

# A Rare Case of an Osteoid Osteoma of the Rib Treated under Computed Tomography Guidance: A Case Report and Review of the Literature

Sakiko Mizuno<sup>a</sup> Ukei Anazawa<sup>b</sup> Hiraku Hotta<sup>b</sup> Naofumi Asano<sup>b</sup>  
Michiro Susa<sup>d</sup> Jun Miyauchi<sup>c</sup> Tateru Shiraishi<sup>b</sup>

<sup>a</sup>Department of Orthopedic Surgery, Keio University School of Medicine, Tokyo, Departments of <sup>b</sup>Orthopedic Surgery and <sup>c</sup>Pathology and Laboratory Medicine, Tokyo Dental College, Ichikawa General Hospital, Chiba, and <sup>d</sup>Department of Orthopedic Surgery, National Defense Medical College, Saitama, Japan

## Key Words

Osteoid osteoma · Rib · Computed tomography guidance

## Abstract

Osteoid osteoma (OO) usually occurs in the extremities of young adults. The tumor can arise in any part of the skeletal tissue; however, it is rarely found in the rib, with limited reports to date. In this report, we present a rare case of OO arising in the rib, which was successfully treated under computed tomography guidance with minimal invasiveness. At the final follow-up after 4 years, no local recurrence was observed.

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## Introduction

Osteoid osteoma (OO) is a benign tumor characterized by a small calcified lesion, usually less than 2 cm in diameter, with nocturnal pain alleviated by the administration of non-steroidal anti-inflammatory drugs (NSAIDs). OO usually affects the long bones and mostly occurs in the first 2 decades of life. OO arising in the rib is extremely rare, and only 12 cases have been reported in detail to date. Treatment for this tumor is resection of the nidus; however, difficulty in reaching the nidus through normal tissues increases the invasiveness of the surgical procedure. In the reported cases of rib OOs with surgical documentation, the affect-

ed ribs were resected in all cases. Here, we present the first case of OO arising in the rib treated with a computed tomography (CT)-guided procedure without en bloc resection of the affected rib.

## Case Report

A 20-year-old male complained of nocturnal pain in his left anterior chest which had persisted for 2 years. Conservative treatment was performed for a period of 22 months with administration of NSAIDs at a nearby hospital. His symptoms were refractory to medication. Therefore, he was referred to our hospital for further treatment. At the initial visit to our hospital, there was no local tenderness, swelling, or redness. A plain radiograph showed bulging and mild bone sclerosis of the left 8th rib (fig. 1). CT examinations revealed a well-demarcated 5-mm nidus with peripheral bone sclerosis in this area (fig. 2). The bone scintigraphy showed focal uptake of radioisotope only on the left 8th rib. Clinical and radiological findings were compatible with an OO of the left 8th rib. Because the patient refused to undergo en bloc rib resection, the operative plan was to perform resection of the nidus under CT guidance. The operative procedure was performed in the CT room under total anesthesia. After identifying the nidus with a marker, a guide pin was inserted by a power drill just adjacent to the edge of the nidus. A 5.0-mm cannulated drill was inserted over the guide pin to remove the nidus. After removing the lesion, the bone specimen which resided in the cannulated drill was sent for histological study. Subsequently, heat ablation by an electrosurgical knife using a standard electrosurgical generator was performed to completely destroy any residual tumors. Each step was confirmed by CT imaging (fig. 3). Histopathological studies showed the characteristic appearance of an OO with differentiated osteoblasts lining the osteoid and interconnected trabeculae of woven bone (fig. 4). Complete pain relief associated with the nidus resection was achieved from the first postoperative day. The patient was free of pain at the final follow-up after 4 years, and no local recurrence was observed.

## Discussion

OO is a benign osteogenic tumor first reported by Jaffe [1] in 1935. OOs may affect any bone, but more than half of the tumors occur in the long bones of the lower extremities. The frequency of OOs affecting the ribs is extremely low (1~1.4%), with only 12 reported cases with surgical intervention to date [2–13].

Both conservative and operative techniques have been reported for the treatment of OO. Conservative treatment consists of NSAID administration for a prolonged period of time, which reportedly leads to alleviation of pain in select cases. The common principle for operative treatment of OO is thorough resection of the nidus, and incomplete resection could lead to local recurrence. A complete resection of the nidus by open surgery may lead to further damage of bone and soft tissues around the lesion, when the affected bone is not subcutaneous or when visual localization of the nidus is technically difficult. Although the ribs are easily accessed, the reported lengths of en bloc resection of the nidus ranged from 5 to 9.5 cm, which is significantly wider than the size of the nidus [4–7]. There are reports of varying degrees of functional impairments due to rib resection.

