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Müller-Weiss Disease Presenting as Chronic Midfoot Pain: A Case Report and Literature Review

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Abstract **Case Report**

Müller-Weiss disease is a rare disorder of the tarsal navicular in adults, traditionally considered to be aseptic osteonecrosis, although its pathophysiology remains controversial. We report the case of a 56-year-old man with no significant medical history who had experienced mechanical dorsomedial pain in the right midfoot for three months, without any triggering trauma. The pain, rated 7/10 on the visual analog scale, was associated with an antalgic gait and a walking distance limited to approximately 500 meters. Examination revealed collapse of the medial longitudinal arch, dorsomedial prominence of the navicular, and painful limitation of midfoot and subtalar joint mobility. Weight-bearing radiographs of the feet showed compression of the lateral portion of the right navicular, osteosclerosis, and a characteristic comma-shaped deformity without fragmentation. MRI demonstrated a flattened and deformed navicular, with low T1 signal and high T2-STIR signal, without fracture or associated perinavicular involvement. The etiological workup identified no secondary cause. A diagnosis of idiopathic Müller-Weiss disease was retained. Conservative treatment combined offloading, celecoxib for two weeks, followed by progressive resumption of weight-bearing with a plantar orthosis. The outcome was favorable, with pain reduction from the third week and satisfactory functional recovery at three months. This case is distinguished by its occurrence in a man, its early diagnosis, the absence of classic risk factors, and the short-term success of conservative treatment.

Keywords: Müller-Weiss disease; tarsal navicular; midfoot; osteonecrosis; MRI; conservative treatment.

INTRODUCTION

Müller-Weiss disease (MWD) is a rare entity corresponding to aseptic osteonecrosis of the navicular in adults. Initially described at the beginning of the twentieth century, it differs from Köhler disease, which occurs in children. Diagnosis is often delayed because of its misleading clinical presentation and lack of awareness of this condition.

CLINICAL OBSERVATION

A 56-year-old man with no significant medical history consulted for right foot pain evolving for approximately 3 months, with progressive and insidious onset and no identified triggering trauma. The pain was localized to the dorsomedial aspect of the right midfoot. It radiated anteriorly toward the first ray and the head of the first metatarsal, posteriorly toward the sinus tarsi, and toward the medial border of the foot. Its pattern was strictly mechanical. The pain appeared during weight-bearing, progressively worsened throughout the day, and disappeared at rest in the supine position. There was no morning stiffness and no spontaneous nocturnal pain. It was rated at 7/10 on the visual analog scale (VAS) when walking on uneven ground and at the end of the day after prolonged standing, with a walking distance limited to approximately 500 meters. Clinical examination found a weight of 101 kg and a height of 198 cm, with a body mass index (BMI) of 25.76. On weight-bearing inspection, there was a right flat valgus foot with visible collapse of the medial longitudinal arch. A palpable bony prominence was present over the right navicular, well localized in the mid-dorsal and slightly medial region, without redness or swelling. Spontaneous walking showed an antalgic gait with reduced stance time on the right. Direct thumb pressure over the right navicular selectively reproduced intense pain rated at 7/10. Passive adduction and abduction of the midfoot were markedly limited and very painful in both directions. Examination of the left ankle showed preserved and painless active and passive dorsiflexion and plantar flexion. Plantar flexion was normal and painless. Ligament testing was negative during forced varus and valgus. Examination of the right subtalar joint showed reduced range of motion

compared with the left side, with reproducible pain at the end of passive inversion and during the grinding test.

Neurological examination of the lower limbs was strictly normal. The right dorsalis pedis and posterior tibial pulses were well perceived and symmetrical.

Anteroposterior weight-bearing radiographs of both feet showed compression of the lateral portion, slight osteosclerosis of its superior surface, a comma-shaped appearance of the right navicular bone, and absence of fragmentation. On magnetic resonance imaging (MRI), the right navicular was flattened and deformed, with low T1 signal and high T2-STIR signal, without associated fracture and without involvement of the soft tissues or perinavicular joints.

