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Hyperplastic Callus Formation: A Rare Case in An Adult

Hiperplastik Kallus Formasyonu: Erişkin Hastada Nadir Bir Vaka

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Abstract

Hyperplastic callus formation is a rare condition that may occur in patients with impaired fracture healing. It is important for the differential diagnosis of malignancies such as osteosarcomas and chondrosarcomas. Some case reports in the literature were misdiagnosed as osteosarcoma, especially in pediatric patients with osteogenesis imperfecta. Here, we present the case of an adult patient with osteoporosis. Cross-sectional imaging showed a mass that had destroyed the bone cortex with soft tissue components and with mineralized matrix in the right superior and inferior pubic rami. The radiological diagnosis was chondrosarcoma, and the mass was completely removed. The patient was diagnosed with a hyperplastic callus that had developed due to osteoporosis.

Keywords: Callus, Hyperplastic Callus, Osteoporosis, Chondrosarcoma.

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Öz

Hiperplastik kallus oluşumu, kırık iyileşmesi bozulmuş hastalarda görülebilen nadir bir durumdur. Osteosarkom ve kondrosarkom gibi malignitelerin ayırıcı tanısında önemlidir. Literatürde özellikle osteogenezis imperfektalı pediatrik hastalarda yanlışlıkla osteosarkom olarak tanı konmuş vaka raporları bulunmaktadır. Bizim vakamız ise osteoporozu olan erişkin bir hastaydı. Kesitsel görüntülemede, sağ superior ve inferior pubik ramusta mineralize matriks içeren yumuşak doku komponenti bulunan, kemik korteksi destrükte eden bir kitle mevcuttu. Radyolojik olarak kondrosarkom ön tanısı verildi ve biyopsi yapıldı. Biyopsi sonucunda malign hücreye rastlanmadı ve ortopedist kitleyi tamamen çıkarmaya karar verdi. Bunun sonucunda hastaya osteoporoza bağlı gelişen hiperplastik kallus tanısı kondu.

Anahtar Kelimeler: Kallus, Hiperplastik Kallus, Osteoporozis, Kondrosarkom.

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Introduction

Following a fracture and resorption of hemorrhage, fibroblasts near the fracture localization begin to proliferate and compose loose granulation tissue. Subsequently, fibroblasts at the fracture area, and throughout the periosteum transform into chondroblasts that form hyaline cartilage, while fibroblasts farther from the fracture site differentiate into osteoblasts that form woven bone. These tissue populations compose a new mass of connective tissue called callus that bridges the fracture surfaces. After callus formation, hyaline cartilage and fibrous tissue are replaced by trabecular bone through mineralization of the existing collagenous matrix. In a remodeling phase, the callus and lamellar bone apposition are shaped according to the original bone structure. Causes such as poor immobilization, corticosteroids, anticoagulants, anemia, radiation, infections, osteoporosis, osteonecrosis, advanced age, and comminuted fractures can affect the healing process of bone fractures. One consequence of this is the formation of hyperplastic callus (1).

Osteoporosis is a metabolic disease of bone characterized by reduced bone mass and skeletal fragility. The World Health Organization (WHO) describes osteoporosis as T-score of bone mineral density less than -2.5 SD. In this disease, which is mainly characterized by bone loss, hyperplastic callus (HPC) formation may occur due to impaired fracture healing. HPC is one of the radiological diagnostic criteria for osteogenesis imperfecta, which causes secondary osteoporosis in childhood (2).

Here, we present a case of HPC in a 60-year-old woman with osteoporosis that was radiologically misdiagnosed as chondrosarcoma. This case is important because it is due solely to osteoporosis without a genetic disease and occurs in an adult age group patient.

Case Report

A 60-year-old female patient was applied to the orthopedic clinic complaining of pelvic pain. No severe trauma was reported. On examination, tenderness was noted in the sacral and symphyseal regions. Measurement of bone mineral density at the femur revealed a T value of-4.2. Radiographs showed a destructive lesion with a soft tissue component containing linear opacities adjacent to the fracture line in the right superior and inferior pubic rami. Computed tomography displayed fractures of the sacrum, right superior and inferior pubic rami, and L5 vertebra. Computed tomography and magnetic resonance imaging revealed a mass destroying the bone cortex with soft tissue components and with mineralized matrix in the right superior and inferior pubic rami (Figure 1, 2).

