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### Case Report

## Fracture of a persistent olecranon physis in an adult

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### ABSTRACT

A persistent olecranon physis is relatively rare; a fracture through the persistent olecranon physis in an adult is particularly rare. Little is known about the pathology of this disease. We report a case of a 36-year-old man presenting with right elbow pain after he had slipped and hit his elbow, with a history of a persistent symptomatic olecranon physis when he was a junior high school baseball player. He had been diagnosed with a fracture through a persistent olecranon physis by another doctor. Ten weeks after the injury, an iliac autograft was inserted and internal fixation was achieved with Kirschner wires and a figure-of-eight tension band in our hospital. Histologically, a fracture passed through the persistent physis cartilage and degeneration of the remnant of the physis was observed. The remnant of the physis at the olecranon side had not been replaced by new bone, though the physis at the distal ulnar was nearly replaced by new bone. The patient returned to work without experiencing pain or limitation in the range of motion 6 months after the operation. Radiographic evidence of bone union was seen after removal of internal fixation at the 13-month follow-up.

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### Introduction

Reports of fracture of a persistent olecranon physis in an adult are rare [1–4], compared with those in adolescence where treatment has been established [5]. Matsuura et al. reported the value of radiographic criteria in the treatment of persistent symptomatic olecranon physis in adolescent throwing athletes [6]. Little is known about the pathology of this disease in adults. Our review of the published literature identified four

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cases of a fracture through a persistent olecranon physis in adults [1–4], of which two had a growth plate remnant evident on histology [1,2]. In one report, the fracture was presumably represented by the line of clefts in a specimen of persistent olecranon physis [1]. Physeal separation was evident through the middle of the growth plate rather than hypertrophic zone but typical physeal fractures tend to pass through the hypertrophic zone [7]. Here, we present a rare case of a fracture through a persistent olecranon physis and the histological findings.

### Case report

A 36-year-old man, with a history of a persistent symptomatic olecranon physis when he was a junior high school baseball player, felt pain in his right elbow after he had slipped and hit his elbow. He was diagnosed with an olecranon fracture by a doctor and later consulted our clinic. Physical examination revealed tenderness around the olecranon physis with a limitation of elbow extension of 20°. Lateral radiographs showed a displaced olecranon fragment with a sclerotic margin (Fig. 1A, B). An operation was performed 10 weeks after the injury. The fracture site was partially removed for histological examination. An iliac autograft and internal fixation of the persistent physis was achieved with Kirschner wires and a figure-of-eight tension band (Fig. 1C). Six months after the operation, the patient had full range of motion and was able to return to work (Fig. 1D).



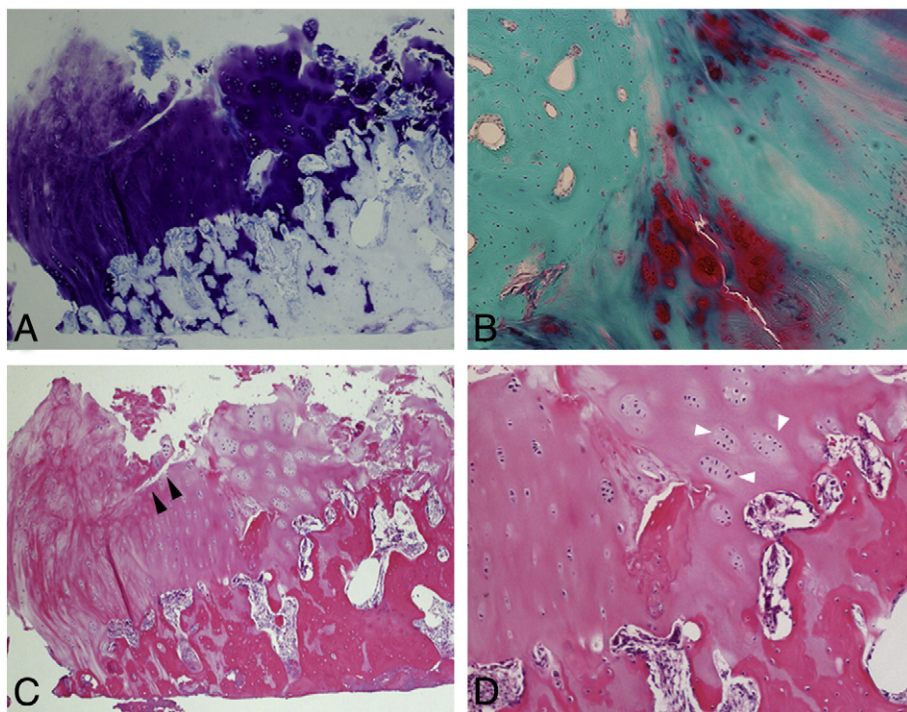
**Fig. 1.** Anteroposterior and lateral radiographs of the elbow (A, B). A transverse, irregular radiolucent line with a sclerotic border was found at the proximal physis of the olecranon. After iliac autograft and internal fixation with tension band wiring (C). After removal of internal fixation (D).

