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# Osteofibrous dysplasia-like adamantinoma versus osteofibrous dysplasia in children: A case report of challenging diagnosis

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## ABSTRACT

**INTRODUCTION:** Osteofibrous dysplasia (OFD) and Osteofibrous dysplasia-like Adamantinoma have a similar appearance both in clinical and radiography, but different in its histopathology. Despite this similarity, the treatment and prognosis are different, therefore the diagnosis should be established precisely.

**CASE ILLUSTRATION:** A three-year-old boy was admitted to hospital after falling on his lower leg. A bead size lump appeared on his tibia with pain and swelling, which later became enlarged. Diagnosis of osteofibrous dysplasia and adamantinoma was considered. We performed limb-salvage procedure by curettage, bone grafting, and internal fixation application. The histology section showed woven bone rimmed by polygonal osteoblast cell with intervening fibrous stroma and small nests of tumour cells raised the possibility of epithelial differentiation. The positivity for cytokeratin immunostaining confirmed the diagnosis as osteofibrous dysplasia-like adamantinoma. In this case it is a very rare spectrum of malignancy in children.

**DISCUSSION:** These two tumor entities have identical radiographic characteristics, histopathology features the distinction between classic adamantinoma and OFD-like adamantinoma based on the predominant epithelial component. The relationship of osteofibrous dysplasia with adamantinoma is unclear. Several authors considered possible calling relationship osteofibrous dysplasia as “juvenile adamantinoma”. However, does not rule out the possible existence of de novo osteofibrous dysplasia not related to adamantinoma.

**CONCLUSIONS:** OFD-like adamantinoma and Osteofibrous Dysplasia had similar histopathology pattern, a pathologist must be aware of this feature and perform immunohistochemical staining for keratin particularly when the histopathological feature of osteofibrous dysplasia showed small nests of tumor cells within the fibrous stroma. diagnostic challenging and require multidisciplinary approach.

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## 1. Introduction

Osteofibrous dysplasia (OFD) and OFD-like Adamantinoma have a similar appearance both in clinical and radiography, but different in its histopathology. Despite this similarity, the treatment and prognosis are very different, therefore establishment of diagnosis should be performed precisely. The age spectrum of OFD is in the first and second decade of life whereas the age spectrum of adamantinoma is older than 20. The predilection site of OFD most often in the anterior shaft of the tibia of children [1,2]. The OFD makes up less than 1 % of all primary bone tumour, and usually develop in patients younger than 20 years old or in skeletally imma-

ture patients. Mostly all OFD occur in the shaft of tibia, with few reports arise in fibula and other long bones in arm such as humerus, radius, and ulna. Adamantinoma can develop at any age with adolescent and young adult are most often affected. These tumours frequently found in the middle part of the tibia, and in many cases the fibula is also affected. In rare instances, also can be found in the bones of the arm, rib, pelvic, foot, and spine. About 20 % of these tumour metastasize to other parts of the bodies, most often to the lung, lymph node, and other bones [3,4].

Although OFD has typical histopathology feature, OFD-like areas are also observed at periphery of classic adamantinoma, and some have indicated that OFD could be either a precursor to or a regressive adamantinoma process [5].

The so-called OFD-like adamantinoma shares certain aspects of both OFD and adamantinoma. In an effort to better describe their morphology, clinical course, and relationship, experts have analysed the physiology, biochemical, histopathology, immunohis-

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tochemistry, ultrastructural, and molecular characteristics of OFD and adamantinomas. Patients with OFD were usually younger than those of with adamantinoma. Osteoblastic and osteoclast was more common in OFD than in OFD-like adamantinoma. In addition to the unnoticeable small clusters of epithelial cells in OFD-like adamantinoma, isolated keratin-positive cells with a special ultrastructural hybrid fibroblastic-epithelial phenotype have been found in the stroma of all OFD and OFD-like adamantinomas [6,7]. Analysis with in situ fluorescence hybridization revealed trisomies 7, 8, and/or 12 in the OFD, OFD-like, and classic adamantinoma with spindle cell stroma, supporting OFD neoplastic origin and a typical histogenesis for all 3 lesions. Trisomies in osteoblasts or osteoclasts were not found, indicating that the osseous portion is reactive and non-neoplastic. Here we present our 3-year-old boy with Osteofibrous Dysplasia-like adamantinoma that came to our center. Our manuscript has been reported in line with the SCARE criteria [15].

