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Periosteal Chondroma of the Rib: A Rare Case With Documented Interval Enlargement

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Abstract

Periosteal chondroma is a rare benign cartilaginous tumor that typically arises in the metaphyses of long tubular bones, with involvement of the rib rarely reported. Although periosteal chondroma is generally described as a slowly growing tumor, longitudinal documentation of its growth is limited, particularly for lesions arising from the rib. We report a rare case of rib periosteal chondroma with documented interval enlargement. A 54-year-old man had an asymptomatic 8-mm nodule incidentally detected on chest computed tomography (CT) five years earlier. The lesion remained 8 mm during two years of CT surveillance, after which follow-up was discontinued. Three years later, routine chest radiography revealed enlargement of the lesion, and subsequent CT demonstrated a diameter of 20 mm. CT-guided percutaneous needle biopsy favored a benign cartilaginous tumor, with periosteal chondroma considered the most likely diagnosis. However, because of the interval enlargement in an adult patient, a malignant cartilaginous tumor could not be completely excluded, and surgical resection was performed for definitive diagnosis. The tumor was excised en bloc using a combined thoracoscopic and open approach, and histopathological examination confirmed the diagnosis. The patient has remained disease-free for four years postoperatively. Although interval enlargement in an adult patient may raise concern for a malignant cartilaginous tumor, growth alone does not necessarily indicate malignancy. This case highlights the diagnostic challenge associated with interval enlargement of a rib periosteal chondroma.

Categories: Radiology, Orthopedics, Cardiac/Thoracic/Vascular Surgery
Keywords: cartilaginous tumor, chest wall tumor, periosteal chondroma, rib tumor, temporal growth, thoracic surgery

Introduction

Periosteal chondroma is a benign cartilaginous tumor first described by Lichtenstein and Hall in 1952 [1]. It arises beneath the periosteum on the surface of bone and typically causes cortical erosion with sclerosis of the adjacent bone [1-3]. It occurs predominantly in children and young adults and most commonly involves the metaphyseal regions of long tubular bones [2,3]. Among more than 7,000 primary bone tumors treated at the Mayo Clinic, only 46 were periosteal chondromas, of which only two involved the rib [2]. Thus, rib involvement has been rarely reported.

Patients with periosteal chondroma may present with symptoms such as pain or swelling, although some lesions are asymptomatic [4-10]. Periosteal chondroma is generally described as a slowly growing tumor [1]; however, longitudinal data on its growth rate and time course are limited. When interval enlargement is observed, periosteal chondrosarcoma should also be considered in the differential diagnosis, making accurate diagnosis clinically important. In the present case, the lesion remained stable at 8 mm during two years of computed tomography (CT) surveillance but was found to have enlarged to 20 mm when reevaluated three years after surveillance was discontinued. This case illustrates that a rib periosteal chondroma may be found to have enlarged after a period of radiographic stability and highlights the diagnostic challenge associated with interval enlargement.

Case Presentation

A 54-year-old man was referred for evaluation of an enlarging right second rib lesion that had been incidentally detected five years earlier, when he was 49 years old. At the time of initial detection, a chest CT had been performed because of suspected drug-induced pneumonia after he developed fever, cough, and peripheral blood eosinophilia. CT showed a pulmonary infiltrate and incidentally revealed an 8-mm subpleural nodule adjacent to the right second rib. His medical history included childhood asthma, allergic rhinitis, and chronic sinusitis, with no history of chest trauma. He had no symptoms or physical examination findings attributable to the lesion. His respiratory symptoms resolved, with no recurrence of the pulmonary infiltrate. The lesion was followed by CT at approximately six-month intervals and remained 8 mm for two years. Because the lesion remained unchanged in size and was not considered clinically suspicious for malignancy, follow-up was discontinued. Three years later, while the patient remained asymptomatic, a chest radiograph obtained during a routine health examination revealed enlargement of the lesion. Subsequent CT demonstrated a diameter of 20 mm (Figure *1*).

