Fibrocartilaginous Dysplasia – A Report of Five Cases with Review of Literature

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Learning Point of the Article:
Fibrocartilaginous dysplasia is a rare variant of fibrous dysplasia which needs to be differentiated from other cartilaginous neoplasms of bone, thereby preventing misdiagnosis.

Abstract

Introduction: Fibrocartilaginous dysplasia (FCD) is a variant of fibrous dysplasia (FD) with extensive cartilaginous differentiation. This has been reported in both monostotic and polyostotic types of FD, the proximal femur being the most common site involved.

Case Report: We report five cases of fibrocartilaginous dysplasia with varying degrees of cartilaginous differentiation. The age of the patients ranged from 7 to 30 years, and there was a female predominance (M:F ratio of 1:4). The proximal femur was the site of involvement in all the cases. Imaging showed well demarcated radiolucent lesions with stippled calcifications. Histologically, cartilaginous areas were noted juxtaposed to typical areas of fibrous dysplasia. Four of the patients were treated with curettage and one with a marginal resection. None of the five cases had recurrences at the past follow-up.

Conclusion: FCD is a rare variant of fibrous dysplasia which needs to be diagnosed and treated early, as there is a high risk of pathological fracture.

Keywords: Fibrous dysplasia, fibrocartilaginous, cartilaginous tumors, enchondroma, chondrosarcoma.

Introduction

Fibrous dysplasia is a benign fibro-osseous lesion of the bone that occurs due to a dysplastic process involving the bone forming mesenchyme. They can be either monostotic or polyostotic and have a predilection for long bones (especially the femur), craniofacial bones, and ribs [1]. There is a wide morphologic spectrum including the infrequent presence of cartilage. Fibrocartilaginous dysplasia is an extreme end of the spectrum of FD with marked cartilaginous overgrowth. Radiological and histopathological findings in some cases, especially if only the cartilaginous component is sampled at biopsy may be mistaken for cartilaginous neoplasms causing a diagnostic dilemma [2, 3, 4].

We report five cases of fibrocartilaginous dysplasia with clinical, radiological, and pathological features and review the literature of this interesting entity.

Case Report

This study included five cases of fibrous dysplasia with varying degrees of cartilaginous differentiation reported at Apollo Hospitals, Chennai. Archived Hematoxylin and Eosin stained sections of these cases were reviewed and fresh sections recut where necessary. The clinical findings of these cases were obtained from the patients' medical records; and radiological images were available and were reviewed. This study was approved by ethics committee (institutional review board).

Four of the cases were children and one was an adult (age range: 8–30 years). There were four females and one male. The presenting symptoms were pain, swelling, or pathological fracture, which prompted the patients to seek medical help. The cases were non-ambulatory, but their pain did not interfere with their daily activities. The radiographs showed well demarcated radiolucent lesions with stippled calcifications. Histological examination revealed cartilaginous areas juxtaposed to typical areas of fibrous dysplasia. Four of the patients were treated with curettage and one with a marginal resection. None of the five cases had recurrences at the past follow-up.

Learning Point of the Article:
Fibrocartilaginous dysplasia is a rare variant of fibrous dysplasia which needs to be differentiated from other cartilaginous neoplasms of bone, thereby preventing misdiagnosis.
The duration of symptoms was variable from few weeks to few years. Imaging revealed monostotic, well demarcated, expansive and lytic lesions with cortical thinning, and involving the neck of femur in all the cases. A classical Shepherds’ crook deformity was noted in all the cases. Fracture associated changes were noted in three cases and there was no soft tissue extension in any. Specs of calcification were noted in all the cases in variable proportions. The radiological impression was fibrous dysplasia in two cases and enchondroma in three. Curettage was done on four cases and an en bloc resection was performed in one patient. The radiograph and the image of the gross specimen of the patient with the marginal resection are shown in (Fig. 1).

Microscopically, typical areas of fibrous dysplasia areas with scattered irregular woven trabeculae with no osteoblastic rimming against a background of spindle cell stroma were noted in all cases. This component was closely juxtaposed to a cartilaginous component which varied from 25% to 80% of the tissue. Well demarcated islands of hyaline cartilaginous with few interdigitating extensions in the adjacent stroma were noted. The cartilaginous component was predominantly hypocellular except for two cases exhibiting focal hypercellularity with infrequent binucleation of chondrocytes. Many of these chondroid nodules showed peripheral calcification and ossification with osteoblastic rimming. Epiphyseal growth plate like areas with chondrocytes arranged in long columns was noted in three cases. Photomicrographs of the histology are shown in (Fig. 2). Clinical follow of all the patients did not reveal any recurrence at follow-up. The clinical details of all the patients are summarized in Table 1.

**Discussion**

Fibrous dysplasia may rarely exhibit cartilaginous differentiation, which may range from rare microscopic focus to grossly or radiologically evident large areas. The percentage of the cartilaginous component varies and no cutoff has been proposed as to when these should be termed FCD rather than FD. Florid fibrocartilaginous dysplasia is the extreme end of spectrum of FD with cartilaginous differentiation. Radiological and histopathological findings in such cases may mimic cartilaginous neoplasms, causing a diagnostic dilemma [2, 3, 4]. Fibro chondrodysplasia was the term proposed by Pelzmann et al. for these cases of fibrous dysplasia with prominent cartilaginous component [5]. The term has been replaced and is now called fibrocartilaginous dysplasia.