2. Case description

A three-year-old boy came to our polyclinic with chief complain there was a lump and pain on his lower leg. He came with a history of trauma in tibia, and pain along with swelling. A bead size lump appeared on his proximal tibia with pain, which later became enlarged (Fig. 1).

From physical examination the mass was not clearly seen, no venectation nor wound, in palpable we found hard mass at mid shaft tibia with pain vas score 3–4 and, ill define border, immobile. The circumferential diameter 24 cm (contralateral 23 cm), range of motion hip and knee was normal. Distal neurovascular within normal limit (Figs. 2 and 3).

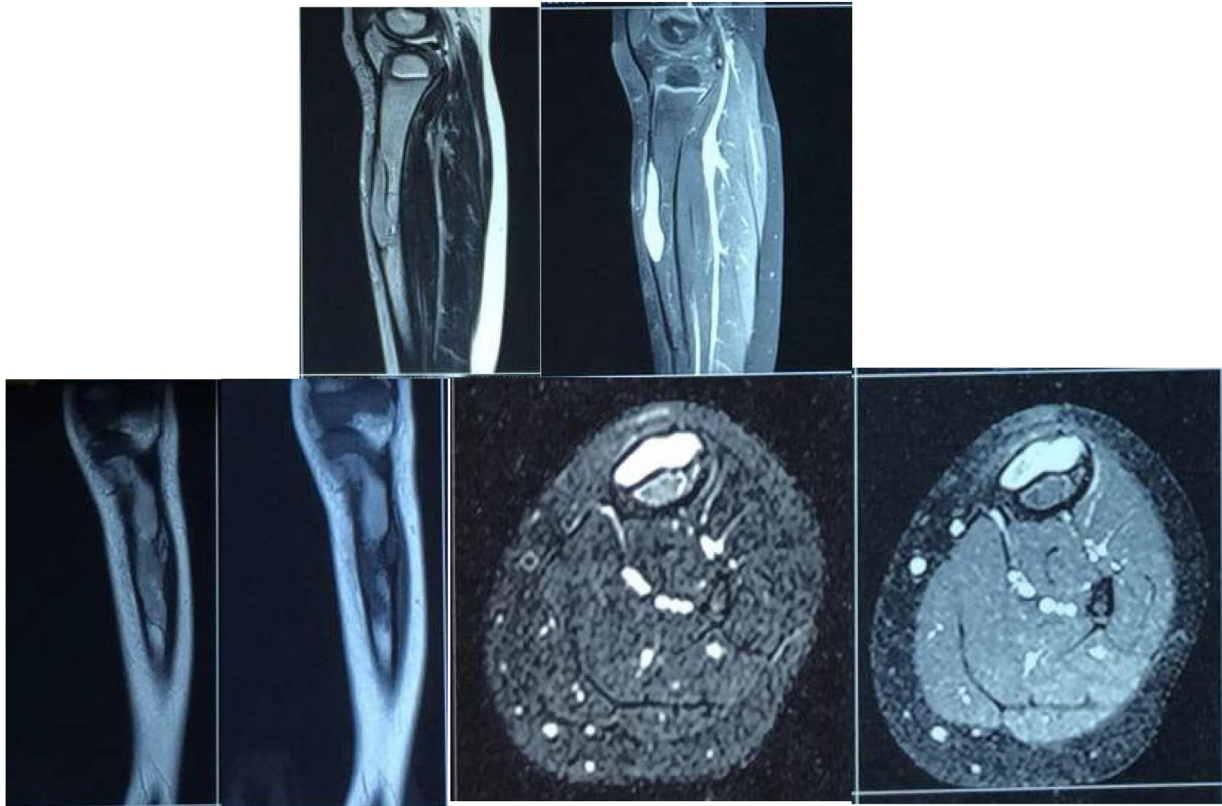
Intraoperatively, the incision was made at the anteromedial side of the leg layer by layer until the periosteum. Then the periosteum was incised at one side and performed curettage until