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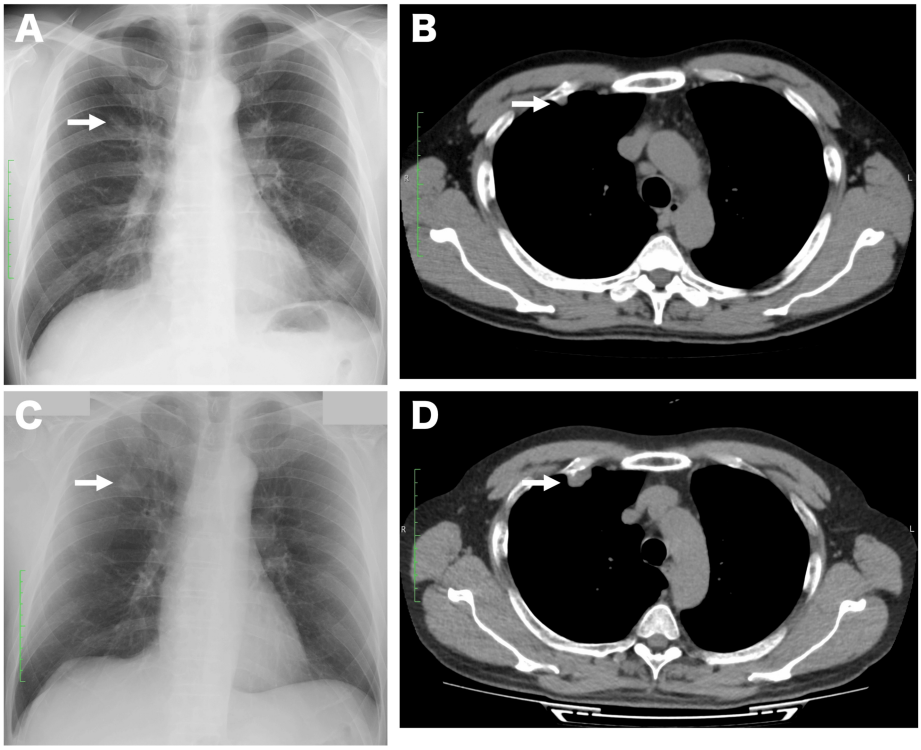


FIGURE 1: Radiological findings.

A: Chest radiograph at initial detection showing an 8-mm nodule adjacent to the right second rib (arrow). B: Chest CT at initial detection demonstrating an 8-mm nodule adjacent to the right second rib (arrow). C: Chest radiograph obtained five years after initial detection showing enlargement of the lesion (arrow). D: Chest CT obtained five years after initial detection demonstrating enlargement to 20 mm (arrow).

CT-guided percutaneous needle biopsy was performed for tissue diagnosis. Histopathological findings favored a benign cartilaginous tumor, and periosteal chondroma was considered the most likely diagnosis based on the histological findings and chest wall location. However, because the lesion had enlarged from 8 mm to 20 mm in an adult patient and the biopsy specimen represented only a limited portion of the lesion, a malignant cartilaginous tumor could not be completely excluded. Therefore, surgical resection was performed for definitive diagnosis and treatment.

Under thoracoscopic visualization, the tumor was found to arise from the anterior portion of the right second rib and was well-encapsulated, with no evidence of invasion into the right lung (Figure *2A*). Because the lesion originated from the rib and periosteal chondrosarcoma could not be completely excluded preoperatively, we considered that resection of the tumor alone would be insufficient for secure en bloc resection of the involved chest wall. Therefore, a hybrid thoracoscopic and open approach was selected. An 8-cm skin incision was made over the second rib, and the tumor was resected en bloc with the involved rib, adjacent intercostal muscle, and parietal pleura, with an approximately 1-cm gross surgical margin. Intraoperative frozen-section examination showed no obvious cytological atypia and a regular cellular arrangement, supporting the diagnosis of periosteal chondroma. Therefore, no additional chest wall resection was performed. No chest wall reconstruction was performed.

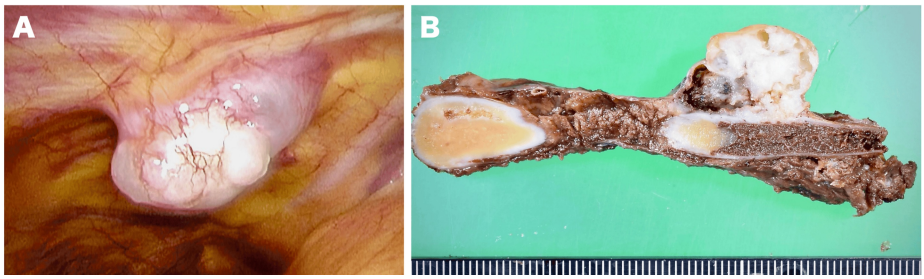


FIGURE 2: Surgical findings.

