

## Case Report

# Periosteal Chondroma of the Proximal Humerus: A Case Report and Review of the Literature

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*Periosteal chondroma is a slow growing benign cartilaginous tumor of bone. It is rarely reported among Thai people. The authors present a case of periosteal chondroma of the proximal humerus. A 14-year-old girl was admitted with a painless mass around her left shoulder.*

*On magnetic resonance images, a subcutaneous lesion with hypointensity on T1-weighted images and marked hyperintensity on T2-weighted images, eroded the underlying cortical bone of the proximal humerus. The patient underwent marginal excision. There was no recurrence of the lesion during 3 years of follow-up.*

**Keywords:** Periosteal chondroma, Chondroma, Humerus

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Periosteal chondroma is a slow-growing benign cartilaginous tumor of limited size arising within or under the periosteum, which through constant pressure induces cortical erosion and periosteal reaction. The first description of periosteal chondroma was published by Keiller<sup>(1)</sup> in 1925. He reported a 20-year-old man with a benign cartilage tumor of the toe, which he called subperiosteal epiphyseal chondroma. In 1952, Lichtenstein and Hall reported six cases of periosteal chondroma<sup>(2)</sup>. Men are affected more often than women and peak age incidence is during the second and third decades<sup>(2,3)</sup>. In 70% of cases the long tubular bones, especially humerus and femur, are affected<sup>(3,4)</sup>. About two-thirds of lesions are centered in the metaphysis<sup>(3,4)</sup>. Presentation is with a painless mass or mild pain, as in the presented case<sup>(2)</sup>. In contrast to periosteal chondrosarcoma, periosteal chondroma rarely exceeds a size of 3-4 cm in diameter<sup>(5)</sup>. Woertler et al reported 12 cases of periosteal chondroma with the tumor size of 1-7 cm<sup>(6)</sup>. The characteristic radiologic appearance is of a single cartilaginous mass in the metaphyseal periosteum causing well-defined depression or saucerization of

the adjacent cortex. Histologically, periosteal chondromas are composed of lobules of hyaline cartilage. The lesion frequently shows hypercellularity, multinucleation, and plump nuclei, which can lead to the erroneous diagnosis of chondrosarcoma<sup>(3-5,7)</sup>. To the authors' knowledge, periosteal chondroma has never been previously reported in the northern part of Thailand. The authors herein present a case of periosteal chondroma of the proximal humerus.

### Case Report

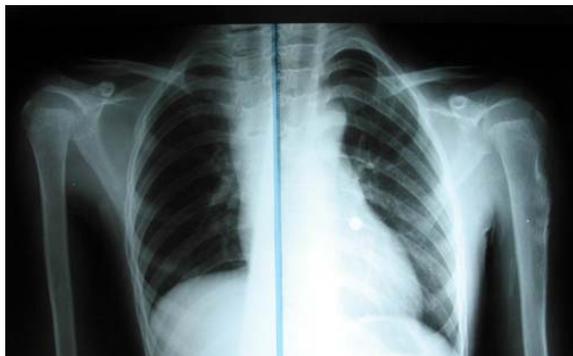
A 14-year-old girl presented at the study hospital because of a painless mass around the left shoulder region of 2 month's duration. The mass had gradually enlarged. Physical examination revealed a hard mass of the lateral aspect of the left upper arm. No skin changes were noted, and the skin was not adherent to the mass. There was neither tenderness nor limitation of motion of the left shoulder. There was no axillary or epitrochlear lymphadenopathy. Past medical history and laboratory studies were unremarkable. Radiographs showed cortical erosion involving the proximal humerus. The lesion was surrounded by periosteal response that produced a fine sclerotic margin (Fig. 1A, B). Computed tomography (CT) showed an extraskeletal lobulated mass with focal calcification.

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**Fig. 1A** Anteroposterior radiograph of left shoulder shows pressure erosion of the lateral cortex with overhanging osseous margins (saucerization)



**Fig. 1B** AP view of both shoulders shows the lesion at left proximal humerus comparing with the right side

Irregularity and thickening of the cortex were also noted (Fig.2). Magnetic resonance imaging (MRI) findings showed low intensity in the T1-enhanced image and high intensity from the T2-enhanced image. The tumor had not invaded the bone marrow (Fig. 3A and B). During the operation, the mass was found to be localized in the subcutaneous tissue, it was totally surrounded by a white capsule, and was attached to the lateral aspect of the proximal humerus. The authors performed marginal excision for the entire lesion. Macroscopically, the periosteal tumor consisted of an oval, well-circumscribed cartilaginous tumor, measuring 5.5 x 2.5 x 2 cm

in greatest dimension. The specimen showed tumor at the margin (Fig. 4A). Its surface was bluish-gray and covered by periosteum. The tumor was sent for frozen section and periosteal chondroma was a presumed diagnosis. An histological examination revealed a lobulated mass composed of dense matrix and groups of chondrocytes. Fibrous periosteal tissue covering the surface of the cartilaginous tumor was also noted (Fig. 4B, C). There was no sign of mitosis, consistent with periosteal chondroma. Postoperative radiographs were shown as Fig. 5A and 5B. There has been no recurrence in the 3 years since the surgical excision.