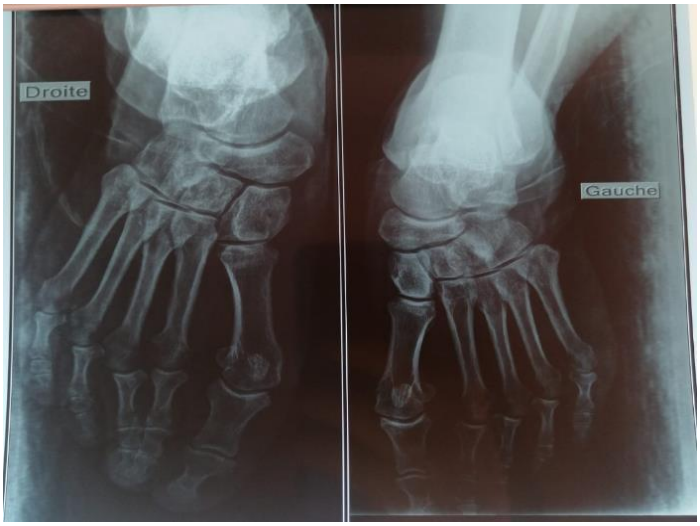

Figure 1: Anteroposterior weight-bearing radiograph of both feet showing compression of the lateral portion, slight osteosclerosis of its superior surface, a comma-shaped appearance of the right navicular bone, and absence of fragmentation

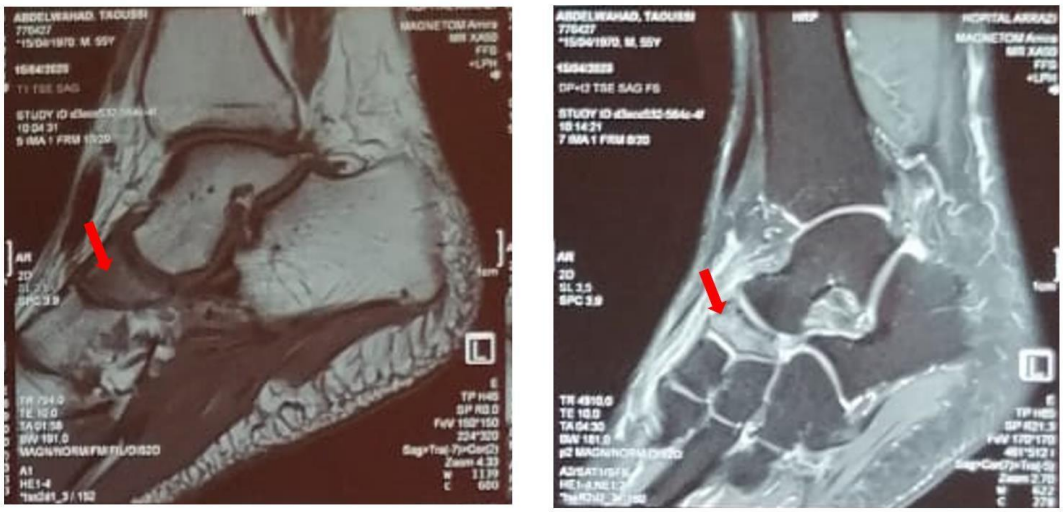

Figure 2: MRI of the right ankle in sagittal T1- and T2-weighted sections showing a flattened and deformed navicular bone and a patchy signal abnormality with low T1 signal and high T2STIR signal

A complete etiological workup was performed to exclude secondary causes of osteonecrosis of the navicular bone, particularly a traumatic or iatrogenic context (corticosteroid therapy) and a history of sickle cell disease. Laboratory investigations included an inflammatory assessment (CBC, ESR, and CRP), thyroid function tests, lipid profile, and glycemic assessment, all of which were negative.

The diagnosis of idiopathic navicular osteonecrosis compatible with Müller-Weiss disease was retained. Medical management consisted of offloading using forearm crutches, with strict limitation of weight-bearing on the affected foot, in order to reduce the mechanical stresses exerted on the navicular. This measure was combined with anti-inflammatory treatment using celecoxib at a dosage of 200 mg/day, prescribed for two weeks to control pain. The clinical

course was rapidly favorable. From the third week, the patient reported a notable reduction in pain. At six weeks, progressive resumption of weight-bearing with a plantar orthosis supporting the medial arch was authorized and well tolerated. At three months, the condition had stabilized, with near-complete disappearance of exertional pain and satisfactory functional recovery.

