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Arthroscopic approach to simple bone cyst of the humeral head—a step toward a minimally invasive technique

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Although they are considered benign lesions, simple bone cysts may lead to chronic pain and even pathologic fractures.[16] The treatment indications of these cysts include not just the prevention of a pathologic fracture but also the control of symptoms— mostly pain.[10,16,23] Since 1974, when Scaglietti introduced intralesional injection with corticosteroids, several options of percutaneous or minimally invasive treatment have appeared.[10,23,26] However, the success rate of these procedures is variable. The efficacy of percutaneous procedures is currently determined by the recurrence rate and the number of procedures needed.[17,21]

Surgical treatment, based on lesion curettage and bone grafting, is used when the options mentioned above have failed, owing to the potential risks of open surgery.[6,9,17,19] In the last decade, however, there has been an exponential growth in the use of minimally invasive surgical techniques. This is particularly seen in the shoulder, where multiple arthroscopic and endoscopic procedures have been described in the treatment of intra- and extra-articular pathologies. We present a patient with a bone cyst of the humeral head treated with fluoroscopically assisted arthroscopic curettage and bone grafting.

Case report

A 35-year-old man had a history (8 years before) of pathologic fracture of the proximal humerus caused by a cystic lesion. This was treated conservatively and monitored by observation. He was referred to a shoulder specialist because of progressive shoulder pain, with discomfort during passive and active mobilization in all planes. However, he did not show any restriction in range of movement or neurovascular deficits.

The imaging studies performed over this time (Fig. 1) showed an intraosseous cystic lesion (33 × 19 mm on the long axis of the axial plane and 34 mm on the long longitudinal axis) with sclerotic borders, without aggressive behavior or significant changes over time.

Three intralesional injections with corticosteroids had failed, so the decision was made to proceed with curettage and bone grafting. The location of the cyst, adjacent to the humeral head cartilage, led us to plan an arthroscopic approach, where open surgery was an alternative in case of failure.

The patient was placed in the beach chair position with 2-kg traction after induction of anesthesia. We performed a diagnostic arthroscopy to document the integrity of the humeral cartilage and any associated lesion that could justify the progressive pain. We used a 30° arthroscope via a posterior portal with 50 mm Hg pressure. Classic anterior and lateral portals (outside-in) were also used.

We did not observe any degenerative cartilage lesions over the cyst lesion area, so the decision was made to proceed to treatment of the bone cyst. An extra portal (2 cm anterior and inferior to the lateral portal) was made that gave us the space to create a bone window by curettage under arthroscopic visualization (Fig. 2, *a*).

Under fluoroscopic control, we proceeded with the curettage in the correct direction to achieve an effective excision of the

Institutional Review Board approval was not required for this case report. The patient provided written consent for the publication of his anonymized data.

