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Case Report

Coraco-Glenoid Chondrosarcoma Glenoid Resection and Reconstruction with an External Tibial Plateau Osteochondral Allograft

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Abstract

Chondrosarcoma is a primary malignant bone tumor composed by a cartilage matrix. With aggressive behavior and no response to conventional chemotherapy and radiotherapy protocols, surgical resection is the only curative treatment that can be offered to patients with this diagnosis. We report the case of a 41-year-old male with a right scapular chondrosarcoma located in the coracoglenoid zone; treated with wide resection of the lesion, and reconstruction with an osteochondral tibial allograft of the external tibial plateau. The technique and functional results are described above.

Keywords: Chondrosarcoma; Osteochondral Allograft; Scapula; Tibial Plateau

Introduction

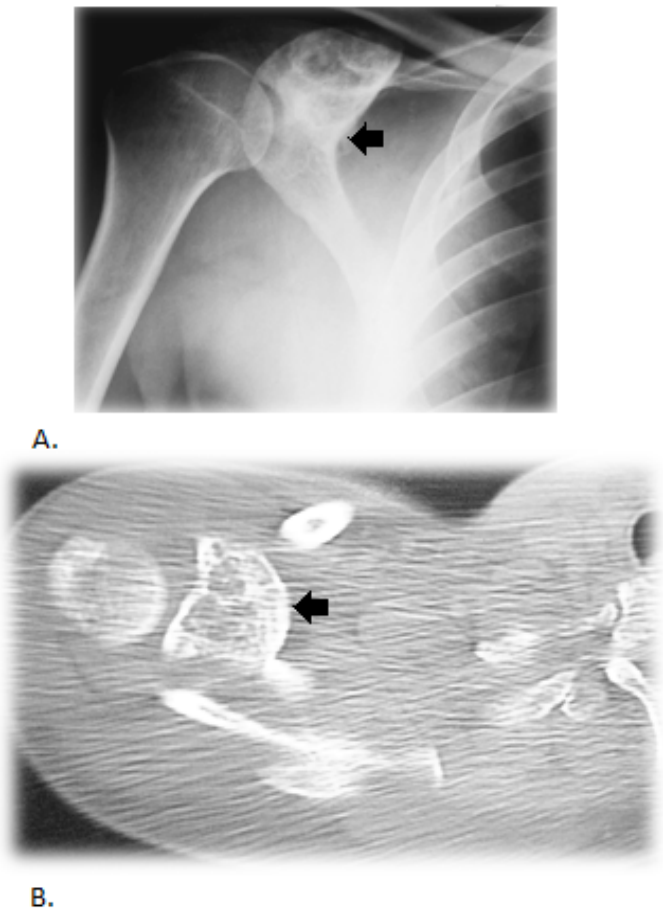
Chondrosarcoma is a primary malignant bone tumor composed by cartilage matrix producing cells. With an aggressive behavior, no response to conventional chemotherapy or radiotherapy protocols and high rate of recurrence, to the current date surgical resection remains the gold standard for its treatment [1]. Chondrosarcoma primary affects pelvic bones, ribs, sternum and scapula [2-5]. Due to its location, it is common to find advanced stages of the disease at the moment of the diagnosis. Distinct reports regarding the management and results of pelvic and thoracic wall chondrosarcoma can be found in literature [6-8], however to the current date, registered data for scapula chondrosarcoma is limited [3,9,10]. The most frequent location of scapula chondrosarcoma is zone S1 corresponding to the scapular body, and S2 [11], made up by glenoid, coracoid process and the acromion, determining anatomical references to keep in mind when planning the surgical approach and establishing reconstruction possibilities. It is considered that post-surgical long and short-term results of patients with scapular chondrosarcoma are far better, when compared to patients with chondrosarcoma in other flat bones. This due to the superficial location of the bone and the rather simple access for surgical resection [11]. The brachial plexus and axillary vessels represent vital structures in close relationship to the scapula, but in general not frequently compromised by these types of tumors.

In the last 25 years, with modern surgical techniques the possibility of limb salvage in bone sarcoma has reached success rates up to 95%.When salvaging procedures are performed at the scapular waist level, reconstructive procedures are not always carried out, resulting in important functional and cosmetic impairment with a clear impact in the overall life quality of these patients [12]. The main complications generated after these resections are restrained arc of motion of the shoulder and instability, since the ligament and capsular structures along with muscular groups that fulfill these functions (rotator cuff and deltoid) must be respected, and the remaining muscular groups lost their insertion [1]. When considering a coracoglenoid reconstruction, whether is prosthetic or biological, the main intention is to recover the stability of scapular waist. Results, in both functional and cosmetic issues in these type of reconstructions are good, but still scarce regarding studies and monitoring [13]. In this article we describe a chondrosarcoma located in the right coracoglenoid region; managed with surgical

resection of the glenoid and reconstruction with an external tibial plateau allograft with its corresponding meniscus and screw osteosynthesis.