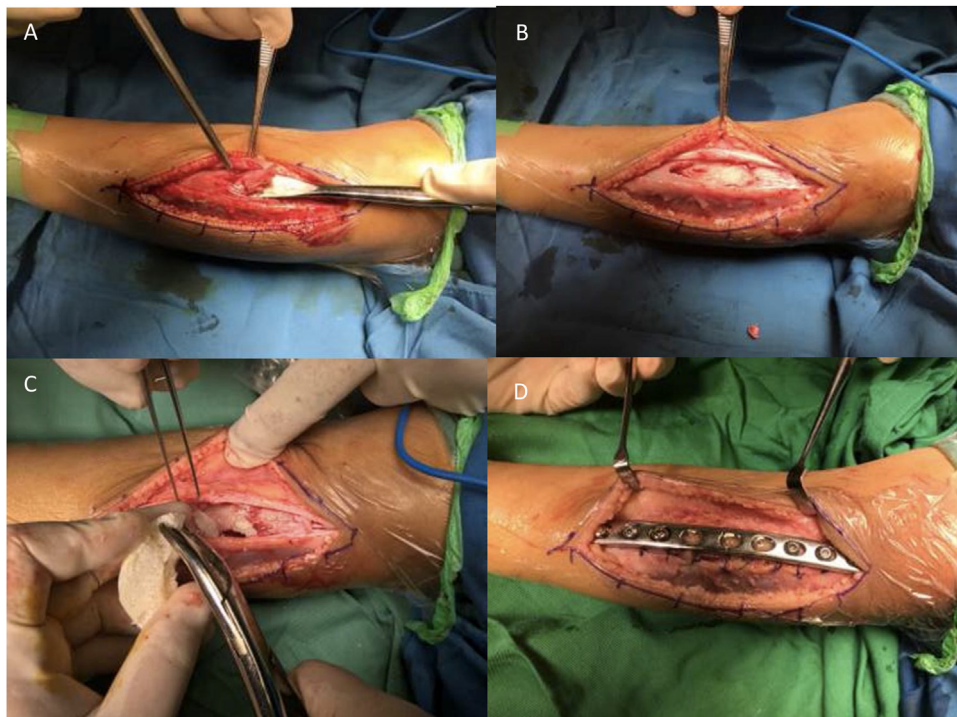
Fig. 1. Clinical picture of the patient; hard palpable mass measuring 24 cm circumferential (contralateral 23 cm), immobile with ill define margin.



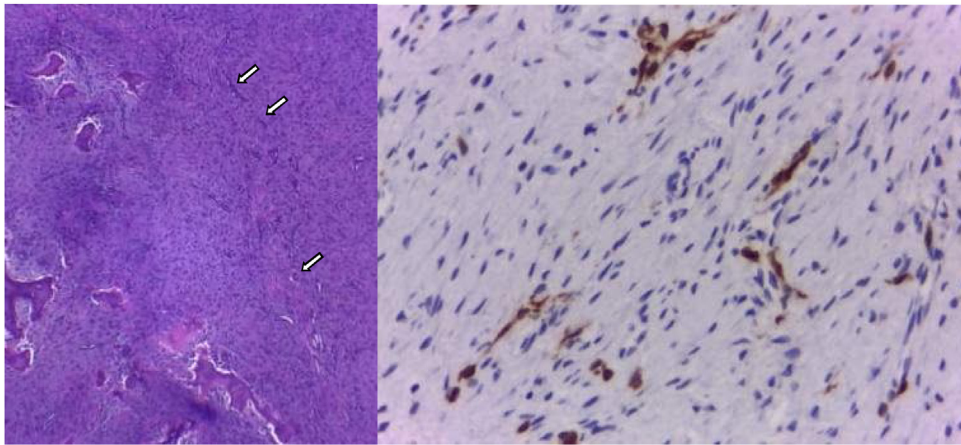
Fig. 2. Preoperative radiography right cruris; showing geographic lytic lesion septation at midshaft tibia without periosteal reaction, narrow transitional zone, well define margin, there is no cortex breakage, no sign soft tissue involvement.



