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Tumors of the coracoid process: clinical evaluation of twenty-one patients

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Objective: We present the incidence and management of bone tumors of the coracoid process and discuss the related clinical and imaging findings and treatment.

Materials and methods: We present 21 patients (7 males and 14 females; mean age, 39 years) treated for bone tumors of the coracoid process from 1900 to 2010. Mean follow-up was 44 months (range, 12-132 months). Clinical presentation, imaging, surgical treatment, complications, range of shoulder motion, and Musculoskeletal Tumor Society (MSTS) function were evaluated.

Results: Bone tumors were benign in 7 (33%) and malignant in 14 (67%). The most common were chondrosarcomas, osteoblastomas, and chondroblastomas. The most common presentation was pain and palpable mass for a mean duration of 11 months. Limb salvage, with or without megaprosthetic reconstruction, was achieved in 20 patients. One patient required forequarter amputation. One patient with chondroblastoma and 2 with chondrosarcoma had local recurrence. The range of shoulder motion varied according to the type of resection: patients with curettage and limited resections without involvement of the abductor mechanism had better shoulder motion, and patients with scapulectomy and proximal humeral resections had significant limitations of motion. The mean MSTS score was 80% (range, 50%-100%).

Conclusions: Chondrosarcomas, osteoblastomas, and chondroblastomas are the most common bone tumors of the coracoid process. Limited resections are associated with nearly normal range of motion and excellent function; however, limited resections are acceptable in only in a small number of patients. In patients with malignant and recurrent lesions, wide resection is required, which is associated with significant limitations of shoulder function.

Level of evidence: Level IV, Case Series, Treatment Study.

Keywords: Coracoid process; shoulder; bone tumors; limb salvage

Bone tumors of the scapula account for 2% to 8% of all bone tumors.[8,14,50] Tumor involvement of the coracoid process of the scapula is rare.[2,4,21,26,27,42,50] Primary bone tumors of the coracoid process, including chondrosarcomas, osteoid osteomas, osteosarcomas, giant cell tumors, capillary hemangiomas, aneurysmal bone cysts, lymphomas, plasmacytomas, and metastatic bone disease have been reported.[1,4,27,42] A tumor in the coracoid process easily may be overlooked because it mimics nontumorous diseases of the shoulder that cause shoulder pain, such as instability, impingement syndrome, tendinitis, and frozen shoulder.[5,42,44,45]

This study was approved by the Institutional Review Board of the Istituto Ortopedico Rizzoli, Bologna, Italia.

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A detailed clinical history, clinical examination, and adequate imaging studies are critical. Standard anteroposterior radiographs of the shoulder may not show a lesion in the coracoid process in up to 10% of cases.[5,11,42,44] An axillary view radiograph better shows the coracoid process and may be more helpful in identifying a lesion in its base. A 20° posterior oblique film with 20° of cephalad angulation can show coracoid morphology and bone lesions more clearly if other views are inconclusive.[5,20] Computed tomography scan and magnetic resonance imaging should be considered when bone abnormalities are evident on radiographs or shoulder symptoms are atypical or progress despite appropriate conservative management.[5,44]

The knowledge of a predilection for certain neoplasms for some bone locations is useful. To enhance the literature, we present the incidence and management of bone tumors of the coracoid process during a long-term experience at a single institution and discuss the related clinical and imaging findings, treatment options, and outcome.

Materials and methods

We searched the registry of the Istituto Ortopedico Rizzoli from 1900 to December 2010 for patients admitted and treated for tumors of the scapula. We found 627 patients with benign and malignant tumors; of these, 21 (3%) had tumors involving the coracoid process and were included in this study. There were 7 male and 14 female patients with a mean age of 39 years (range, 6-74 years). All patients with coracoid process tumors were diagnosed after 1978.