without experiencing pain. Radiographic evidence of bone union was seen after removal of internal fixation at the 13-month follow-up (Fig. 1D). All procedures followed the ethical standards of the committee on human experimentation (institutional and national) and the Helsinki Declaration of 1964 and its later versions. Written informed consent was obtained from the patient for publication of the study.

Histological examination showed that bone trabeculae were thickened and a remnant of the growth plate was present (Fig. 2A), consisting of mainly hyaline cartilage that showed metachromasia with toluidine blue staining. Although the remnant of the growth plate was surrounded by new bone at the distal edge (diaphysis side) of the fracture (Fig. 2B), new bone was not seen at the proximal edge (olecranon side) (Fig. 2C). The cleavage was observed in the middle of the growth plate (indicated by black arrowheads, Fig. 2C). Chondrocyte columns were disorganised and the number of chondrocytes were decreased (Fig. 2D). Chondrocyte cluster formations were observed at the growth plate (white arrowheads, Fig. 2D). These findings were consistent with cartilage degeneration and fracture of the persistent olecranon physis.

## Discussion

Here, we described a case of a fracture of a persistent olecranon physis in an adult with histological findings. The diagnosis of the persistent olecranon physis was made based on the patient's history and histology findings of the operative specimen. Radiographs of persistent olecranon physis in adolescents have been well studied and the criteria for treatment have been established by Matsuura et al. [6]. Our case was thought to be stage II according to their criteria. All findings were consistent with a diagnosis of fracture of the persistent olecranon physis.



**Fig. 2.** Specimen of the proximal bone fragment was stained with toluidine blue. (A) and H & E (C, D). The remnant of the physis was metachromatically stained (A). Specimen of the distal bone fragment was stained with Safranin O. Chondrocytes, stained with red, was completely surrounded by new bone, stained with green (B). Disorganised chondrocyte columns and uneven staining were observed at the cartilage matrix (C). Black arrowheads indicate the cleft in the physis. Hypocellularity and chondrocyte clustering (white arrowheads) were observed at the physis (D). A, B  $\times 40$ ; C, D  $\times 100$ .

Our histological findings were consistent with those in previous reports [1–4]. The remnant of the physis was surrounded by sclerotic bone, and new bone formation did not occur at the proximal edge of the fracture site. In addition, we showed that degeneration of cartilage matrix was present. Enishi et al. reported the presence of cartilage degeneration in the persistent olecranon physis of an adolescent baseball player [8], which is consistent with our finding. The olecranon fracture traversed the middle of the physis remnant. Generally, fractures of the physis occur at the hypertrophic zone because of its mechanical weakness [7]. The lack of chondrocyte columns and the degeneration and homogenization of the cartilage matrix might have shifted the site of greatest mechanical weakness to the middle of the remnant of the physis.

Radiographs showed that the bone fragment was completely separated and new bone was not observed at the edge of fracture site. On histological examination, new bone was not observed at the edge of the proximal fragment although the remnant of the persistent olecranon physis was replaced by a bone at the edge of the distal bone fragment. It has been reported that conservative therapy failed to heal a fracture of the persistent olecranon physis [2]. These observations strongly suggest that an operation is necessary to treat fracture of the persistent olecranon physis in adults [8].

The necessity of the iliac autograft in the present case remains unclear and represents a limitation of this study. Bone union might be achieved with appropriate care even in the absence of an iliac autograft. In this case, an iliac autograft was inserted because sclerotic change was observed at the rim of the persistent physis and blood supply to the fracture site was therefore considered to be poor.

In conclusion, we described a rare case of fracture of the persistent olecranon physis in an adult. The remnant of the growth plate had degenerated and was not replaced by new bone. The fracture through the persistent olecranon physis was successfully treated with internal fixation plus an iliac autograft.

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## Conflict of interest statement

All authors declare that they have no conflicts of interest.

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