**Fig. 3.** MRI of the leg; tumor lesion appears on anterior side of tibia, isointensity on T1 and hyperintensity on T2. After contrast administration lesion uptake contrast and enhancement of lesion with homogenous pattern, no sign infiltration into surrounding soft tissue and intramedullary. Conclusion from MRI are primary bone tumor suggestif benign suspect osteofibrous dysplasia, no sign of malignancy.



**Fig. 4.** (A) identifying and curettage of the tumor, (B)bone defect after curettage in the cruris, (C) bone graft application, (D) small DCP plate application.



**Fig. 5.** (A) The histology showing irregular trabeculae of woven bone rimmed by osteoblasts with intervening fibrous stroma and small nests of epithelial cells (arrow), H&E, 40×; (B) Small nests of tumor cell positive for cytokeratin (100×).



**Fig. 6.** Post-operative x-ray.



Fig. 7. Clinical picture after one-year post-operative.

the distal and proximal edge. After the curettage, the defect was filled with bone graft and the periosteum was sutured back. For the reinforcement of the leg, a small 9-holes DCP was applied. After that the wound was cleansed and sutured layer by layer (Figs. 4–6).

Diagnosis of OFD-like adamantinoma was considered after this case was discussed in clinicopathology forum and our pathologist suspicious of multiple small nest island of epithelial cell in the stroma. Then we proceed to exclude the possibility of malignancy with performed immunohistochemical staining for keratin. The positivity for cytokeratin in immunostaining confirmed the diagnosis as osteofibrous dysplasia-like adamantinoma. In this case, it is very rare spectrum of malignancy in children.

Osteofibrous dysplasia-like adamantinoma had typical feature of osteofibrous dysplasia with spectrum age in children, slow growing mass, from imaging there is no sign of soft tissue and intramedullary involvement of the tumor. The histology of this tumor is overall similar to OFD, the bony trabeculae are mostly rimmed by osteoblast with intervening fascicles of fibroblastic cells. The small nests of epithelial cells and individual keratin positive cells in the stroma are characteristic feature of OFD-like adamantinoma. Therefore, it is essential to confirm the diagnosis from the morphology and immunostaining.

We evaluated the patient one year after surgery, there is no complain, patient can walk normally without aid. Clinical and radiological evaluation there is no sign of recurrency (Figs. 7 and 8).

### 3. Discussion

Osteofibrous Dysplasia is predominantly a childhood's disease, while adamantinoma usually occurs in adolescents and young adults, and indeed half of the patients in our OFD series were 9 years old or older, whereas none with adamantinoma was less than 9 years old. The predominant symptoms for OFD is painless, however if the pain present it is mandatory to include the OFD-like adamantinoma as a differential diagnosis [1,5].

These two tumor entities have identical radiographic characteristics including the predilection for the tibial diaphysis anterior cortex and a multiloculated, mixed osteolytic and sclerotic presentation with sclerotic margins. Both lesions in the tibia may be multifocal or have synchronous lesions in the fibula. Like previous studies, our study showed that tibial bowing is more common in OFD, however medullary extension is more frequent in adamantinoma, but there is no pathognomonic picture characteristic of either lesion.