A: Thoracoscopic view showing a well-encapsulated tumor arising from the right second rib. B: Resected specimen showing the tumor in continuity with the cortical bone with a well-defined boundary. The ruler scale is marked in 1-mm increments.

The chest tube was removed on postoperative day 2, and the patient was discharged on postoperative day 5 without major complications. Epidural analgesia was continued until chest tube removal, after which pain was adequately controlled with oral analgesics. Transient paradoxical movement of the chest wall was observed at the resection site. The paradoxical movement gradually improved, was evident only during deep respiration or coughing at approximately three weeks, and had almost completely resolved by six months after surgery. The resected tumor measured 20 mm × 15 mm × 15 mm and was continuous with the cortical bone, with a well-defined boundary on the cut surface (Figure *2B*).

Histopathological examination with hematoxylin and eosin staining revealed proliferation of cartilage cells with minimal cytological atypia, without obvious nuclear atypia, and with a regular cellular arrangement. These findings were consistent with periosteal chondroma, with no histological features suggestive of chondrosarcoma (Figure *3*).

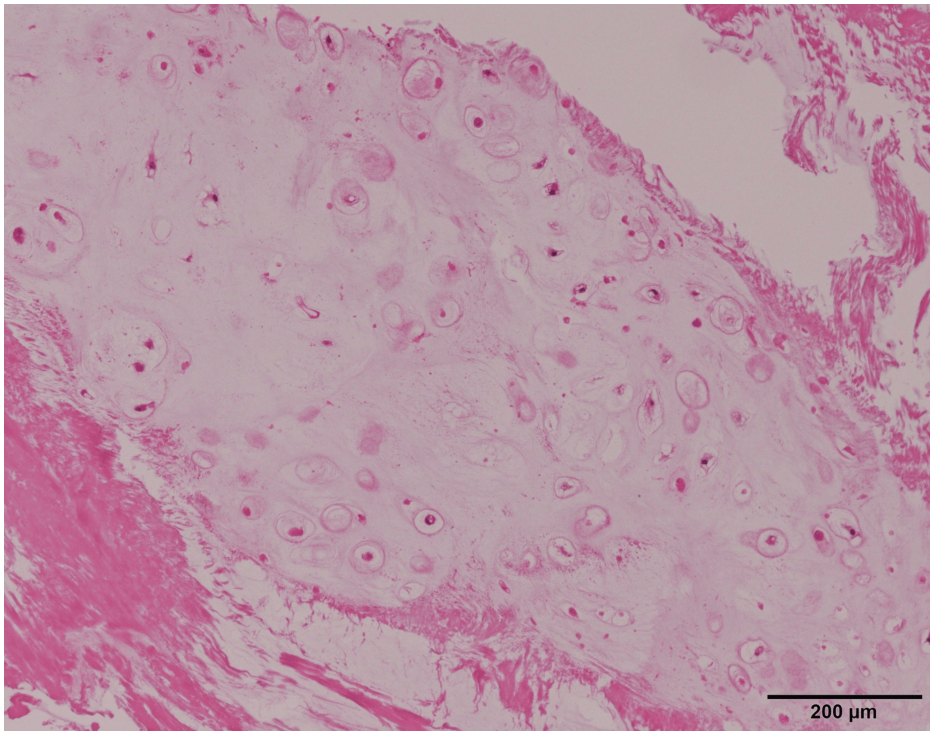


FIGURE 3: Histopathological findings.

Hematoxylin and eosin staining showing proliferation of cartilage cells with minimal cytological atypia, no obvious nuclear atypia, and a regular cellular arrangement, consistent with periosteal chondroma (scale bar = 200 µm).

The patient has been followed annually with chest CT. At the most recent follow-up, four years after surgery, he remained asymptomatic, and chest CT showed no evidence of local recurrence. No adjuvant therapy was administered.

Discussion

We reviewed cases reported in the English-language literature in which the diagnosis of periosteal chondroma was explicitly stated and sufficient clinical information was available. These cases are summarized in Table *1* [4-10].