In 1990, Voto et al. [14] introduced the successful treatment of OOs by percutaneous CT-guided resection. Over the years, several percutaneous treatment methods using CT guidance have been introduced: drilling resection, thermocoagulation with radiofrequency, eth-

anol injection, and a combination of these methods. These CT-guided percutaneous procedures are less invasive than conventional resection. However, recurrence rates have been reported to be as high as 10~20%, and in cases where the nidus is >10 mm, these procedures have been reported to be more likely to fail [15]. Despite these recurrence rates, a secondary operation either by CT guidance or en bloc resection leads to good results due to the remaining trace left by the primary treatment, enabling minimally invasive en bloc resection. One drawback of CT-guided resection is that a histological diagnosis may be difficult in some cases, because the resected specimens are small in quantity. By using a cannulated drill and careful curettage, we were able to make a histological diagnosis in over 90% of the cases (data not shown). CT-guided percutaneous treatment should be considered as a first-line therapy for OO in the majority of cases, except for lesions difficult to access due to the proximity of vital organs, lesions presenting with atypical findings that are difficult to diagnose as OO, and failed primary CT-guided treatments.

### Conclusion

We were able to avoid rib resection without any recurrence of symptoms by the use of a CT-guided resection and heat ablation. In addition, we were able to obtain enough tissue for histological examination by using a 5.0-mm cannulated drill. CT-guided procedures should be considered as a treatment of choice for OO of the rib in order to minimize the loss of respiratory function.

### Statement of Ethics

The authors have no ethical conflicts to disclose. Informed consent was obtained from the patient for this case report and any accompanying images.

### Disclosure Statement

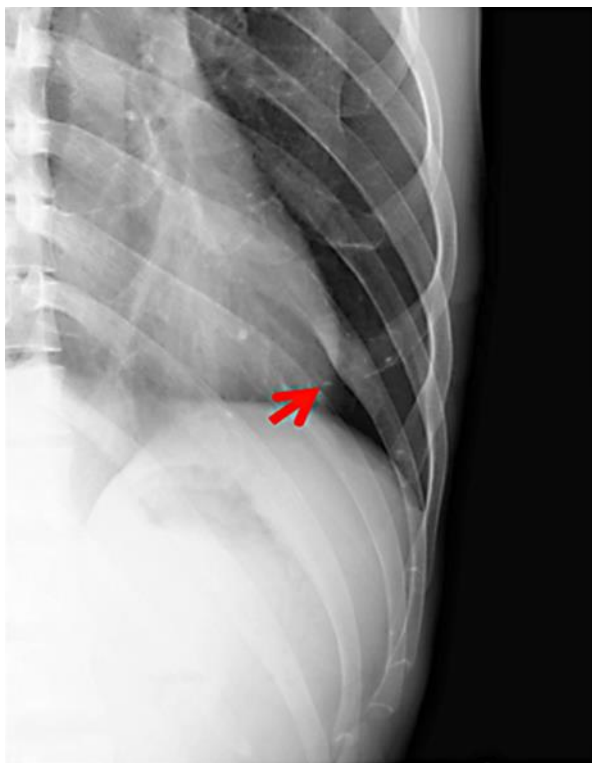
The authors have no conflicts of interest to declare.