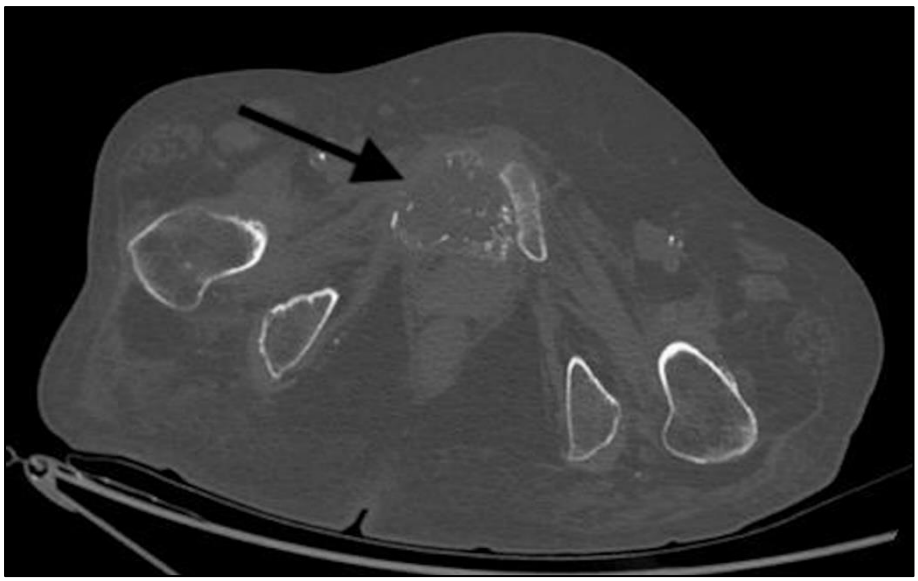

Figure 1. On the axial CT image, the mineralized matrix at the destructive mass (black arrow)

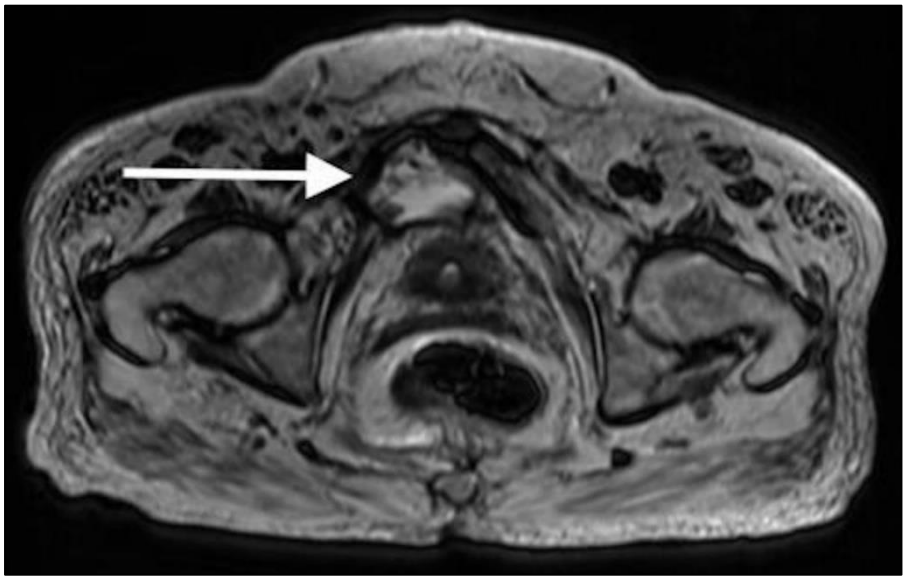

Figure 2. On T2WI hyperintense expansive and destructive mass (white arrow)

Chondrosarcoma was considered as a radiologic diagnosis. A biopsy was obtained from the mass. Pathological examination revealed hypocellular chondroid areas, with no evidence of malignancy. The pathologist suggested a repeat biopsy as the initial biopsy did not correlate with the radiological findings. The orthopedic surgeon decided to completely remove the mass. Microscopically, the sections revealed fibrous tissue composed of spindle cells with hypocellular, hyalinized areas and vascular structures. These fibrous areas continued between the bone lamellae and showed well-defined extensions toward the surrounding adipose tissue. The fragments of cartilage tissue observed in the sections were hypocellular and had an immature appearance (Figure 3). The patient was diagnosed with a hyperplastic callus that had developed due to osteoporosis.