### Discussion

Periosteal chondroma is a relatively uncommon benign tumor of bone. It is a cartilaginous tumor that arises within or under the periosteum producing a broad based cartilaginous mass that may extend into soft tissues. The tumor often induces cortical erosion and periosteal reaction through constant pressure. Nojima et al<sup>(5)</sup> described the presence of 46 periosteal chondromas from more than 7000 primary bone tumors at the Mayo clinic. Brien et al<sup>(14)</sup> reported 16 cases of periosteal chondroma representing 1.3% of all cartilage tumors. The tumor has its highest incidence in the second decade of life, with mean ages from 23 to 28 years, but a wide range of ages (1 year to 73 years) also was observed<sup>(3-5,7,9)</sup>. Periosteal chondroma has



**Fig. 2** The axial CT scan reveals a mass with matrix calcification and scalloping of humeral cortex



**A**



**B**

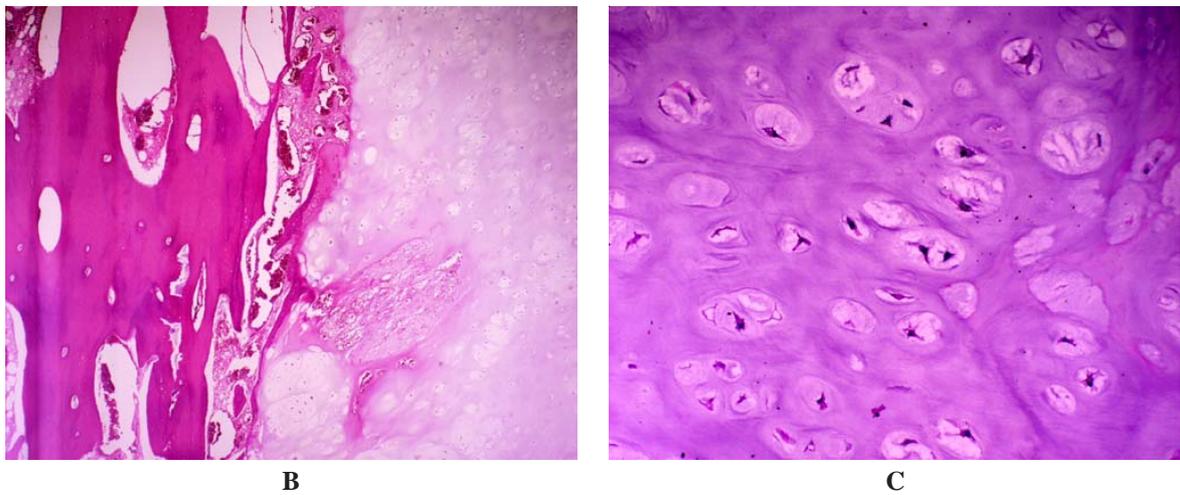
**Fig. 3A, B** The MR images show a lobulated mass at the bone surface, hyperintense relative to fat. The lesion does not invade the intramedullary canal



**Fig. 4A** A picture of gross specimen shows a lobulated, bluish mass

been reported in various bones<sup>(3,8,9)</sup> but the tumor has commonly involved the proximal humerus<sup>(3-5,7,9,14)</sup>. The average size of the tumor is 2.8 cm, with a range of 0.9-6.0 cm<sup>(5)</sup>. The common clinical manifestation includes

focal swelling and pain, and sometimes a mass<sup>(3,7-9)</sup>. The patient presented with painless mass around the shoulder. Radiographs often show cortical erosion surrounded by periosteal reaction producing a thin



**Fig. 4B, C** Histologic photomicrographs demonstrate hypercellular cartilage lobules covered by fibrovascular tissue. Note periosteal new bone formation. High power photomicrographs show hyaline cartilage with focal mixoid change. Chondrocytes show no obvious atypia and binucleated chondrocytes are occasionally noted