Kyriakos et al. in their review article state that FCD may occur at any age ranging from 3 to 66 years with a mean of 18.3 years. There is slight male preponderance as compared to FD, where there is no gender predilection. They have been reported in both polyostotic and monostotic cases. Some studies have reported its frequent occurrence in monostotic cases and others in polyostotic cases. The femur is the most common location that has been reported. FCD often presents with pain, a mass, or deformities of the limb [2].

There are many hypotheses regarding the origin of the cartilaginous islands. Sankerin et al. proposed that they arise from the developmental rests at the epiphyseal growth plate [4]. This concept is supported by the fact that these cartilaginous nodules often show peripheral enchondral ossification with osteoblastic rimming, unlike the adjacent metaplastic bone of fibrous dysplasia. Areas resembling epiphyseal growth plates are
Radiologically, fibrous dysplasia is usually a well-defined expansile lesion involving the medullary cavity, often with cortical thinning. The density of the tumor varies depending on the relative proportions of fibrous, cartilaginous, and osseous tissue. Soft-tissue extension is not seen. In long-standing cases, the bone is markedly expanded causing extreme bowing and angulation, resulting in a classical shepherd crook’s deformity [10]. While FCDs resemble fibrous dysplasia radiologically, the associated cartilaginous foci have dot-like, ring-like (annular), or floccular calcifications. If the cartilaginous component is associated cartilaginous foci have dot-like, ring-like (annular), or floccular calcifications. If the cartilaginous component is extensive, a cartilaginous neoplasm may be mimicked radiologically [2].

Histologically, there is an admixture of typical areas of fibrous dysplasia and hyaline cartilaginous nodules. The cartilaginous areas are often well delineated with peripheral calcification and enchondral ossification and demonstrate scattered chondrocytes lacking atypia with rare binucleation [2]. Occasionally foci resembling epiphyseal growth plates are observed. Molecular studies have shown that fibrous dysplasia is caused by postzygotic missense mutations of GNAS1 gene [11] and is now being incorporated in the diagnostic workup of fibro-osseous lesions. However, its significance in FCD has not been well studied, there being a single case report of FCD with GNAS mutations [12].

These lesions may mimic various cartilaginous neoplasms radiologically and histologically. The main differentials that are considered are enchondroma, low grade chondrosarcoma, dedifferentiated chondrosarcoma, and fibrocartilaginous mesenchymoma. Enchondroma is a consideration especially in small biopsies where FD areas are not sampled. However, the presence of epiphyseal growth plate-like areas with enchondral ossification should raise a suspicion of FCD. FCD may rarely show binucleated chondrocytes, thereby raising concern for a low-grade chondrosarcoma. Lack of atypia with absence of a soft-tissue component may help in separating the two entities. Rarely the spindle cell areas next to cartilaginous nodules may mimic a dedifferentiated chondrosarcoma. However, absence of high-grade cellular areas with marked nuclear pleomorphism will exclude dedifferentiated chondrosarcoma. The main differential diagnosis is fibrocartilaginous mesenchymoma which shows significant overlap with FCD clinically, histologically, and radiologically. This is a benign tumor with locally aggressive behavior. Radiologically, they resemble FCD except for some cases showing soft-tissue extension. Histologically, they show cartilaginous nodules within a spindle celled stroma and the cartilaginous areas are similar to FCD with enchondral ossification. Unlike FCDs, however, the stroma is compact and hypercellular with elongated hyalochromatic spindle cells. They may even show mild nuclear atypia [13]. Finally, FCDs should not be confused with focal fibrocartilaginous dysplasia which is a dysplastic process of long bones causing angular deformity in children. It has been suggested that there is failure in mesenchymal differentiation at the region of pes anserinus, resulting in excessive fibrocartilage, which interferes with local bone growth [14].

FCD with abundant cartilage can lead to extreme deformity with attendant significant therapeutic problems. Early treatment is required, as they often predispose the bone for pathological fracture. Treatment is similar to that of FD, often surgical with curettage and bone grafting or osteotomy with internal fixation. Rarely en bloc resection can be done for cases with extreme deformities [2, 3, 4, 7].

Malignancy arising from fibrous dysplasia has been rarely reported, especially osteosarcoma and fibrosarcoma [15]. However, review of literature suggests a benign course of FCD with no reported recurrences or malignancies. Kyriakos et al. in their review article suggested that since cartilage has been in reported in fibrous dysplasia in varying amounts in many cases, fibrocartilaginous dysplasia probably represents the extreme end of cartilaginous differentiation in FD, rather than a distinct entity [2].

**Conclusion**

FCD is a rare variant of fibrous dysplasia and its distinction from other benign or malignant cartilaginous neoplasms is important. The location and radiology coupled with the biphasic histology enables the alert observer to recognize this entity in curetted’s; though in a needle or small biopsies the presence of only the cartilaginous component could create diagnostic difficulties. Awareness of the entity and radiological correlation helps prevent misdiagnosis.
Clinical Message

These five cases are being reported to create greater awareness among pathologists of a rare variant of a common disorder. The histopathological differentiation from other cartilaginous neoplasms is crucial as the treatment is often conservative surgical intervention.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient’s parents have given their consent for patient images and other clinical information to be reported in the journal. The patient’s parents understand that his names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.
Conflict of interest: Nil  Source of support: None

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Conflict of Interest: Nil  Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this case report

How to Cite this Article

Lakshmanan A, Parameswaran A. Fibrocartilagenous Dysplasia – A Report of Five Cases with Review of Literature. Journal of Orthopaedic Case Reports 2022 February; 12(2): 61-64.