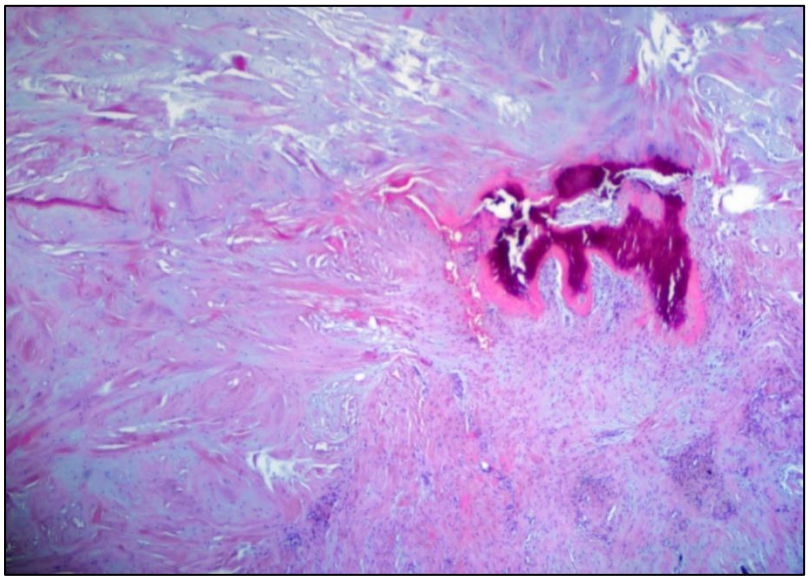

Figure 3. İmmature cartilage and focal bone formation in highly hyalinised stroma consistent with exuberant callus (HEx10)

Discussion

A fibrocartilage callus is an interim formation of fibroblasts and chondroblasts that compose at the site of a bone fracture as the bone tries to heal itself. Finally, the cells dissolve and rest in the resulting extracellular matrix that forms the new bone. In cases where fracture healing is impaired, callus formation is interrupted and may remain at the fibrocartilage stage. As a result, HPC is characterized by an excessive bone formation that is disproportionate to the size of the affected bone and extends beyond the fracture region (3).

HPC can lead to mineralization around the bone cortices and in the adjacent soft tissues after fracture, mimicking a malignant tumor (4). Differentiating between benign HPC formation and malignant osteocartilaginous malignancies is crucial in adult patients (5). The clinical and radiological features, as well as alkaline phosphatase elevation, may be similar in both entities. Clinical findings include pain and enlargement of the limb, and the affected area becomes warm and tender. The skin stretches with dilated veins and has a low-grade fever (6). In our case, since the involvement was in the pubic bone rather than an extremity, only pain was present.

While some authors suggest that these patients can be followed up based on clinical and imaging cross-sectional findings (7), others argue that to differentiate between HPC and osteocartilaginous malignancies a biopsy is necessary (6, 8). Cases resembling osteosarcoma in HPC developing in patients with osteogenesis imperfecta have been reported in the literature (4, 5). Vonderlind et al. noted that HPC mostly occurs in children and adolescents (9). To our knowledge, there are no cases described in the literature in the adult age group.

In contrast to the literature, in our case, the lesion on the superior pubic ramus was radiologically diagnosed as chondrosarcoma. Chondrosarcoma typically occurs in the 4th and 5th decades of life and may present with matrix calcification, endosteal scalloping, permeative and destructive appearance, soft tissue components, cortical remodeling, and periosteal reaction. It is commonly found in the long bones and pelvic bones (10).

In our case, there was mass destruction in the bone cortex with soft tissue components and mineralized matrix. The age of the patient and the location of the lesion were consistent with chondrosarcoma. However, no malignant cells were found histopathologically after the mass was excised. Histopathologically, immature cartilage and focal bone formation were noted in a highly hyalinized stroma. This lesion was accompanied by fractures of the sacrum, inferior pubis, and L5 vertebra. The bone mineral density T-score measured at the femur indicated osteoporosis (-4.2). Based on these findings, the diagnosis of HPC was made, and the patient was further observed.

A study of rats with tibial bone defects showed a significant reduction in newly formed bone, a higher rate of granulation tissue formation, and immaturity of newly formed bone in rats with osteoporosis (11). A study by Gorter et al. also confirmed this (12). These studies suggest that callus formation in osteoporotic patients may remain in the chondroid stage and exhibit hypertrophic features (11, 12).

At different stages, the callus may have immature fibroblastic, chondroblastic, and osteoblastic cells that mimic fibrosarcoma, chondrosarcoma, or osteosarcoma (4-6, 8, 9). Radiological examination alone is insufficient to distinguish between them, and thus a biopsy is required to differentiate HPC from osteocartilaginous malignancies.

Hyperplastic callus formation is a rare condition that can occur in patients with impaired fracture healing, including those with osteoporosis. It is important to differentiate it from malignancies such as osteosarcoma and chondrosarcoma, as the radiological features can mimic these malignancies. This case report highlights a patient with osteoporosis who presented with a radiological diagnosis of chondrosarcoma but was ultimately diagnosed with a hyperplastic callus. Awareness of this condition and consideration of hyperplastic callus in the differential diagnosis can prevent unnecessary invasive procedures and guide appropriate management.

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