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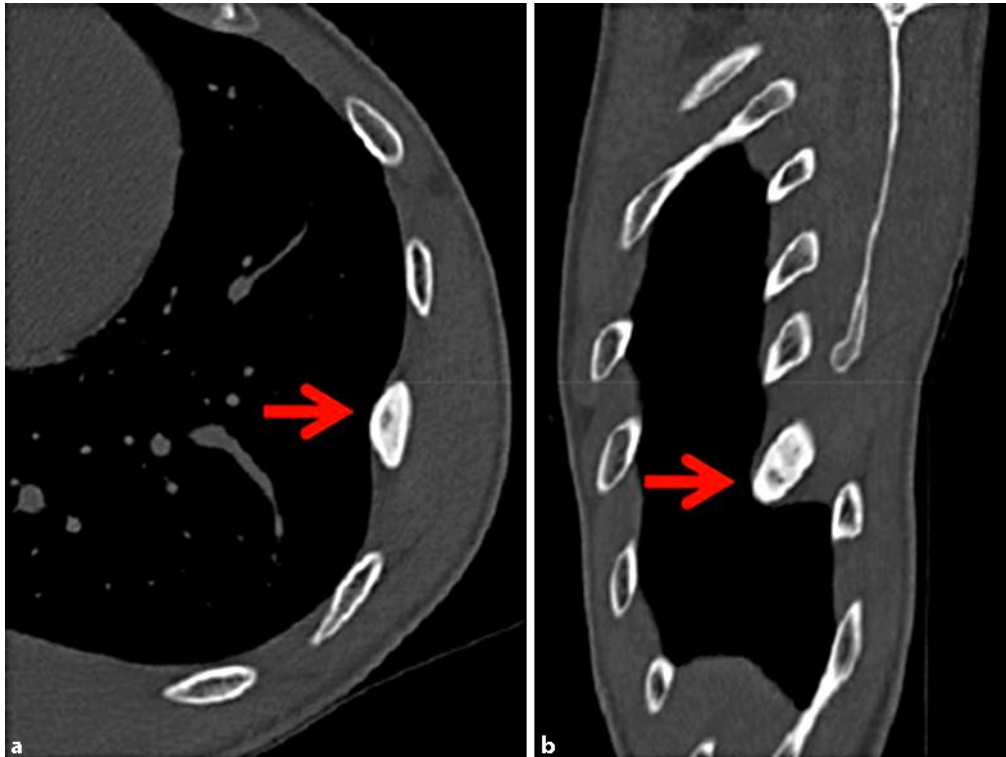
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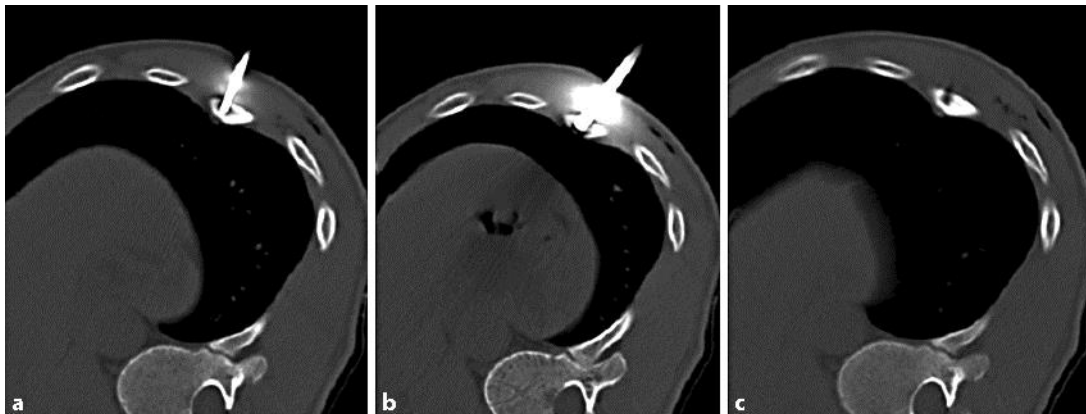


**Fig. 1.** Radiograph of the rib at the initial presentation. Bulging and mild sclerosis can be seen in the left 8th rib (arrow).

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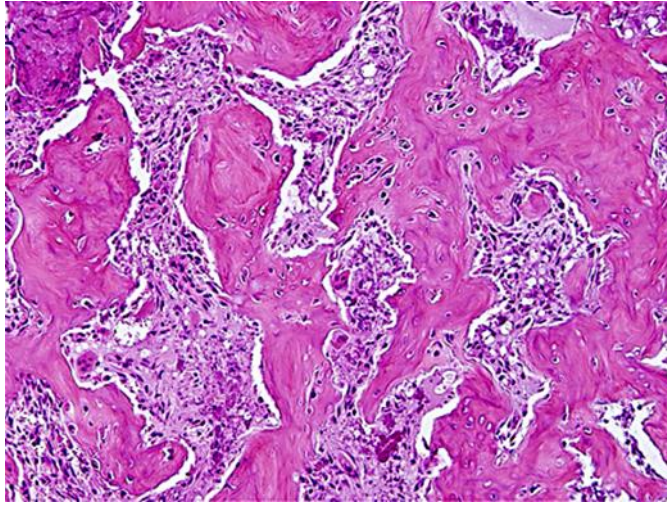


**Fig. 2.** Preoperative CT examination. Axial view (a) and sagittal view (b). An osteolytic lesion surrounded by bone sclerosis (arrow) can be observed in the left 8th rib without any periosteal reaction.



**Fig. 3.** Intraoperative findings. a A guidewire has been inserted into the nidus under CT guidance. b Tumor resection by a 5.0-mm cannulated drill over the guidewire. c A postoperative CT shows the successful resection of the nidus.

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**Fig. 4.** Histopathological findings demonstrate random reticular osteoid formation within a fibrovascular stroma consistent with OO.