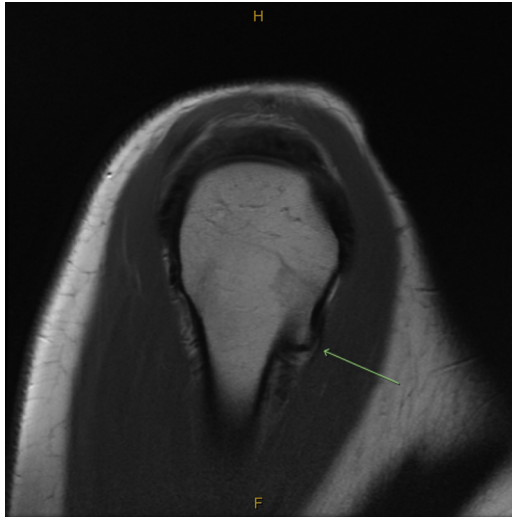
**Figure 4** T1 parasagittal MRI right shoulder, the green line measuring subacromial osteochondroma. MRI, magnetic resonance imaging.

The patient was provided a sling for comfort for one week, and active assisted shoulder physiotherapy was commenced immediately. The patient recovered full range of motion without impingement or groove pain. The third osteochondroma on the scapular body remained asymptomatic. Skeletal survey revealed an asymptomatic osteochondroma on the right fibula. With a total of 4 osteochondromas diagnosed, the patient was consulted for the possibility of multiple hereditary osteochondromatosis, further referral was recommended, and the decision for observation was made.

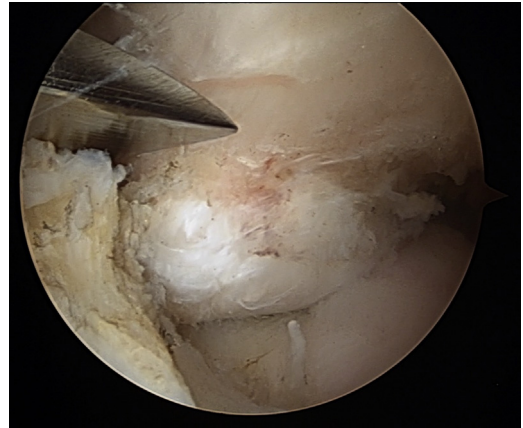
### Discussion

This is the first report of a rotator cuff tear due to subacromial osteochondroma in a young adult. Furthermore, our case demonstrates that these lesions may be underestimated in initial MRI and warrants early surgical arthroscopic intervention on a young population.

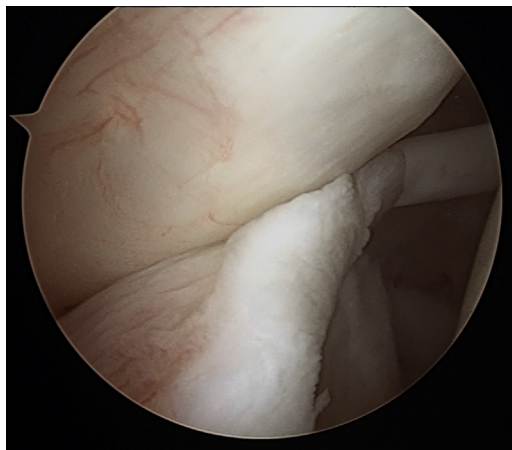
Subacromial impingement syndrome after osteochondromas in the subacromial space is very rare.<sup>15</sup> They have been described in several case reports with most tumor pedestals arising from the



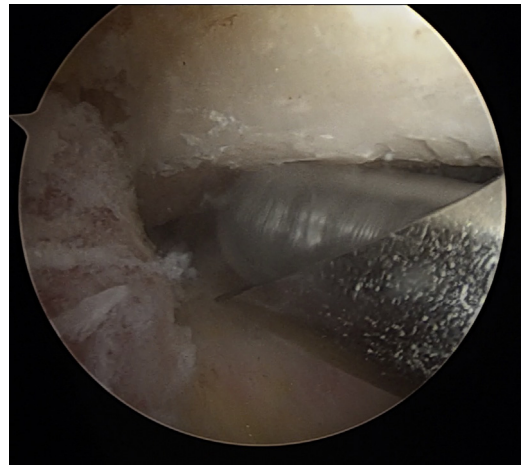
**Figure 5** T1 parasagittal MRI right shoulder, the ← points to osteochondroma in bicipital groove. MRI, magnetic resonance imaging.



