OSTEOPOIKILOSIS: REPORT OF A PATIENT WITH ASSOCIATED COMPLEX KNEE INJURIES AND LITERATURE REVIEW

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ABSTRACT

Introduction: Osteopoikilosis (OPK) is a rare autosomal dominant hereditary disease with a prevalence estimated at 1/50000. Most of the time asymptomatic and benign, it can be misdiagnosed as other osteoblastic bone diseases (such as bone metastases) and lead to unnecessary stress and costly investigation. We report a 15-year-old boy with a complicated knee injury and associated OPK as well as a literature review.

KEYWORDS Osteopoikilosis, Multiple sclerotic lesions, sclerosing bone dysplasia

Introduction

Osteopoikilosis (OPK) is a rare, usually asymptomatic and benign, osteosclerotic dysplasia. It is an autosomal dominant hereditary disease caused by LEMD3 gene mutation. With an estimated prevalence at 1/50000, OPK is usually incidentally discovered with a plain radiograph. Moreover, it is radiologically characterized by multiple well-defined oval or rounded sclerotic lesions, usually symmetrically disseminated around epiphyseal and metaphyseal regions of long bones. By its aspect, it can be misdiagnosed as other osteoblastic bone diseases (such as bone metastases) and lead to unnecessary stress and costly investigation. We report a 15-year-old boy with a complicated knee injury and associated OPK; we also present a literature review.

Case presentation

A 15-year-old boy attended the emergency department with a torsion injury to its right knee while playing soccer. Clinical examination revealed a mild knee swelling and a tenderness of both meniscal points. Knee grinding was painful in internal and external rotation. A 30° flexion deficit was noted with a full extension still possible without pain. No swelling of the other joint was noted.

A plain radiograph of the right knee showed a mild intra-capsular swelling but no fracture or dislocation. The radiologist was concerned by countless nodular sclerotic lesions around the knee joint. A retrospective examination of previous radiography revealed similar lesions in the tarsal and metatarsal, carpal and metacarpal region, the distal radial and ulnar metaphysis, the femoral and humeral heads, and both cotyles and glenoid cavities. No lesions were found in the iliac crest’s radiography, the whole spine’s vertebral bodies, the sacrum, the ribs, the clavicle, the scapula’s main bodies, or the skull.

Magnetic resonance imaging and CT-arthrogram showed a complex lesion of both menisci and an ACL complete distal rupture. Those exams confirm the presence of multiple sclerotic ovoid lesions around the knee compatible with OPK.

Because no evolution of the previously observed lesion was objectified, we did not complete the diagnostic with a radionucleotide bone scan. The patient underwent reconstructive surgery for both menisci and the ACL (Figure 1). Although the follow-up period was not long enough to confirm a full recovery with an MRI, no clinical rehabilitation delay was noted.

Discussion

Definition

OPK was first described in 1915 by Albers-Schönberg[7] and is characterized by an abnormality in the endochondral bone
maturation process leading to compact lamellar bone focal deposit within cancellous bone.

Incidence

OPK is a rare disorder, with an estimated prevalence of 1/50000, and affects men and women equally [2]. Some authors report a higher prevalence in men, but this may result in a bias caused by a small population sample or the higher prevalence of traumatic injuries in men leading to more imagery in this population.

Pathophysiology

Genetic and familial occurrence studies indicate an autosomal dominant genetic transmission. Heterozygous mutations in the LEMD3 gene have been identified as the primary cause of OPK. LEMD3 mutation results in the up-regulation of target genes downstream of BMP and TGF-B pathways, causing the increased bone formation seen in the sclerotic areas of OPK patient’s bones[6,12].