Clinical Case

A 41-year old male mechanic, was referred to our hospital with a painful mass in his right shoulder. The patient also reported progressive pain and limitation in arc of motion and physical activity. Physical examination revealed a hard mass firmly attached to the coracoid region; skin in the surrounding area was found to be euchromic, eutrophic, without collateral circulation. Active and passive arc of motion revealed restrained shoulder elevation and internal rotation, with no associated neurological or distal vascular deficit. There is no reference of traumatic origin or previous pathologic triggering episodes. The initial X-ray showed a well circumscribed lytic tumoral lesion with expansion of the cortical bone compromising zone S2 of the scapula (coracoid and glenoid). (Figure 1)



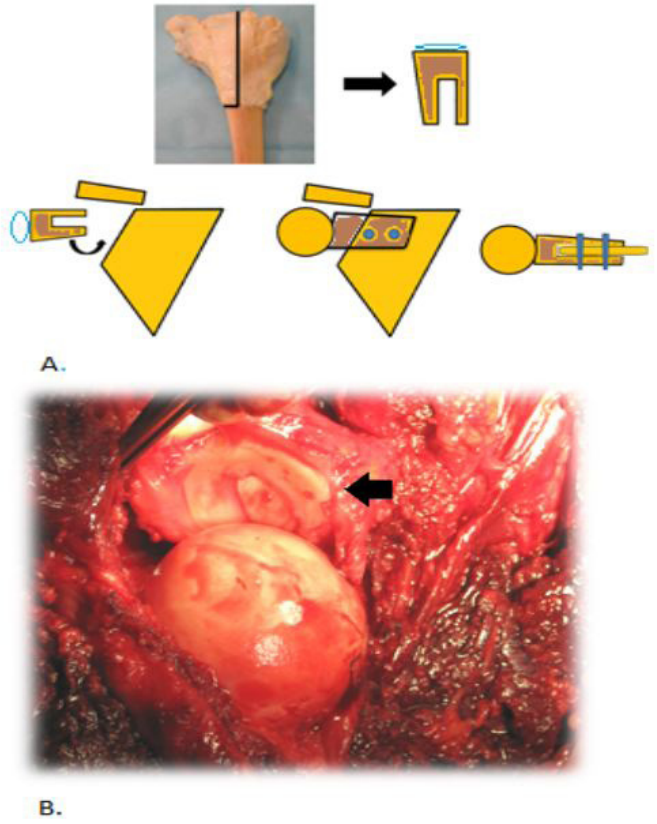
Figures 1(A-B): (A). Shoulder X-ray with a tumoral lesion in the glenoid (black arrow) **(B).** Shoulder CT-Scan showing low density well circumscribed lesion in the glenoid area (black arrow).

An open biopsy of the mass reported permeative chondroblastic tumor that in correlation with radiographical imaging correspond to a conventional chondrosarcoma grade I-II.

Surgical Procedure

Once biopsy results confirmed the presence of chondrosarcoma, it was decided to perform coraco-glenoid wide resection surgery, and reconstruction of the glenoid with an osteochondral allograft of external tibial plateau. The decision of using an external tibial plateau was based in the circumferential and concave morphology of the external knee meniscus that allowed a proper reproduction of the resected glenoid labrum. After positioning the patient in a left lateral decubitus, we performed an expanded deltopectoral approach. Resection of the previous biopsy zone was performed considering it a potentially tumor contaminated area. Cephalic vein ligation, myotomy of the pectoralis major and deltoid muscles was performed allowing safe exploration of the axillary content and proper dissection of infraclavicular neurovascular structures. Ostectomy of the distal third of the clavicle was performed all together with a resection of the coracoid, previous dissection of the musculocutaneous nerve. Once the subscapularis muscle was identified, longitudinal myotomy was performed respecting the circumflex neurovascular bundle.

An accessory posterior approach to the scapular spine was performed, after posterior capsulotomy, marking cuts were made at the neck of the scapula with resection of the entire glenoid and coracoid process. Bone edges were reexamined, observing them macroscopically free of tumor. All surgical pieces were sent for anatomopathologic study in our institution. After saline irrigation we proceeded to start the reconstruction process, prior change of surgical field, clothing and instruments of all the surgical team in order to avoid tumoral contamination. The osteochondral graft of the proximal tibia was harvested by resecting the external tibial plateau with an oscila. A canal was made with a drill over the non-articular segment allowing proper fit on to the lateral edge of the scapula, replacing the glenoid. Once the allograft was adapted in correct position, it was fixed with two 3.5mm cortical screws. The humeral head was reduced, observing an adequate restauration of the articular relationship between the humeral head and the "neoglenoid" (Figure 2).