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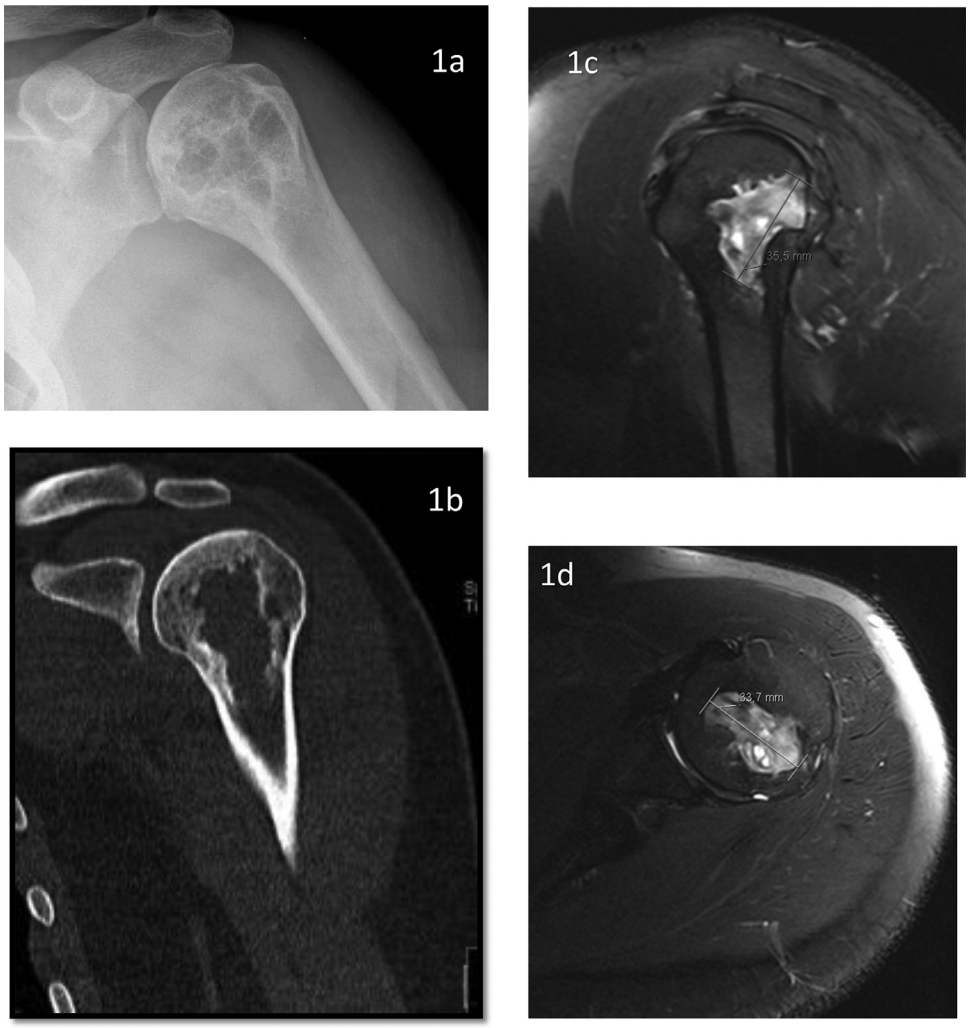

Figure 1 Imaging studies before the surgical treatment show the features of the cyst on the humeral head of the left shoulder: (**a**) conventional X-ray, (**b**) computed tomography, and magnetic resonance imaging in (**c**) coronal and (**d**) axial planes.

bone cyst (Fig. 2, *b*). The curettage was done without arthroscopic fluid and without epinephrine.

The intralesional visualization showed a membrane and flushed tissue with reduced trabecular bone (Fig. 3, *a*). We performed an exhaustive curettage with a shaver until all pathologic tissue was completely removed (Fig. 3, *b*). Through the same window, we removed cancellous bone from the humeral metaphysis (approximately 3 cm down), which was then used to graft the defect (Fig. 3, *c*).

The pathology report confirmed the diagnosis of a simple bone cyst without any evidence of malignancy. The patient was not immobilized and began physical therapy once the wound was healed. He was allowed full activity at 2 months and completed this process uneventfully. Radiographic evidence of bone ingrowth was seen at the 12-month follow-up (Fig. 4), and the patient was without symptoms and doing well. At the 24-month follow-up, he had an equivalent shoulder range of motion compared with the contralateral side, with no recurrence in the image control.

Discussion

Simple bone cysts are common, benign lesions and appear mainly on the humerus and femur, before skeletal maturity.[13,15,20] However, depending on their location, they may lead to important consequences for the patients. In fact, its diagnosis appears several times on the study of fractures after minor trauma.[11]

The purpose of the treatment is effective removal of the cyst, typically through intralesional curettage, bone grafting, and restoration of the architectural integrity of the bone, improving the bone resistance capacity to different stress forces.[9,15] The main minimally invasive treatment options are intracystic injections with corticosteroid or bone marrow.[15] The first treatment reduces the production of the cystic fluid from its inner wall, thus increasing bone healing.[27] Bone marrow injection has been suggested to speed up the cicatrisation due to its osteogenic potential, allowing the bone to remodel itself.[4,22] Both options seem to have similar results.[15]

However, open surgery with curettage and bone grafting remains as the gold standard treatment for some authors.[6–9] Cho et al[6] compared the results of both methods of treatment and stated that the surgical treatment showed results that were significantly better and reduced recurrence and the number of procedures required. Autograft and allograft substrates have demonstrated similar healing rates and outcomes in the treatment of these lesions. Allograft is not always readily available, however, and an autograft becomes the sole option in some cases. Iliac crest has historically been used but has an associated morbidity that cannot be disregarded.[2,12,15] The use of new biomaterials has been increasing, but the outcomes of the treatment of these lesions are still controversial.[15,25] We were able to use local autograft in this patient with good results.

