Osteblastoma of the Capitate Bone

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Introduction

Osteblastoma is a bone-producing tumor closely related to osteoid osteoma [1–3]. Osteblastoma usually involves the vertebral columns, pelvis and long bones; however, there are sporadic reports of wrist and hand involvement [4–22].

The uncommon occurrence of an osteblastoma diagnosis means that it is rarely considered in differential diagnosis of hand tumors. Osteblastoma in the carpal bones is usually reported in the scaphoid bone [6, 7, 9, 11, 15, 20, 21]. Murray et al. in their review about primary neoplasms of carpal bones found only one case of osteblastoma involving the capitate bone; however, they did not present any further detail about the case [9]. This report presents a singular case of osteblastoma involving the capitate bone.

Case Report

A 33-year-old man was referred because of constant pain and tenderness over the dorsal portion of his right

wrist. The pain began 6 months prior, with progressive intensity and without relief from non-steroidal anti-inflammatory medications. Right wrist range of motion had been lost. The patient had point tenderness over the capitate bone and diffuse swelling over the dorsal wrist joint. The previous year, the patient sustained a crash injury with lacerations on the volar surface of his right wrist. A foreign body was palpable on the volar surface of the wrist but the patient had no related symptoms. All laboratory examinations were normal.

The anteroposterior radiograph of the right wrist demonstrated a lesion in the capitate bone; however, the lesion was obscured due to superimposed boney architectures. A foreign body shadow was superimposed on the lunate bone (Fig. 1). The foreign body was located subcutaneously on the lateral view of the right wrist. Computerized tomogram (CT) scans showed a well-defined lesion located in the dorsal portion of the neck of the capitate bone with a sclerotic margin (Fig. 2). A radioisotope bone scan showed increased uptake over the center of the right wrist joint. Magnetic resonance imaging revealed the lesion and its border along the capitate bone (Fig. 3). It was determined that the lesion had a benign nature and its differential diagnosis consisted of osteoid osteoma, chondroma, giant cell tumor and intraosseous ganglion.

The lesion was approached through a longitudinal dorsal wrist arthrotomy. After opening the wrist capsule, a reactive synovitis in the midcarpal joint was noticed. The lesion measured 5×5×5 mm and was visible on the neck of the capitate bone (Fig. 4). It is likely the synovitis developed because of the intraarticular localization of the lesion. The lesion was treated by complete curettage. Due to the small size of the lesion, it was not filled with bone graft and no other adjuvant treatment was used.

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Fig. 1 In the anteroposterior radiography of the right wrist the lesion in the capitate bone is not well recognized. (Black arrows) A foreign body shadow is superimposed on the lunate bone. (White arrow)

Fig. 2 A CT scan focused on coronal plane of the right wrist shows the lesion with a sclerotic rim in the dorsal portion of the capitate bone. (Black arrows)

A histopathology study indicated an interlacing network of bone trabeculae evenly distributed in a loose fibroblastic stroma with a prominent vasculature (Fig. 5). The bone trabeculae had a prominent rimming of active epithelioid osteoblasts and multinucleated osteoclast-like giant cells were also seen (Fig. 6). There was no cartilage, immature bone and osteoid tissue. The characteristic nidus of osteoid osteoma in the histopathologic sections was not seen. Histopathology study confirmed the diagnosis of osteoblastoma.

The patient's wrist pain completely resolved after surgery. The patient regained full range of motion six months after the operation. After 1 year the patient had no recurrence of his tumor. However, the patient is still being followed because it is possible the tumor may reappear (Fig. 7).

Discussion

Primary tumors of the carpal bones are especially rare. Their prevalence has been estimated as less than 1% of all primary bone tumors [5, 7, 9]. Murray, et al., found only 44 (0.16%) primary neoplasms of carpal bones out of

26,800 total primary bone tumors. When the tumors were found the scaphoid bone was the most involved bone. One of the six osteoblastomas among the 44 carpal bone tumors in the Murray's series was located in the capitate bone, however further detail of the case is obscure [9].

Osteoblastoma and osteoid osteoma are closely related lesions. The typical clinical symptoms, the age at presentation and the male-to-female patient ratio are similar between osteoblastoma and osteoid osteoma. It has been mentioned that the size of the lesion is a major factor used to differentiate between an osteoblastoma and an osteoid osteoma. In the large bones, the size of an osteoblastoma is greater than 2 cm while the nidus of an osteoid osteoma is less than 1.5 cm [1–3]. In the current case, however, the lesion was quite small, making it nearly impossible to diagnose based on its size.

Viewed in a radiograph, an osteoblastoma has a less prominent sclerotic margin than an osteoid osteoma, but the small size of the carpal bones and crowded normal osseous structures in the wrist make the radiographic recognition difficult.

Histopathologic evaluation can help differentiate an osteoblastoma from an osteoid osteoma. An osteoblastoma

Fig. 3 Magnetic resonance imaging demonstrates the lesion in the capitate bone. (Black arrows)

Fig. 4 The defect in the capitate bone and the lesion at surgery is visible

Fig. 5 A histologic section shows an interlacing network of bone trabeculae lined by active osteoblasts within a prominent vascular stroma. (Hematoxyline and Eosin, $\times 100$)

shows greater cellularity with abundant and large hypertrophic osteoblasts. An osteoblastoma also contains fields of giant cells of an osteoclast type. An osteoid osteoma has a preponderance of immature bone mixed with osteoid tissue. The characteristic nidus of osteoid osteoma is not found in osteoblastoma [1–3].