**Fig. 5A, B** Postoperative radiographs show the lesion was en bloc excised. A complete recovery was achieved with no recurrence during 3 years of follow-up

margin of cortical sclerosis underlying the base of the tumor. Additionally, focal calcification can be detected within the soft tissue mass<sup>(4,6,9)</sup>. Of particular interest is the differentiation of periosteal chondroma from

periosteal chondrosarcoma. It is widely recognized that the radiographs are easily misinterpreted and thought to be those of a chondrosarcoma<sup>(2)</sup>. Periosteal chondrosarcoma generally are larger, and may present a large mass in the soft tissues<sup>(10)</sup>. Although scalloping and sclerosis of the cortex can be similar in the two lesions, periosteal chondrosarcomas tend to invade the underlying bone. In addition, periosteal osteosarcoma should be considered in the differential diagnosis of periosteal chondroma. Other benign tumors including fibrous cortical defect, cortical desmoid, and aneurysmal bone cyst may be also considered in the differential diagnosis of periosteal chondroma. CT may show the scalloped cortex, matrix calcification, and cortical shell. Magnetic resonance imaging (MRI) in addition to radiography can effectively aid in the preoperative differential diagnosis by demonstrating a subperiosteal mass with typical features of a cartilaginous tumor, defining the shape of the osseous defect, and excluding involvement of the medullary canal<sup>(6)</sup>. Varma et al<sup>(15)</sup> described the characteristics of periosteal chondroma on MRI having intermediate signal intensity on T1-weighted imaging and high intensity on T2-weighted imaging.

Lorento et al<sup>(11)</sup> noted that CT and MRI provided the best means of diagnosing periosteal chondroma because of their accuracy in distinguishing the soft tissues. The radiographic abnormalities observed in the presented patient correspond well to data from the literature<sup>(4,6)</sup>, thus the diagnosis for periosteal

chondroma was not difficult for this patient. Histologically, the lesions show benign cartilage arranged in a lobular pattern. This is predominantly normocellular, but hypercellularity and mild atypia may be present<sup>(12)</sup>. Therefore, the tumor can erroneously be interpreted as signs of malignancy<sup>(13)</sup>. Nojima et al<sup>(5)</sup> reported a series of 46 patients with periosteal chondroma in which 33 had hypercellularity, nuclear enlargement, hyperchromasia, double-nucleated cells, or myxoid change of the matrix, as seen in the presented patient. Other series have shown similar results<sup>(3,4,7,14)</sup>. Preoperative diagnosis in the presented case was not difficult because radiological and histological features corresponded with periosteal chondroma. The treatment of choice for periosteal chondroma is marginal excision. Although intralesional curettage is a successful treatment for many patients with periosteal chondromas, recurrence has been reported after intralesional surgery<sup>(7,9,16,17)</sup>. Mora et al<sup>(16)</sup> believe that the reported cases of local recurrence can be attributed to inadequate intralesional excision. According to the literature review, Lewis et al showed that among 165 cases of periosteal chondroma, only six cases of local recurrence were reported, a recurrence rate of 3.6%<sup>(9)</sup>. The authors obtained a cure for the reported case without any recurrence through marginal excision.

### Conclusion

This is the first case of periosteal chondroma of the proximal humerus reported from the northern part of Thailand. Although there was no published article for the incidence of this tumor in Thailand, the authors believe that periosteal chondroma is very rare among Thai people. The clinical findings and the typical radiological features of the presented case point to the diagnosis of periosteal chondroma, which must be confirmed with histological examination.

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## รายงานผู้ป่วยเป็นเนื้องอกของกระดูกชนิด Periosteal chondroma ที่กระดูกต้นแขน

ศิริชัย ลีวิฑูรเวชกิจ, โอปาร อาภรณ์ชยานนท์, ธนินนิตย์ ลีรพันธ์, ทรงศักดิ์ ชุนศรี

เนื้องอกของกระดูกชนิด Periosteal chondroma เป็นเนื้องอกของกระดูกอ่อนที่สามารถขยายขนาดใหญ่ขึ้นได้อย่างช้า ๆ เนื้องอกชนิดนี้พบได้น้อยในคนไทย ผู้นี้พนธ์ได้รายงานการตรวจพบเนื้องอก Periosteal chondroma ในผู้ป่วยเด็กหญิงอายุ 14 ปี ซึ่งมารับการรักษาด้วยปัญหาที่มีก้อนที่บริเวณหัวไหล่ข้างซ้าย ผู้ป่วยไม่มีอาการปวด ผลการตรวจคลื่นแม่เหล็ก (MRI) พบว่ามีเนื้องอกอยู่ในชั้นใต้ผิวหนังและกดบริเวณกระดูกต้นแขนเป็นรอยหวำ ผู้ป่วยรายนี้ได้รับการผ่าตัดรักษาแบบ marginal excision และยังไม่พบว่ามีกำเริบเป็นซ้ำของเนื้องอก หลังจากผ่าตัดตาม ผู้ป่วยหลังผ่าตัด 3 ปี

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