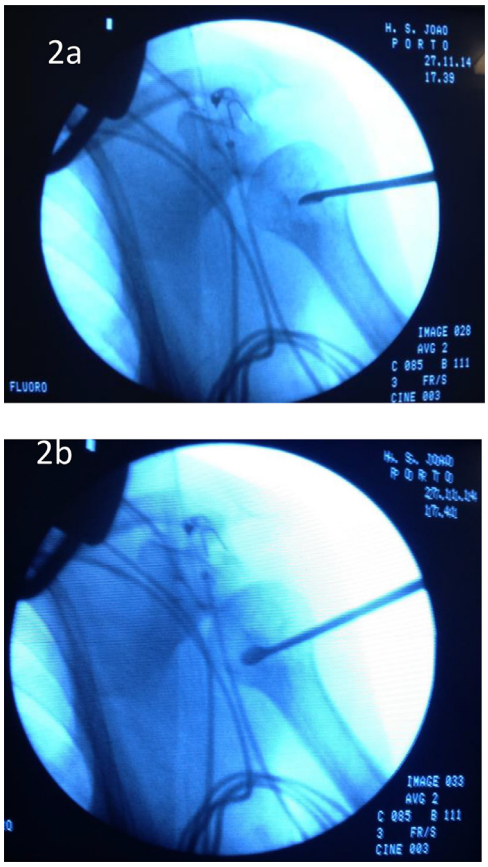

Figure 2 (**a**) Opening of the bone window`` on the proximal humerus. (**b**) Progression of the curette, under imaging control, up to the cyst of the humeral head.

The technique that is described here goes against the mentioned premises, associating the advantages of the arthroscopic procedures over the conventional surgery: minimal incisions are made, blood loss is negligible, and rehabilitation can be initiated earlier.[11,17,20] The harvesting of spongy bone by the same bone window shows the advantages that are inherent to the autologous graft, without the morbidity associated with harvesting from other anatomic regions. However, is important to emphasize that before pursuing the arthroscopic management of this pathology, the confidence in diagnosis should be significant.

The possibility of also performing diagnostic arthroscopy allows us not just to evaluate the quality of the cartilage adjacent to the cyst but also to rule out other intra- and extra-articular lesions that may contribute to the patient's clinical condition. In fact, the presence of bone cysts on the humeral head is correlated with increased bone porosity and rotator cuff tears.[1,14,24] The presence of both might alter the surgical plan, and in those conditions, the subchondral bone does not allow an effective fixation of the traditional anchors.[5] So, if the bone cyst occupies the area of insertion of the anchors, another type of procedure must be used to proceed to the rotator cuff repair.[1,3,18]

We performed the curettage of the bone cyst (under fluoroscopic control) without arthroscopic fluid. It is important to emphasize that a fluid irrigation of an unknown lesion could potentially contaminate the entire upper extremity, which would be disastrous if the pathology revealed a malignancy.

The best treatment for bone cysts is still arguable, for agreement on treatment is not unanimous.[15] This report shows the advantages of arthroscopy for the treatment of a simple bone cyst of the humeral head with a good outcome and no signs of recurrence. The positive results shown in this clinical case suggest that it may become a good option for the surgical treatment of simple bone cysts. More studies are required to better delineate reproducible outcomes and consistency of this procedure for this diagnosis.