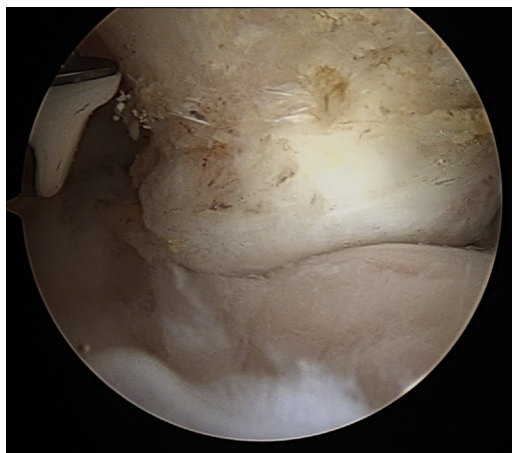
**Figure 8** Right shoulder arthroscopy lateral viewing portal subacromial. Top left placement of osteotome through the posterior portal on the osteochondroma base.



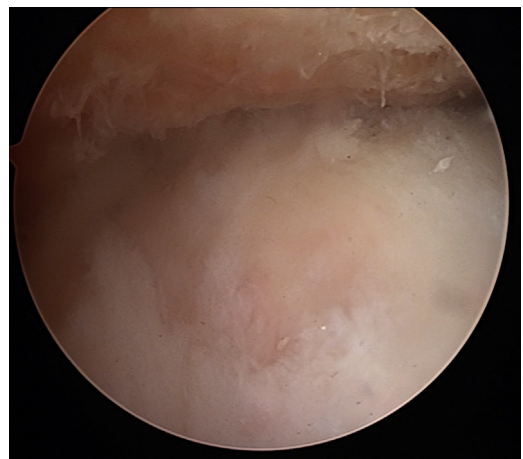
**Figure 6** Right shoulder arthroscopic intra-articular view from the posterior portal, top left impingement of the supraspinatus tendon on the superior glenoid.



**Figure 9** Right shoulder arthroscopy, posterior viewing portal. Introduction of burr from the lateral portal, resection of spur from the acromion undersurface.

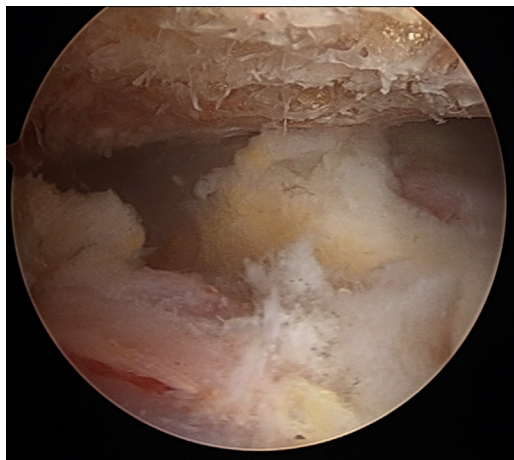


**Figure 7** Right shoulder arthroscopy lateral viewing portal subacromial. Osteochondroma with cartilage cap, below is bursal-sided supraspinatus tendon fraying.



**Figure 10** Right shoulder arthroscopy lateral viewing portal after decompression, bursal fraying of the supraspinatus tendon.





**Figure 11** Right shoulder arthroscopy lateral viewing portal after decompression (the top part of the picture), in center below is visible muscletendinous tear of supraspinatus.

distal clavicle or scapular body.<sup>4,8</sup> Older studies—although reporting successful treatment of impingement—have recommended an open surgical approach for complete resection.<sup>8,13</sup> Clement et al reported an osteochondroma arising from the scapular spine in a 19-year-old that resulted in impingement and was successfully treated arthroscopically with a decompression, although no further pathologies were described during the surgery.<sup>6</sup> Furthermore, Kim et al described successful arthroscopic removal of a distal clavicle osteochondroma with no recurrence at two years.<sup>10</sup> We confirm these findings that arthroscopic early removal of subacromial osteochondromas is technically safe and efficient.<sup>12</sup>

Çitlak et al described the consequences of a neglected subacromial osteochondroma arising from the acromion tip in a 34-year-old, pointing out that arthroscopic treatment was technically challenging and open surgical removal had to be performed, while the rotator cuff injury was chronic and unsalvageable.<sup>3</sup> Because of the known progressive nature of osteochondromas and previous reports of irreversible joint damage with extensive subacromial expansion, early arthroscopic intervention may play a role in preventing further deterioration of rotator cuff integrity from mechanical obstruction and impingement and might be considered despite the patient's young age.<sup>9</sup>

## Conclusion

- Subacromial impingement pain in young adults is uncommon with osteochondromas a rare cause.
- Persistent symptoms demand further imaging and will allow surgery to limit pain and rotator cuff tear progression.
- Most lesions can be addressed arthroscopically, but mini-open approaches may be required for less accessible regions or subtle lesions.

## Disclaimers

**Funding:** No funding was disclosed by the authors.

**Conflicts of interest:** The authors, their immediate family, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

**Patient consent:** Obtained.

## Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.xrrt.2021.09.008>.