No patients were recalled specifically for this study; all data were obtained from the medical records and imaging studies. The medical records included complete demographic details, clinical information regarding the presenting symptoms and their duration, imaging studies, histologic diagnosis, type of treatment and surgical reports, and clinical and imaging follow-up evaluations. Imaging studies including standard radiographs or tomography scans were available for all patients; for the most recent patients, computed tomography (CT) or magnetic resonance imaging (MRI), or both, were also available. The mean follow-up was 44 months (range, 12-132 months; Table I). All patients or their relatives gave written informed consent for their data to be included in this study.

Patients 13, 17, and 18 received chemotherapy. Curettage or different types of resection were performed in 20 patients. Patient 8 underwent forequarter amputation. Megaprosthetic reconstruction of the proximal humerus after extra-articular shoulder resection was performed in patients 9, 11, 16 and 20, and allograft reconstruction after partial scapula resection in patient 19.

Surgical resections were retrospectively classified according to the Musculoskeletal Tumor Society (MSTS) system[12] and Ogose et al[42] modification. With the MSTS system, the shoulder girdle is divided into 5 regions (S1 to S5), and the status of the abductor mechanism is denoted by "A" if it is intact and available for reconstruction, or "B" if it is disrupted and reconstruction is not feasible. The scapula is divided into 2 zones (S1 and S2): the blade of the scapula is designated as S1, and the acromion-glenoid-coracoid complex as S2. At least half of the region must be resected to be so designated, and the glenoid must be resected for an S2 classification.[12] The Ogose et al.[42] modification of the MSTS system for the S2 region aimed to better define the resection of the coracoid process alone (S2CA resection), and the resection of the coracoid in addition to a significant, but subtotal portion of the glenoid (S2CGA resection).[42]

The duration and presenting clinical symptoms, complications, local recurrences and metastases, and range of motion of the shoulder joint in active abduction, flexion, and external rotation were documented from the medical reports and follow-up imaging from the patients' files. Normal abduction, flexion and external rotation was considered to 90°. Functional evaluation was performed using the MSTS scoring system.[13] For the earliest patients, the MSTS functional score was derived from the available information from the patients' files.

Results

Benign bone tumors were diagnosed in 7 patients (33%) and malignant in 14 (67%; Table I). The most common bone tumors were chondrosarcomas (Fig. 1), followed by osteoblastomas and chondroblastomas (Fig. 2, Table II). Malignant bone tumors were more common in patients aged older than 40 years. Patient 8 developed a radiation-induced malignant fibrous histiocytoma 3 years after radiation therapy for breast cancer, and patient 18 developed metastasis at the coracoid process from metastatic breast cancer. The most common clinical presentations were pain in 19 patients and palpable mass in 12. Patient 15 presented with a painless growing mass. Patient 7 was diagnosed incidentally after a shoulder injury. The mean duration of clinical symptoms before diagnosis was 11 months (range, 4-36 months). The most common imaging finding was a lytic destructive lesion; a soft-tissue mass was observed in patients 8, 15, and 16.

In patients 1, 2, 3, 5, 6, 7, 17, and 18, the tumors involved only the coracoid process, and curettage or an S2CA resection was performed. In patients 4, 15, 19, and 21 the tumors involved the coracoid process and the glenoid, and an S2CGA resection was performed. In patients 10, 12, 13, and 14, the tumors also involved the acromion, and an S12 resection with (S12A) or without (S12B) intact abduction mechanism was performed. The tumors in patients 9, 11, 16 and 20 extended to the proximal humerus and were treated with an S1-4B resection and reconstruction of the proximal humerus with a megaprosthesis as spacer, suspended from the thorax or the clavicle. Allograft reconstruction was performed in patient 19 after partial scapulectomy. Forequarter amputation was performed as the primary treatment in patient 8 because of extensive bone and neurovascular involvement from a radiation-induced malignant fibrous histiocytoma.

Local recurrence occurred in 3 patients (14%). Patient 2, with recurrent chondroblastoma, was treated with repeat curettage without evidence of re-recurrence through the period of this study; patient 12, with recurrent