Figures 2(A-B): (A). Pre-op surgical plan with external tibial plateau allograft harvesting. **(B).** Relation between the neoglenoid of external tibial plateau and humeral head before capsulorrhaphy and miorrhaphy. Lateral meniscus shown (white arrow).

Immediately capsulorrhaphy and additional miorrhaphy with the subscapularis, pectoralis major, supraspinatus and deltoid were performed with non-absorbable sutures conferring greater articular stability. Standard stability test was, performed intraoperatively with satisfactory arc of motion assessed. Intraoperative X-rays confirmed adequate position and screw fixation of the graft. Standard layer surgical closure of the wound was performed, and final immobilization with an arm sling was added.

Postoperative controls whit pathology reports confirmed the chondrosarcoma diagnosis and discarded tumoral compromise of the resection margins. After non-absorbable sutures were removed we began the rehabilitation protocol. Further postoperative controls revealed adequate allograft integration and bone consolidation after 6 months (Figure 3). No complaints regarding instability in the neoglenoid-humeral articulation were addressed by the patient as arc of motion exercises began.

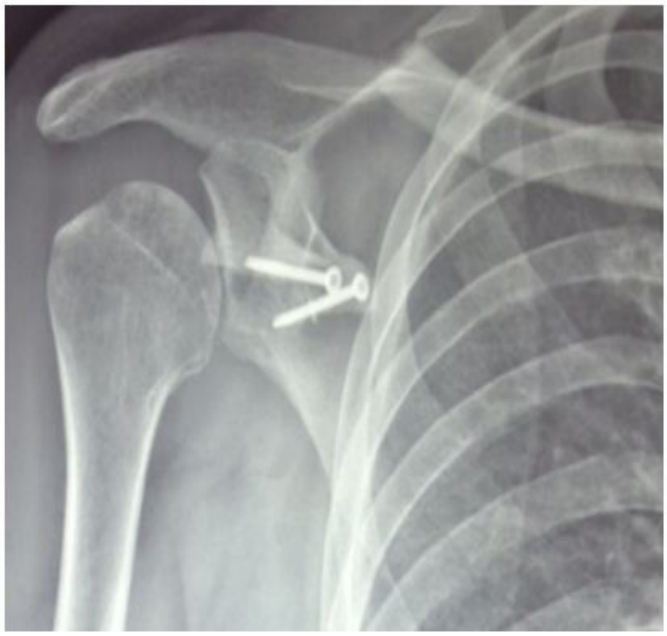


Figure 3: Shoulder PA X-ray. Full integration of graft and signs of remodelation of the neoglenoid articular surface can be seen. No tumoral recurrence was observed.

The Enneking functional scale was applied to evaluate patient's post-operational function, with a final score of 25/30, which is a highly satisfactory result. Currently the patient has been fully reintegrated to his working activities, with minimum restriction (Figure 4).

Figure 4: Shoulder mobility at 6 months post-operative.

Discussion

Chondrosarcoma is a tumor of purely surgical management, which strives for a definitive control in the first surgery. It must be considered that although some scapular reconstructive surgical procedures have been described in the literature, none of these considers isolated reconstruction of glenoid. Moreover, none of

them aim to properly improve shoulder stability and arc of motion (articular functioning). Reconstruction of scapular waist after wide resection as treatment for chondrosarcoma is a challenge for the orthopeadic oncologist, since it must consider the type of injury, its size, location, the pathological stage, the compromise of surrounding tissues, and the presence or not of metastasis.

Once a thorough analysis of the case has been made, pre-surgical planning is fundamental step for any reconstructive procedure, as it determines the optimal surgical approach that allows tumor-free margins, the size and type of the resection to be made, considering that lesions with a size greater than 5 cm and located in S2 scapular zone, are generally treated with total scapulectomy. A key success factor in the aim for shoulder stability after tumor resection and the creation of the new glenoid articulation is to be able to conserve a deltoid muscular and articular capsule remnant, as well as the majority of the muscles that make up the rotator cuff, which will allow achieving optimal stability and arc of motion. Last, even though the surgeon could opt for a reconstructive procedure involving the use of a metallic prosthesis for the glenoid, this process will be more expensive, with less predictable results, greater morbidity, and less functional recovery. In our experience, we chose the option of an external tibial plateau allograft, since functional results for soft tissue reconstructions and long-term durability are greater when compared to those of achieved with prosthetic replacement.

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