Extraskeletal Osteochondroma Arising on the Plantar Region

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Key Words
Extraskeletal osteochondroma · Extraskeletal chondroma · Soft-tissue chondroma · Foot

Abstract
Extraskeletal osteochondroma is a variant of extraskeletal chondromas that are uncommon soft-tissue cartilaginous tumors. These tumors may undergo extensive enchondral ossification to form an extraskeletal osteochondroma. This report describes the case of a 39-year-old Japanese man with an extraskeletal osteochondroma arising on the plantar aspect of the foot.

Introduction
Extraskeletal chondromas are uncommon soft-tissue tumors, occurring in extraosseous and extrasynovial structures, predominantly composed of mature hyaline cartilage [1, 2]. Extraskeletal osteochondroma is a variant of those, which has undergone extensive enchondral ossification [1, 2]. This article presents a case of an extraskeletal osteochondroma arising on the plantar region.

Case Report
A 39-year-old Japanese male presented with a nodule on his left foot that had been present for 15 years. The patient felt gradually increasing pain while ambulating. He had no memory of any injury to the region. A clinical examination revealed a nodule measuring 2.0 cm in diameter, with tylosis on the surface, located on the plantar aspect of the left forefoot (fig. 1). The nodular lesion was well confined, smooth, hard, and held in place by the basement structures. There was no translucency through the tumor, and the patient experienced tenderness during the examination. Routine laboratory tests were within normal limits. Magnetic resonance imaging (MRI) showed a well-defined mass located in the subcutaneous soft tissues of the plantar aspect of the foot between the third and fourth metatarsal heads, measuring 1.3 cm in diameter, with hypointensity on both T1- and T2-weighted images (WI) (fig. 2).

The tumor was completely resected under local anesthesia, revealing a demarcated yellowish lobulated mass with a thin capsule loosely connected to the plantar aponeurosis and adjacent to the...
tendon sheath of the third-toe flexor tendon, but without any adhesion to the bone (fig. 1b). The histological examination revealed a circumscribed lobulated nodular lesion covered with a fibrous capsule (fig. 3a). The tumor was composed of cartilaginous matrices (fig. 3b) with prominent ossification (fig. 3c) and contained chondrocytes embedded in cartilage at the periphery of the lesion (fig. 3d). No mitotic figures were present. The histological findings were consistent with those of extraskeletal osteochondroma, a variant of extraskeletal chondroma with extensive enchondral ossification. No recurrence has been observed after 2 years.

Discussion

Extraskeletal chondromas, synonymous with soft-tissue chondromas or chondromas of soft parts, are slow-growing well-defined solitary nodules of hyaline cartilage [1, 2]. They usually arise adjacent to periarticular tissues or tenosynovium but not attached to the intra-articular synovium or periosteum by definition [1]. Kransdorf and Meis [3] reported that extraskeletal chondroma represented 276 of 18,771 cases (1.5%) of all benign soft-tissue tumors examined at their institute (AFIP: Armed Forces Institute of Pathology). They are slow growing and rarely exceed 3 cm in diameter [1, 2]. Twenty percent of the patients with extraskeletal chondroma present with pain or tenderness, especially located in the plantar region or finger [4, 5]. Chung and Enzinger [6] surveyed the 104 cases of extraskeletal chondromas referred to AFIP and reported that they usually occur in patients in their thirties or forties, ranging from 9 to 78 years of age and that the most affected site was the fingers (49%), followed by the hands (15%), toes (11%), feet (10%), forearms (4%) and other sites.

Hondar Wu et al. [7] reported that extraskeletal chondromas usually show intermediate signal intensity on T1 WI and high signal intensity on T2 WI in most MRI studies, and such high signal intensity is due to the high water content of the cartilage. However, they also noted that the major part of the chondroma in one case showed hypointensity both on T1 and T2 WI as suggested in the present case. Those findings were ascribed to dense calcification, indicating that MRI of extraskeletal chondroma can vary in relation to the content and degree of calcification in the tumor [7], while others report that the diagnosis can be made based on MRI [1, 5].

Extraskeletal chondromas can undergo extensive enchondral ossification, and then such lesions are designated extraskeletal osteochondromas [1, 2]. The term ‘extraskeletal osteochondroma’ should not be confused with ‘osteochondroma’, one of the most common benign bone tumors, accounting for 40% of tumors seen in flat bones and at the end of long bones, also referred to as an exostosis [8, 9].

Local excision is the standard treatment for extraskeletal chondromas [2]. The local recurrence rate is 15% [2, 6]. Recurrent tumors are usually treated by re-excision [2, 4]. Although some extraskeletal chondromas show atypical cellular features, these tumors are benign [2].

The present case showed the typical epidemiology, site of involvement and clinical features of extraskeletal chondromas. The lesion had some unusual features and was diagnosed to be an extraskeletal osteochondroma because of extensive enchondral ossification, which presented as hypointensity on T1 and T2 WI MRI due to considerable calcification, unlike ordinary extraskeletal chondromas.
Fig. 1. a A nodular lesion with tylosis on the surface, located on the plantar aspect of the left forefoot. b A demarcated yellowish lobulated tumor with a thin fibrous capsule.

Fig. 2. MRI showing a well-defined mass located in the subcutaneous soft tissues of the plantar aspect and no evidence of connection to the bone. The MRI signal of the lesion showed hypointensity on both T1- (a) and T2-weighted (b) images.
Fig. 3. Findings of an HE-stained specimen. a Low magnification revealed a circumscribed lobulated nodular lesion covered with a fibrous capsule (original magnification, ×12.5). b The lesion contained mature hyaline cartilage (original magnification, ×40). c The tumor shared extensive ossification (original magnification, ×200). d There were chondrocytes embedded in cartilage at the periphery of the lesion (original magnification, ×400).

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