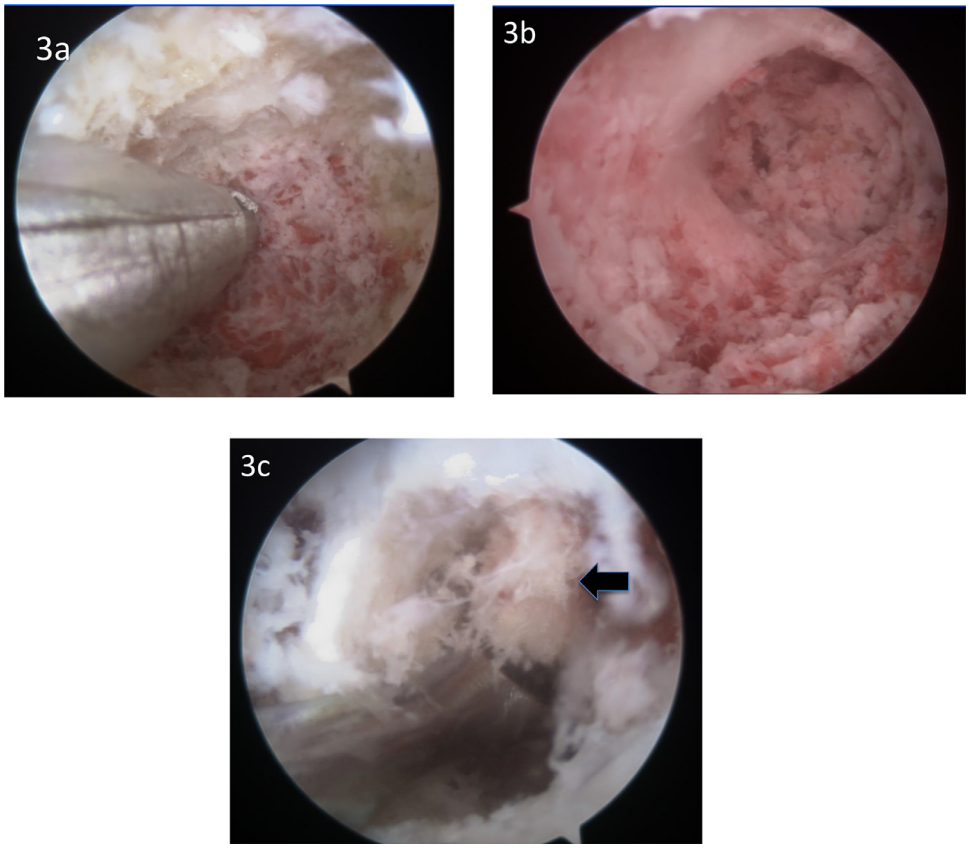

Figure 3 (**a**) Intralesional endoscopy of the bone cyst shows a membranous and flushed tissue. (**b**) Humeral head after exhaustive curettage of the cyst. (**c**) Bone grafting on the area previously occupied by the cyst. The *arrow* indicates the spongy bone fragment that was removed from the humeral metaphysis.

Figure 4 X-ray images 2 years after surgery show bone healing of the cystic lesion.

Conclusion

The current surgical management for simple bone cysts is curettage and bone grafting through minimal incisions. This case report appears to be the first documented case of arthroscopic treatment of a unicameral bone cyst with local autograft from the metaphyseal proximal humerus. This index procedure resulted in excellent outcomes and no signs of recurrence at 12 months of follow-up.