Radiography

On plain radiography, OPK appears as numerous well defined homogenous, circular or ovoid, sclerotic lesions. They are symmetrically distributed, usually in the epiphyseal or metaphyseal region of long bones, in metacarpal/tarsal bones of hands and feet, or the pelvic bones. It rarely involves ribs, clavicles, mandible, vertebral bodies, or the skull[2,8,9]. Slightly increased activity can sometimes be seen on bone scintigraphy due to an increased osseous remodelling at the lesion site.[8,11]

Symptomatology

OPK is usually asymptomatic and discovered incidentally with imagery investigation. However, 15 to 20% of patients present mild articular pain and joint effusion without dysfunction or deformities at the affected joint. [1,3]

Association

Syndromic associations are reported and accepted, such as the Bushke-Ollendorff syndrome and the Gunal-Seber-Basaran syndrome, characterized by OPK lesions associated with dermatofibromas and dacryocystitis, respectively. [4,5] A wide variety of associated disorders have been reported in the literature, from isolated individual cases to disorders seen in multiple family members. (Table 1)

Table 1 Associated disorders

| Associated disorders |
|---------------------|
| Spinal stenosis     |
| Dacryocystis        |
| Peptic ulcer        |
| Aorta coarctation   |
| Urogenital defect   |
| Growth abnormalities|
| Diabetes mellitus   |
| Arthritis           |
| Osteitis condensans ilii |
| Melorheostosis      |
| Giant cell tumor    |
| Fibrous dysplasia   |
| Chondrosarcoma      |
| Synovial chondrolysis |
| Facial abnormalities|
| Hare lip            |
| Dental abnormalities|
| Keloid formation    |
| Plantar and palmar keratoma |
| Renal malformation  |
| Discoid and systemic lupus erythematosus |
| Rheumatoid arthritis|
| Reactive arthritis  |
| Ankylosing spondylitis |
| Psoriatic arthritis |
| Familial Mediterranean fever |
| Scleroderma         |
| De Quervain tendinitis |
| Klippel-Feil syndrome |

Differential diagnosis

The principal and most malignant differential diagnosis is osteoblastic metastasis. Other possible differential diagnoses are shown in table 2. [3,10]

Contrary to OPK, osteoblastic metastasis is usually seen on the vertebral bodies, the pelvis, the skull, the ribs, the proximal femur and humerus, and the scapula. Radiographically, these lesions are asymmetrical, vary in size, and show signs of osseous destruction with periosteal reaction. They can be differentiated
Table 2 Differential diagnosis

| Malignant etiologies          | Benign etiologies                      |
|------------------------------|----------------------------------------|
| Osteoblastic metastasis      | Pagel’s disease                        |
| Lymphoma and Hodgkin disease | Mastocytosis                           |
| Renal osteodystrophy         | Chronic osteomyelitis                  |
| Primal hyperparathyroidism   | Tuberous sclerosis                     |
| Myeloid splenomegaly and Myeloproliferative disorders | Osteopathia striata                  |
|                               | Melorhostosis                          |
|                               | SAPHO Syndrom                          |

by a radionucleotide bone scan as osteoblastic metastasis show a much more increased intake than OPK.[8]

Complication and impact on surgery
OPK is a benign disorder. Nevertheless, some rare complications have been described in the literature, such as osteosarcoma, giant cell tumor, and chondrosarcoma evolution. However, no direct causal link has been proved regarding OPK malign transformation. To our better knowledge, no impact of OPK on fracture or torn tendon healing has been described in the literature. No treatment is needed for OPK, but a follow-up is recommended due to its hypothetical malign transformation.

Conclusion
In conclusion, OPK is a benign disorder sometimes seen on plain radiography. Its existence should be kept in mind, particularly in an asymptomatic patient with no oncologic history, as a misdiagnosis could lead to unnecessary stress and costly investigation. The diagnosis is usually made with a plain radiograph. However, if the patient presents an oncologic history or doubt remains after the first imagery, a radionucleotide bone scan is required to rule out a malign disorder. Individuals should be informed of their condition, and a follow-up is needed to monitor possible malign transformation.

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Conflict of interest
There are no conflicts of interest to declare by any of the authors of this study.

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