## References

1. Bartoníček J, Říha M, Tuček M. Osteochondroma of scapular body—trans-scapular technique of resection: a case report. *J Shoulder Elbow Surg* 2018;27:e348-53. <https://doi.org/10.1016/j.jse.2018.08.004>.
2. Chalmers PN, Beck L, Miller M, Kawakami J, Dukas AG, Burks RT, et al. Acromial morphology is not associated with rotator cuff tearing or repair healing. *J Shoulder Elbow Surg* 2020;29:2229-39. <https://doi.org/10.1016/j.jse.2019.12.035>.
3. Çitlak A, Akgün U, Bulut T, Aslan C, Mete BD, Şener M. Subacromial osteochondroma: A rare cause of impingement syndrome. *Int J Surg Case Rep* 2015;6:126-8. <https://doi.org/10.1016/j.ijscr.2014.12.010>.
4. Clarke DO, Crichlow A, Christmas M, Vaughan K, Mullings S, Neil I, et al. The unusual osteochondroma: A case of snapping scapula syndrome and review of the literature. *Orthop Traumatol Surg Res* 2017;103:1295-8. <https://doi.org/10.1016/j.otsr.2017.01.019>.
5. Cleeman E, Auerbach JD, Springfield DS. Tumors of the shoulder girdle: A review of 194 cases. *J Shoulder Elbow Surg* 2005;14:460-5. <https://doi.org/10.1016/j.jse.2005.02.003>.
6. Clement ND, McBirnie JM, Porter DE. Subacromial impingement syndrome in a patient with hereditary multiple exostosis: A case report. *BMC Sports Sci Med Rehabil* 2013;5:20. <https://doi.org/10.1186/2052-1847-5-20>.
7. Clement ND, Ng CE, Porter DE. Shoulder exostoses in hereditary multiple exostoses: Probability of surgery and malignant change. *J Shoulder Elbow Surg* 2011;20:290-4. <https://doi.org/10.1016/j.jse.2010.07.020>.
8. Frost NL, Parada SA, Manoso MW, Arrington E, Benfanti P. Scapular osteochondromas treated with surgical excision. *Orthopedics* 2010;33:804. <https://doi.org/10.3928/01477447-20100924-09>.
9. Jacobsen JR, Jensen CM, Deutch SR. Acromioplasty in patients selected for operation by national guidelines. *J Shoulder Elbow Surg* 2017;26:1854-61. <https://doi.org/10.1016/j.jse.2017.03.028>.
10. Kim DW, Bae KC, Son ES, Baek CS, Cho CH. Osteochondroma of the Distal Clavicle: A Rare Cause of Impingement and Biceps Tear of the Shoulder. *Clin Shoulder Elbow* 2018;21:158-61. <https://doi.org/10.5397/cise.2018.21.3.158>.
11. Lu MT, Abboud JA. Subacromial osteochondroma. *Orthopedics* 2011;34. <https://doi.org/10.3928/01477447-20110714-19>.
12. MacDermid JC, Ramos J, Drosdowech D, Faber K, Patterson S. The impact of rotator cuff pathology on isometric and isokinetic strength, function, and quality of life. *J Shoulder Elbow Surg* 2004;13:593-8. <https://doi.org/10.1016/j.jse.2004.03.009>.
13. Messinese P, Vismara V, Sircana G, Campana V, Mocini F, Cardona V, et al. Arthroscopic treatment of an unusual distal clavicle osteochondroma causing rotator cuff impingement: Case report and literature review. *Orthop Rev (Pavia)* 2020;12:105-7. <https://doi.org/10.4081/or.2020.8683>.
14. Padua R, Castagna A, Ceccarelli E, Bondi R, Alviti F, Padua L. Intracapsular osteochondroma of the humeral head in an adult causing restriction of motion: A case report. *J Shoulder Elbow Surg* 2009;18:e30-1. <https://doi.org/10.1016/j.jse.2008.09.008>.
15. Simonetti I, Chianca V, Ascione F, Romano AM, Pietro F Di. Clavicular Osteochondroma: Extremely Rare Cause of Impingement Syndrome. *J Orthop Case Reports* 2018;8:50-3. <https://doi.org/10.13107/jocr.2250-0685.1254>.
16. Tepelenis K, Papathanakos G, Kitsouli A, Troupis T, Barbouti A, Vlachos K, et al. Osteochondromas: An updated review of epidemiology, pathogenesis, clinical presentation, radiological features and treatment options. *In Vivo (Brooklyn)* 2021;35:681-91. <https://doi.org/10.21873/INVIVO.12308>.
17. Tomo H, Ito Y, Aono M, Takaoka K. Chest wall deformity associated with osteochondroma of the scapula: A case report and review of the literature. *J Shoulder Elbow Surg* 2005;14:103-6. <https://doi.org/10.1016/j.jse.2004.03.007>.