Osteoblastoma can occur and represents an aggressive growth pattern without changing its histological pattern [11, 22]. Osteoblastoma can have malignant transformation and develops distant metastasis [23, 24]. In previous studies the recurrence of the tumor was heralded by pain, detected in less than six months after the initial treatment [10, 11, 22–24]. Adler has reported a case of multifocal osteoblastoma in the short tubular bones of the hand in a 9-year old child [4].

In the survey conducted by Jackson, et al., there was a 9.8% recurrence rate among the 184 osteoblastomas that had different types of treatment. The authors indicated that there was no recurrence after complete enbloc resection [1]. Therefore; enbloc resection has been considered as the treatment of choice for osteoblastomas [1, 9]. Aggressive surgery in the wrist and hand region, however, may lead to functional deficits.

Table 1 summaries a number studies that were focused on osteoblastoma involving the hand and wrist. Chaise and

Fig. 6 A histologic section shows a bone trabecula lined by active osteoblasts. (Black arrows) (Hematoxyline and Eosine, $\times 400$)

Fig. 7 A follow up X- ray, there was no recurrence 1 year after the operation

Witvoet believe that osteoblastoma is a benign lesion and so the treatment must be conservative [16, 17]. Some osteoblastomas in the carpal bones have been treated successfully by simple curettage or curettage and bone graft; [4–7, 10, 15, 18] however, recurrent, aggressive and malignant-transformed osteoblastoma lesions have also been observed, which required further surgery [10, 11, 13, 22]. Therefore; close follow-up for osteoblastoma lesions is necessary.

In a retrospective review of 46 upper extremity osteoid osteoma cases conducted by Bednar, et al., many lesions had been considered in the differential diagnosis except osteolastoma [25]. Therefore; a high index of suspicion is required to include osteoblastoma in the differential diagnosis of osteoid osteoma and other benign bone tumors in the hand and wrist region.

Table 1 Some previous research reports about osteoblastoma involving the hand and wrist

Authors	Location of the lesion	Initial treatment	recurrence	Further treatment
Olbourne et al. [14]	metacarpal	a	a	a
Davis et al. [18]	a	a	a	a
Mosher & Peckham [8]	Right fifth metacarpal	Excision+non-vascular fibular bone graft	—	—
Chaise and Witvoet [16, 17]	Proximal phalange of right thumb	a	a	a
Morton et al. [22]	Right second metacarpal	Enblock resection+ bone graft	+ within 5 months	11 operations+radiotherapy
Pizio et al. [13]	Thumb metacarpal	a	+	Resection of first metacarpal+ replacement by freeze-dried cortical-spongy bone
Apergis et al. [5]	Left hamate	Curettage+bone graft	—	—
Fanning et al. [7]	Right scaphoid	Curettage+bone graft	—	—
Castello et al. [6]	Right scaphoid	Curettage	—	—
Van Dijk [10]	Right hamate	Curettage	+ within 6 months	Enblock resection+free vascularized iliac crest flap
Murray [9]	Capitate	a	a	a
Adler [4]	Right multiple metacarpals and phalanges	Curettage+bone graft	—	—
Ragois et al. [20]	Scaphoid	Biopsy+scaphoidectomy	—	—
Xarchas and Leveit [11]	Right scaphoid	scaphoidectomy+Proximal row carpectomy	—	—
Meade et al. [15]	Scaphoid	Curettage+bone graft	—	—
Farzan et al. [19]	Right fifth metacarpal	Curettage+bone graft	—	—
Farzan et al. [19]	Right second metacarpal	Curettage+bone graft	—	—
Farzan et al. [19]	Left third metacarpal	Curettage+cement	—	Cement removal+bone graft after 3 months
Farzan et al. [19]	Proximal phalange of right index	biopsy	—	Ray amputation due to misdiagnosis
Farzan et al. [19]	Distal phalange of right thumb	Curettage+bone graft	—	—
Ntagiopoulos et al. [12]	Right fourth metacarpal	Incisional biopsy+ non-vascular fibular bone graft	—	—
Jamshidi et al. [21]	Left scaphoid	Biopsy+scaphoidectomy	—	—
This report (2011)	Right capitate	curettage	—	—

^a Further detail was not available

Primary carpal bone tumors do not have a characteristic clinical presentation. Their diagnoses can be difficult or delayed. Primary carpal bone tumors can easily be misdiagnosed and result in delayed or incomplete treatment [9]. In the current case, the diagnosis of osteoblastoma was not considered at the outset because of its infrequent occurrence. Nevertheless, en bloc resection of an osteoblastoma lesion in the large bone was the recommended treatment [1, 10, 26, 27]. This patient was treated with complete curettage of the lesion and had no recurrence at the most recent follow up although ongoing evaluation is continuing.

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