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Radiologic Findings in Seven Patients with Fibrodysplasia Ossificans Progressiva

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Fibrodysplasia ossificans progressiva is a rare and disabling syndrome, which is characterized by heterotopic ossifications and skeletal deformities. So far, around 200 patients with fibrodysplasia ossificans progressiva have been reported in the world literature. Herein, we analyze the clinical records of 7 known cases of fibrodysplasia ossificans progressiva from Iran who were admitted to the pediatrics wards of our centers between 1983 and 2002, and present the radiologic findings.

**Keywords:** Fibrodysplasia ossificans progressiva (FOP) • radiologic findings

Introduction

Fibrodysplasia ossificans progressiva (FOP) is a rare and disabling syndrome, which is characterized by heterotopic ossifications and skeletal deformities. So far, around 200 patients with FOP have been reported in the world literature. The disorder tends to inherit as an autosomal dominant trait, but the majority of cases are sporadic mutations.1, 2 The age of onset is mostly in the first two decades of life, and no gender preferences have been described. FOP has a chronic and progressive course and often leads to morbidity and severe disabilities in early life.3

The first clinical feature includes a localized and rapidly progressive swelling, mainly in muscle bundles of the neck, shoulder, and upper arms. The lesions may become warm, erythematous, and tender. They could be cystic and even contain blood. The lesions are initially painful, and may ulcerate.4, 5

After months and even years, other regions, such as pelvis, face, jaws, back, extremities, abdominal wall, and chest will be involved and torticollis and kyphosis may occur.5 Gradually, muscles are replaced by ossified or calcified tissues, which may be located across joints. This leads to restricted range of motion and even ankylosis in joints, so that the patient would be called a “stone man.”7 The tongue, heart, larynx, diaphragm, and sphincters are never involved during the course of the disease. Furthermore, no specific laboratory findings were reported except for an increased phosphatase activity during the inflammatory stage of the disease.8

The main purpose of this study was to identify the radiologic manifestations of seven patients with FOP whose roentgenograms were available.

Although the diagnosis of FOP is clinical, it is confirmed by imaging. The radiologic features are divided into three categories:

- Ectopic ossifications; the initial sites of ossification are the soft tissues of the trunk (mainly neck and shoulder girdle), with extension to the proximal portions of the limbs. Gradually, large areas of bone appear in skeletal muscles, fasciae, aponeuroses, and ligaments, also ossified bridges around joints will lead to restricted range of motion and ankylosis. The ossification process is maximal in thorax and neck. Exostoses are also common.
- Joint and spine involvement; osseous struts may fix humerus to the chest wall, and continued...
metaphyseal growth causes dislocation of humeral head and finally the thorax may become deformed. Subluxation of hip may result in shallow acetabula with sloping roofs. Ankylosis of temporo-mandibular joint is rare and more frequently, primary dysplasia of the mandibular condyles is observed. Progressive fusion of vertebral bodies is also reported, particularly in cervical spine. Finally, the entire spine may be fused. On the other hand, the ossification of ligamentum nuchae is common, which leads to immobilization of neck and thus diminished growth of vertebral bodies.9, 10

- Digital anomalies; these features could be the first clues to early diagnosis of the disease, which may even be recognized at birth. The most common anomaly is microdactyly of the great toes and less frequently, the thumb. Phalangeal shortening is also detected in most cases and the phalanges of the first toes and thumbs may also show synostosis; sometimes, only one large phalanx may be present. Hallux valgus is a common finding and exostoses, especially in the first toes, have been reported in the majority of patients. Moreover, additional epiphyseal centers and carpal and tarsal fusions have been reported. Some of these patients show the absence of upper incisors.1

Patients and Methods

We analyzed the clinical records of 11 known cases of FOP from Iran who were admitted to the Pediatric Wards of Imam Khomeini Hospital and Children’s Medical Center, Tehran University of Medical Sciences, Tehran, Iran, between 1983 and 2002.

Of eleven patients, the roentgenograms of seven were available and included in the analyses. All patients are currently alive and under regular follow-up. We studied their X-rays, detected the radiologic manifestations, and compared them with other reported findings up to now.

Results

Two of the seven patients were females. The mean age of the patients was 4 years and 2 months (range 1.5 mo to 13.5 yr). We found evidences of involvement in all soft tissue components including fasciae, tendons, aponeuroses, ligaments, and muscular bundles. All patients had the congenital great toes malformations. Moreover, the most affected sites were cervical spine and shoulder girdle. All patients had ectopic ossification, which is a key finding in FOP. Exostosis was a common finding with involvement of multiple sites including femur, humerus, digits, and clavicles. Ossified bridges were found in two patients; in one of whom presented as a humero-vertebral bridge. Calcification of ligamentum nuchae was detected in four patients.

Joints and spine were involved in all of the patients studied; the most important finding was the fusion of articular facets in cervical spine, though the vertebral bodies were spared. Small vertebral bodies were present in three cases and accessory epiphysis was detected in one. Four patients developed narrow spinal canal, which was measured on lateral neck X-ray.

Microdactyly was found in five patients (fifth finger). However, the most frequent digital abnormality was hallux valgus, which was found in all patients. We also detected additional epiphyseal center in two patients, and shortening of the first toe in five cases.

Delay in skeletal maturation was also found in two patients (confirmed by hand X-rays). One more important finding, among these patients, was the absence of upper incisors, which was reported before15; we detected it in one of our patients. No cases of carpal or tarsal fusion and decreased humeral-epicondylar angle were found.

Discussion

Our findings were mainly in accord to other reports. Ectopic ossification was present in all patients, which was in keeping with Kaplan et al.1,3,15 Other features such as exostosis, ossified bridges, and the involvement of joints and spine were concordant with the literature.1,3, 11

A notable finding in our study was the fusion of articular facets in cervical spine of five out of seven patients, while some previous studies reported the fusion of vertebral bodies.6,12,9 On the contrary, vertebral bodies were spared in our patients.

Other findings such as small vertebral bodies and hallux valgus were reported before and we detected no differences between our cases and theirs.13, 14 Delay in skeletal maturation was reported earlier and was noticeable in two of our patients.3 In our very recent new patient who was a
9-year-old boy, we detected the absence of upper incisor teeth, which is also reported before.\(^\text{15}\)

It would be highly recommended that our colleagues be aware of common sites of involvement in FOP, and also consider it as a differential diagnosis in any child showing one of the above features. These data might be useful in coming to an early diagnosis, in order to provide the optimal care, which may help us control the disease progression and prevent severe morbidity and finally have a better outcome.

References

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