Disclaimer

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REFERENCES

1. Agrawal V, Stinson M. Arthroscopic grafting of greater tuberosity cyst and rotator cuff repair. Arthroscopy 2007;23. 904.e1-3. http://dx.doi.org/10.1016/j.arthro.2006.10.026.
2. Arrington ED, Smith WJ, Chambers HG, Bucknell AL, Davino NA. Complications of iliac crest bone graft harvesting. Clin Orthop Relat Res 1996(329):300-9.
3. Burkhart SS, Klein JR. Arthroscopic repair of rotator cuff tears associated with large bone cysts of the proximal humerus: compaction bone grafting technique. Arthroscopy 2005;21:1149. http://dx.doi.org/10.1016/j.arthro.2005.07.022
4. Burwell RG. Studies in the transplantation of bone. VII. The fresh composite homograft of cancellous bone, an analysis of factors leading to osteogenesis in marrow transplantations and in marrow-containing bone grafts. J Bone Joint Surg Br 1964;46:110-40.
5. Caniggia M, Maniscalco P, Pagliantini L, Bocchi L. Titanium anchors for the repair of rotator cuff tears: preliminary report of a surgical technique. J Orthop Trauma 1995;9:312-7.
6. Cho HS, Oh JH, Kim HS, Kang HG, Lee SH. Unicameral bone cysts: a comparison of injection of steroid and grafting with autologous bone marrow. J Bone Joint Surg Br 2007;89:222-6. http://dx.doi.org/10.1302/0301-620X.89B2.18116
7. Cho HS, Seo SH, Park SH, Park JH, Shin DS, Park IH. Minimal invasive surgery for unicameral bone cyst using demineralized bone matrix: a case series. BMC Musculoskelet Disord 2012;13:134. http://dx.doi.org/10.1186/1471-2474-13-134
8. Di Bella C, Dozza B, Frisoni T, Cevolani L, Donati D. Injection of demineralized bone matrix with bone marrow concentrate improves healing in unicameral bone cyst. Clin Orthop Relat Res 2010;468:3047-55. http://dx.doi.org/10.1007/s11999-010-1430-5
9. Donaldson S, Chundamala J, Yandow S, Wright JG. Treatment for unicameral bone cysts in long bones: an evidence based review. Orthop Rev (Pavia) 2010;2:e13. http://dx.doi.org/10.4081/or.2010.e13
10. Dorfman HD, Czerniak B. Bone tumors. St. Louis: Mosby; 1998.
11. Fahey JJ, O'Brien ET. Subtotal resection and grafting in selected cases of solitary unicameral bone cyst. J Bone Joint Surg Am 1973;55:59-68.
12. Goulet JA, Senunas LE, DeSilva GL, Greenfield ML. Autogenous iliac crest bone graft: complications and functional assessment. Clin Orthop Relat Res 1997(339):76-81.
13. Jaffe H, Lichtenstein L. Solitary unicameral bone cyst with emphasis on the roentgen picture, the pathologic appearance and the pathogenesis. Arch Surg 1942;44:1004-25.
14. Jiang Y, Zhao J, van Holsbeeck MT, Flynn MJ, Ouyang X, Genant HK. Trabecular microstructure and surface changes in the greater tuberosity in rotator cuff tears. Skeletal Radiol 2002;31:522-8. http://dx.doi.org/10.1007/s00256-002-0536-6
15. Kadhim M, Thacker M, Kadhim A, Holmes Jr L. Treatment of unicameral bone cyst: systematic review and meta analysis. J Child Orthop 2014;8:171-91. http://dx.doi.org/10.1007/s11832-014-0566-3
16. Kaelin AJ, MacEwen GD. Unicameral bone cysts. Natural history and the risk of fracture. Int Orthop 1989;13:275-82.
17. Killian JT, Wilkinson L, White S, Brassard M. Treatment of unicameral bone cyst with demineralized bone matrix. J Pediatr Orthop 1998;18:621-4.
18. Levy DM, Moen TC, Ahmad CS. Bone grafting of humeral head cystic defects during rotator cuff repair. Am J Orthop (Belle Mead NJ) 2012;41:92-4.
19. Mik G, Arkader A, Manteghi A, Dormans JP. Results of a minimally invasive technique for treatment of unicameral bone cysts. Clin Orthop Relat Res 2009;467:2949-54. http://dx.doi.org/10.1007/s11999-009-1008-2
20. Neer CS, Francis KC, Marcove RC, Terz J, Carbonara PN. Treatment of unicameral bone cyst. A follow-up study of one hundred seventy-five cases. J Bone Joint Surg Am 1966;48:731-45.
21. Rougraff BT, Kling TJ. Treatment of active unicameral bone cysts with percutaneous injection of demineralized bone matrix and autogenous bone marrow. J Bone Joint Surg Am 2002;84-A:921-9.
22. Salama R, Weissman SL. The clinical use of combined xenografts of bone and autologous red marrow. A preliminary report. Bone Joint Surg Br 1978;60:111-5.
23. Scaglietti O. Sull' azione osteogenetica dell' acetato di prednisolone. Boll Mem Soc Tosco Umbra Chir 1974;35:7.
24. Tingart MJ, Apreleva M, Zurakowski D, Warner JJ. Pullout strength of suture anchors used in rotator cuff repair. J Bone Joint Surg Am 2003;85-A:2190-8.
25. Tsuchiya H, Abdel-Wanis ME, Uehara K, Tomita K, Takagi Y, Yasutake H. Cannulation of simple bone cysts. J Bone Joint Surg Br 2002;84:245-8.
26. Wright JG, Yandow S, Donaldson S, Marley L. A randomized clinical trial comparing intralesional bone marrow and steroid injections for simple bone cysts. J Bone Joint Surg Am 2008;90:722-30. http://dx.doi.org/10.2106/JBJS.G.00620
27. Yu CL, D'Astous J, Finnegan M. Simple bone cysts. The effects of methylprednisolone on synovial cells in culture. Clin Orthop Relat Res 1991(262):34-41.