Authors	Year	Age/ Sex	Symptoms/ Presentation	Rib site	Tumor size (mm)	Treatment
Morisaki et al. [4]	1996	45/M	Pain	R6	70 × 55 × 40	Resection
Inoue et al. [5]	2001	5/M	Pain, swelling	L5	8 × 6 × 5	Resection
Inoue et al. [5]	2001	39/M	Cough	L4	22 × 15 × 13	Resection
Karabakhtsian et al. [6]	2005	11/F	Asymptomatic	L4	25 × 15 × 8	Resection
Matsushima et al. [7]	2006	13/M	Pain, dyspnea, hemothorax	R9	Not reported	Resection
Samaddar et al. [8]	2019	12/F	Swelling, pain	L2	80 × 67 × 64	Resection
Kurt et al. [9]	2021	44/M	Pain	R6	Not reported	Resection
Gao et al. [10]	2022	43/M	Asymptomatic	R4	47 × 28	Resection

TABLE 1: Reported cases of periosteal chondroma of the rib with available clinical details.

M: male; F: female

Clinical presentation varied among the reported cases, ranging from asymptomatic lesions to tumors associated with pain, swelling, or hemothorax. Tumor size also varied considerably, and lesions as large as 80 mm were histologically diagnosed as benign periosteal chondroma [8]. All cases included in Table *1* underwent surgical resection, and no longitudinal preoperative observation was described. However, because reported cases are limited to lesions that were biopsied or resected, small asymptomatic rib lesions may be underrecognized, and the true incidence of rib periosteal chondroma remains unknown.

In contrast, the present case was followed radiographically for two years, during which the lesion remained stable. Follow-up was then discontinued, and when the lesion was reevaluated three years later, it had enlarged from 8 mm to 20 mm. Periosteal chondroma is generally described as a slowly growing tumor [1]; however, because no imaging was performed during this three-year interval, the exact timing and rate of enlargement in the present case cannot be determined. Nevertheless, this case illustrates that enlargement may be detected after a period of radiographic stability. Such interval enlargement should prompt reassessment for possible malignancy, although growth alone does not necessarily indicate malignancy. Because longitudinal observations of unresected periosteal chondromas are limited, the available evidence is insufficient to define an optimal follow-up interval or a specific growth threshold for surgical intervention.

Interval enlargement of a periosteal cartilaginous tumor should raise concern for malignancy. Marcove and Huvos reported 35 cartilaginous tumors of the ribs, including eight chondromas and 27 chondrosarcomas; all chondromas measured less than 4 cm, whereas enlargement during observation was reported in four patients with chondrosarcoma [11]. Robinson et al. compared 11 periosteal chondromas with 11 periosteal chondrosarcomas and found that periosteal chondrosarcomas were significantly larger than periosteal chondromas; however, considerable overlap in tumor size was observed between the two entities, making reliable radiological distinction difficult [12]. Based on these findings, they suggested that wide surgical excision may be appropriate for lesions larger than 3 cm. In the present case, CT-guided percutaneous needle biopsy favored a benign cartilaginous tumor, with periosteal chondroma considered the most likely diagnosis; however, because the lesion had enlarged and the biopsy specimen represented only a limited portion of the lesion, malignancy could not be completely excluded. We therefore performed en bloc resection of the lesion and involved chest wall to allow histopathological evaluation of the entire lesion while considering the possibility of malignancy. Intraoperative frozen-section examination supported the diagnosis of periosteal chondroma, and no additional chest wall resection was performed.

Conclusions

Periosteal chondroma is generally described as a slowly growing benign tumor. However, a lesion that has previously been radiographically stable may subsequently be found to have enlarged. Although interval enlargement can raise concern for a malignant cartilaginous tumor, growth alone does not necessarily indicate malignancy. Because periosteal chondroma may be difficult to distinguish reliably from periosteal chondrosarcoma by imaging and limited biopsy specimens, interval enlargement should prompt

reassessment. When malignancy cannot be confidently excluded, surgical excision for definitive diagnosis should be considered.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Sachiko Imai

Acquisition, analysis, or interpretation of data: Sachiko Imai, Erika Mori

Drafting of the manuscript: Sachiko Imai

Critical review of the manuscript for important intellectual content: Erika Mori

Disclosures

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