The radiologic features of the OFD and OFD-like Adamantinoma are quite similar. It is not possible to distinguish between osteofibrous dysplasia and OFD-like adamantinoma based on imaging alone [9]. Classic adamantinoma could be distinguished from osteofibrous dysplasia according to the involvement of the medullary cavity and soft tissue extension seen on MRI [9,12]. Complete involvement of the medullary cavity is almost always seen in an adamantinoma. In contrast to OFD and OFD-like

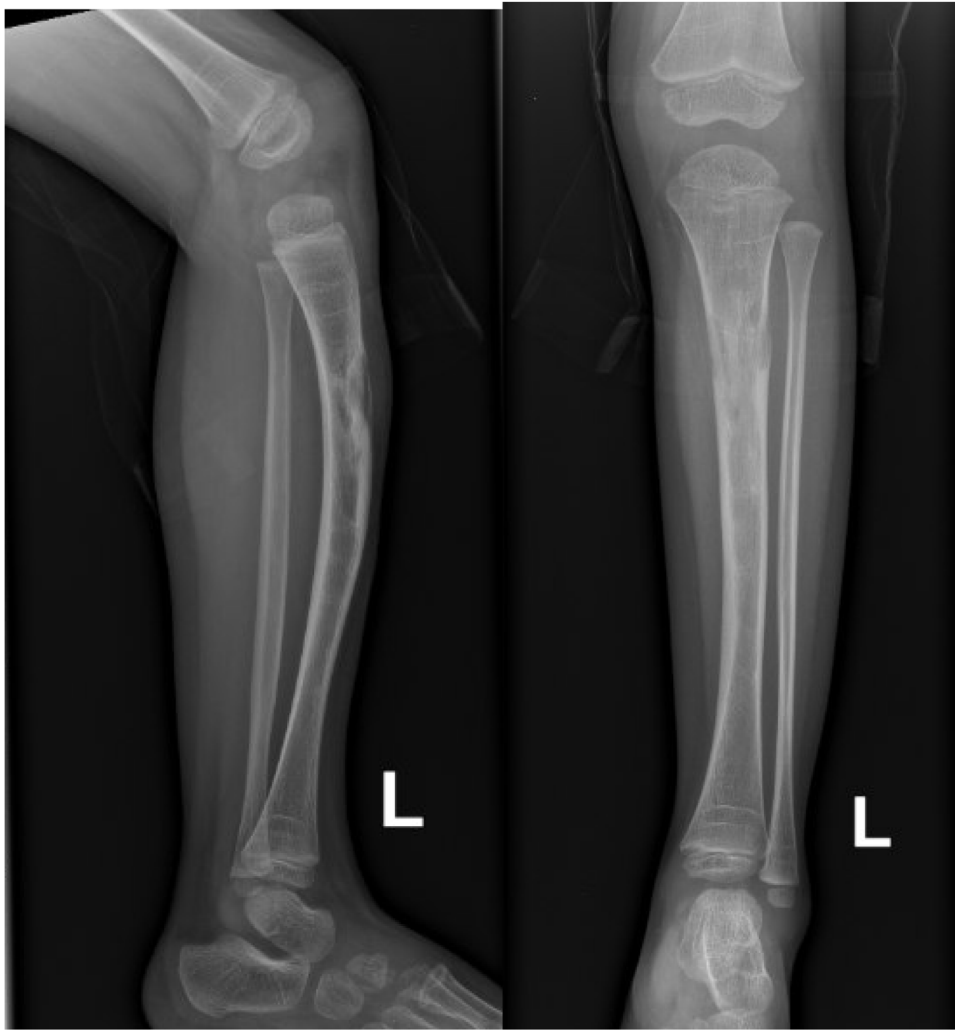


Fig. 8. Plain radiography after one-year post-operative and implant removal.

adamantinoma, intra medullary involvement is minimal or absent [9,12].

Some author suggested osteofibrous dysplasia are radiologically diagnostic, however radiological feature of osteofibrous dysplasia and OFD-like adamantinoma are indistinguishable. Both have same site predilection on midshaft tibia, anterior bowing, multiple lucencies, sclerotic foci, or both features involving the anterolateral cortex of the tibia with associated cortical expansion and sclerosis of the intervening cortex. There is a little differentiation between OFD-like adamantinoma and osteofibrous dysplasia. OFD-like adamantinoma usually present with long history of dull pain on anterior tibia, on the other hand osteofibrous dysplasia usually painless with anterior bowing of tibia, but clinical symptom is not pathognomonic. However, when we compare differentiation between classic adamantinoma and OFD-like adamantinoma more clearly, in classic adamantinoma mostly there is involvement of intramedullary cavity, surrounding soft tissue and complete cortical disruption. This imaging feature are able to distinguish between classic adamantinoma with OFD-like adamantinoma [3].

