Case Report

An unexpected culprit: Intraosseous vascular malformation in the elderly man's tibia revealed by magnetic resonance imaging

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ABSTRACT

Intraosseous vascular malformations (IVMs) are rare, benign vascular anomalies within bone that may cause diagnostic confusion due to their infrequent presentation and subtle radiologic features. They can mimic neoplastic or inflammatory bone conditions, and their clinical presentation is often vague. Magnetic resonance imaging (MRI) plays a vital role in delineating these anomalies. This paper presents a case of suspected IVM of the right tibia, identified on MRI, with associated findings of superficial venous dilation. We herein report the case of a 67-year-old male who presented with complaints of swelling and pain in the right lower leg with slight restriction of movement. On radiograph, there was a mixed osteolytic and sclerotic lesion in the middle third of the right tibia mimicking a fibrous tumor. However, MRI revealed a dilated nutrient artery that was forming clusters at the distal tibia, providing the clue for the diagnosis of arteriovenous malformation.

Key words: Intraosseous vascular malformations, Intraosseous venous malformations, Magnetic resonance imaging bone vascular anomaly, Tibial bone lesion

Vascular malformations are part of the spectrum of vascular malformations designated by their vessel of origin, based on the widely accepted classification of vascular anomalies endorsed by the International Society for the Study of Vascular Anomalies (ISSVA) [1]. They depict dilated, congenitally deformed venous channels with slow internal flow that are frequently found in soft tissues; the muscles of mastication are a particularly prevalent place in the head-and-neck. Compared to soft-tissue venous malformations in the head-and-neck, intraosseous venous malformations are less frequent. Intraosseous vascular malformations (IVMs) constitute <1% of all vascular tumors [2,3]. The majority of reported cases occur in younger patients, particularly in the craniofacial bones, tibia, femur, humerus, and spine [4]. The reference study by Wang *et al*. highlights the case of a 20-year-old female with intraosseous arteriovenous malformations (AVM) in the tibia, emphasizing the importance of magnetic resonance imaging (MRI) features in differentiating these lesions from other bone tumors [5]. While intraosseous AVMs are more commonly diagnosed in younger individuals, intraosseous hemangiomas are frequently found in older patients, particularly in the fifth and sixth decades of life [6,7].

Very few cases of tibial IVMs have been reported. Documenting the imaging findings, clinical presentation, and rationale for systemic therapy adds valuable reference material for future diagnosis and management. Misdiagnosis can lead to inappropriate or even harmful interventions (e.g., biopsy or curettage may trigger massive bleeding in intraosseous AVMs) [8]. The presence of an IVM in a 67-year-old male is therefore atypical but not implausible, especially if the MRI features align with those described in the reference study [5].

CASE REPORT

A 67-year-old male, hostel warden by occupation and resident of Lucknow, presented to us with complaints of pain and swelling in the right lower leg with slight restriction of movement (mobility was normal) since 2–3 months. The past medical history of the patient and his family was unremarkable.

On examination, vitals were all within normal limits; the patient was afebrile, blood pressure was (80/110) mmHg, pulse rate was 93 beats/min, and respiratory rate was 14/min. Physical examination

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showed swelling and tenderness in the right lower leg with slight bluish discoloration and no deformity (Fig. 1a and b). Examination of the left leg revealed the presence of varicose veins along the medial and posterior aspects.

Laboratory tests were all within normal limits. Radiograph revealed an intramedullary osteolytic lesion with sclerotic margins, which was pushing the diagnosis toward fibrous dysplasia or metastasis. However, MRI of the right leg was performed (Figs. 2 and 3), which revealed a prominent nutrient artery of the right tibia that was forming a vascular cluster at the distal tibial end, strongly suggesting an IVM with prominent pre-tibial veins. The rest of the bones and surrounding soft tissue had normal appearance with no obvious fluid collection or abnormal signal intensity.

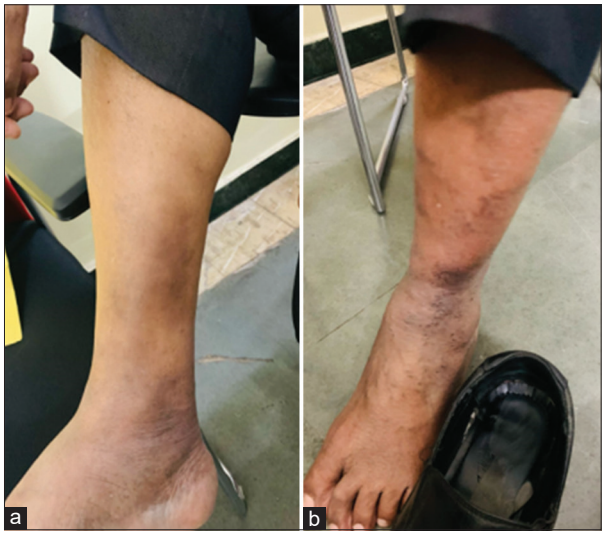

Figure 1: (a and b) Reveals mild swelling and bluish discoloration in the right lower leg with no deformity

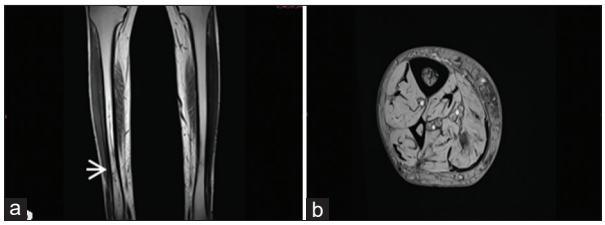

Figure 2: (a and b) T1-weighted sequence of coronal and axial sections of legs revealing low signal on T1 of the affected tibia with preserved surrounding bone architecture and no evidence of cortical breach or periosteal reaction (arrows)

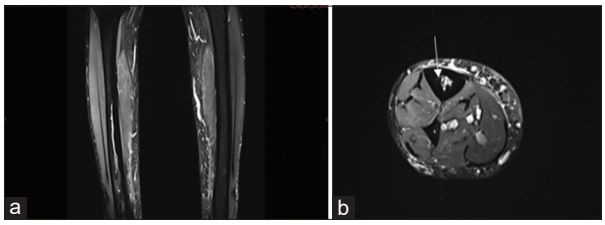

Figure 3: (a and b) T2-weighted sequence of coronal and axial sections of legs revealing high signal on T2 indicating vascular component and demonstrating a prominent nutrient artery forming a vascular cluster at the distal tibial end (arrows), highly suggestive of an intraosseous vascular malformation

DISCUSSION

IVMs are rare, benign vascular lesions that originate within the bone. These malformations are part of a broader category of vascular anomalies classified by the ISSVA and are characterized by slow-flow venous or capillary channels [1]. They are congenital in nature, although clinical manifestations may not arise until later in life, often as incidental findings during imaging for unrelated complaints.

The pathogenesis of IVMs involves abnormal morphogenesis of vascular tissues, leading to clusters of ectatic vascular channels that can affect bone remodeling. These lesions are most commonly located in the spine, pelvis, and craniofacial bones. The tibia, as in the present case, is an uncommon location, making such presentations diagnostically challenging and clinically intriguing [9].

Lai and Husain reported a 63-year-old male with a progressively enlarging intraosseous lesion of the left maxilla over 15 years, presenting as an exophytic mass causing facial distortion. The clinical differential diagnosis included AVM and low-grade osteosarcoma. Following incisional biopsy and osteoplasty, histopathologic examination confirmed an IVM, characterized by malformed capillaries, arteries, and venules with abnormal dilation, but without features of malignancy [10]. According to Wang *et al*., MRI plays a crucial role in diagnosing intraosseous AVMs [5] due to its superior soft tissue contrast resolution and ability to characterize vascular flow dynamics. On radiographs, a central medullary lytic lesion with thick sclerotic margins and on MRI, these lesions typically present as areas of altered signal intensity, often with low signal on T1-weighted images and high signal on T2-weighted images, reflecting the presence of slow-flow blood or venous lakes. In our case, a prominent nutrient artery forming a vascular cluster at the distal tibial end was identified, raising strong suspicion for an IVM.

Differential diagnoses for such imaging appearances include fibrous lesions and metastatic lesions on radiographs and hemangiomas, bone cysts, enchondromas, and metastatic lesions on MRI [5]. However, the presence of a vascular cluster, preservation of bone architecture, and absence of cortical breach or aggressive periosteal reaction favor the diagnosis of a benign vascular malformation over malignant or destructive processes [9].

Our patient was managed conservatively under the rheumatology department with physiotherapy, quadriceps/calf muscles extension exercises, and medication, which included methotrexate, prednisolone, and folic acid. Methotrexate acts as an angiogenic and antiproliferative agent; it suppresses endothelial cell proliferation and inflammatory pathways involved in abnormal vascular tissue growth. The patient has not undergone any further interventions and revealed 50–70% relief in symptoms.

IVMs are typically asymptomatic, but when symptomatic, patients may present with localized pain, swelling, pathologic fractures, or rarely, bleeding. In this case, there were no associated osseous or soft tissue abnormalities, suggesting a clinically silent lesion. Nevertheless, this identification warrants further vascular evaluation, especially in the presence of additional vascular anomalies, such as varicose veins, as seen in the contralateral leg in this patient.

Management of IVMs is generally conservative unless symptomatic. In symptomatic or complicated cases, treatment options include sclerotherapy, embolization, or surgical excision, depending on the lesion's location, size, and impact on surrounding structures. Multidisciplinary input from radiology, vascular surgery, and orthopedics is often necessary for optimal patient management. MRI serves as an invaluable tool in the identification and characterization of these anomalies, guiding further clinical and interventional decisions.

CONCLUSION

This case underscores the importance of recognizing IVMs as part of the differential diagnosis in patients with atypical vascular findings on imaging. A 67-year-old male presenting with a lesion that matches these imaging findings can be considered a rare but valid case of IVM. Although intraosseous AVMs are primarily reported in younger individuals, intraosseous hemangiomas, which share similar imaging characteristics, are more common in older patients. This suggests that an intraosseous vascular lesion in an elderly patient should not be ruled out solely based on age. Given the potential risks associated with biopsy and misdiagnosis**,** early radiological identification is essential for guiding appropriate management.

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