From histopathology feature the distinction between classic adamantinoma and OFD-like adamantinoma based on the predominant epithelial component. In classic adamantinoma the epithelial component is dominant and easily seen, but the OFD-like areas are inconspicuous. Conversely OFD-like adamantinoma have small nests of epithelial component with predominant OFD-like areas.

The small nests of epithelial tumor cells are characteristic feature of OFD-like adamantinoma. The small nest of epithelial cells also distinguishes OFD-like adamantinoma from osteofibrous dysplasia, as in the osteofibrous dysplasia the small nest of epithelial cells is not seen. Only single scattered keratin-positive stromal cells are present in OFD [3,14].

OFD-like adamantinoma and osteofibrous dysplasia have similar histopathology pattern, pathologist must be aware to perform immunohistochemical staining for keratin particularly when the histopathological feature of osteofibrous dysplasia shows small nests of epithelial tumour cells within the fibrous stroma [1,5].

The relationship of osteofibrous dysplasia with adamantinoma is unclear. Czerniak et al. [3] reported that there is a continuum of lesions with classic adamantinoma at one end and osteofibrous dysplasia at the other. This hypothesis is also supported by another author considered this possible relationship by calling osteofibrous dysplasia as “juvenile adamantinoma”. This hypothesis, however does not set aside the possibility of *de novo* osteofibrous dysplasia that has no relation to adamantinoma. However, the study determined that there was no definite evidence of a precursor role for osteofibrous dysplasia [3,9,11].

As the OFD is not malignant lesion and will not grow after the patient reaches skeletal maturity, the treatment typically involves observation and conservative treatment. However, if the lesion has caused considerable damage to the bone it is advisable to per-

form surgical removal of the lesion in order to stabilize the bone. On the other hand, treatment of adamantinoma always require surgery. They do not respond to chemotherapy and radiation. The treatment for adamantinoma is somewhat like the treatment for GCT and osteosarcoma with regards to surgical management, adamantinoma is a far more aggressive lesion than OFD and as such requires wide local resection with reconstructive surgery for optimal management. Adamantinoma has a risk of local recurrence and pulmonary metastatic disease despite is lower than another bone malignancy. Various study suggests that a curettage combined with bone graft could be considered for the treatment of the tumor like adamantinoma [8–10]. Conservative management with observation sometimes can be done, however resection with clear margin is required for patients with adamantinoma. [8,13]. One year after surgery we evaluate patient and we found no sign of recurrency nor progression into worse condition. However, because this case of low-grade malignancy we plan to evaluate every year in this patient.

#### 4. Conclusion

We reported a rare case of OFD-like adamantinoma which was treated by limb salvage surgery with curettage, bone graft application, ORIF plate and screw. OFD-like Adamantinoma and osteofibrous dysplasia had similar histopathology pattern, pathologist must be aware to perform immunohistochemical staining for keratin particularly when the histopathological feature of osteofibrous dysplasia shows small nests of tumor cells within the fibrous stroma. Although the incidence of OFD-like adamantinoma is low, it is important to recognize this rare bone tumour. Furthermore, to differentiate between osteofibrous dysplasia and OFD-like Adamantinoma still diagnostic challenging and require multidisciplinary approach.

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#### Ethical approval

Ethical approval was not required in this case report.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Author contribution

Achmad Fauzi Kamal contributes in the study concept or design, data collection, analysis and interpretation, oversight and

leadership responsibility for the research activity planning and execution, including mentorship external to the core team.

Fahmi Anshori contributes to the study concept or design, supervising and critically review the manuscript.

Evelina Kodrat contributes to the study concept or design, data collection and writing the paper.

#### Registration of research studies

Not applicable.

#### Guarantor

Achmad Fauzi Kamal is the sole guarantor of this submitted article.

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