Furthermore, the patient's BMI was 25.76 kg/m², corresponding to mild overweight that did not justify specialized management. Moderate weight reduction was advised in order to reduce stress on the medial arch and optimize the effectiveness of conservative treatment.

DISCUSSION

Müller-Weiss disease is a rare disorder of the adult tarsal navicular, distinct from Köhler disease observed in children. It is characterized by progressive deformity of the navicular, generally predominant in its lateral portion, which may lead to flattening, fragmentation, and the development of perinavicular osteoarthritis [1–4]. Although traditionally described as spontaneous aseptic osteonecrosis, its pathophysiology remains controversial. Current hypotheses favor a multifactorial mechanism combining constitutional vulnerability of the navicular, a disorder of its ossification, and repeated mechanical stress on the midfoot. Osteonecrosis may therefore be secondary to deformity and mechanical overload rather than systematically constituting the initial event [2–6].

The navicular plays a major role in load transmission between the hindfoot and forefoot. Its location between the talar head and the three cuneiforms exposes it to substantial compression and shear forces. In Müller-Weiss disease, collapse of its lateral portion leads to rotation of the midfoot, dorsomedial protrusion of the remaining portion, and progressive modification of the medial longitudinal arch [2–4]. These biomechanical abnormalities explain the dorsomedial mechanical pain, palpable bony prominence, painful limitation of midfoot mobility, and subtalar abnormalities found in our patient.

Epidemiologically, the disease mainly affects middle-aged adults, with a clear female predominance in most series [7–10]. Doyle *et al.,*reported a series composed exclusively of women, with a mean age of 57.9 years [9]. Similarly, in the radiological series by Haller *et al*., four of the five patients with a spontaneous form were women [8]. The age of 56 years in our patient therefore corresponds to the age group usually described, but his male sex constitutes a less frequent presentation.

Involvement may be bilateral, sometimes asymptomatically. Martín-Gorgojo *et al.,* found bilateral involvement in 47.5% of cases [7], while Haller *et al.,* described bilateral involvement in four of the five patients with a spontaneous form [8]. The apparently unilateral nature of our observation therefore differs from the bilateral forms frequently reported. However, subclinical contralateral involvement cannot be formally excluded.

The clinical presentation is generally nonspecific. Pain is usually located on the dorsal or dorsomedial aspect of the midfoot, increases during weight-bearing, and may be associated with progressive foot deformity, functional limitation, and limping [3,4,9,10]. Symptom severity does not always correlate with the extent of radiographic abnormalities. In our observation, the pain was clearly intense, with a VAS score of 7/10, an antalgic gait, and a walking distance limited to approximately 500 meters. Its interest lies rather in the relatively early diagnosis, established after approximately three months of evolution. This delay is considerably shorter than those reported in several series, particularly that of Doyle *et al*., in which the mean duration of symptoms was 5.2 years [9].

Diagnosis is based mainly on weight-bearing radiographs. Characteristic abnormalities include reduced navicular size, compression of its lateral portion, sclerosis, fragmentation, and commashaped deformity on the dorsoplantar view [3,4,8,11]. Medial or dorsomedial protrusion and talonavicular or naviculocuneiform osteoarthritic changes may also be observed. In our patient, the anteroposterior weight-bearing radiograph of both feet showing compression of the lateral portion, slight osteosclerosis of its superior surface, a comma-shaped appearance of the right navicular bone, and absence of navicular fragmentation was strongly suggestive of the diagnosis.

MRI is useful for early detection of bone marrow abnormalities, searching for an associated fracture, and specifying involvement of the soft tissues and perinavicular joints [3,4,11,12]. The flattening of the navicular, its low T1 signal, and its high T2-STIR signal observed in our patient indicate bone injury associated with bone marrow edema.

Computed tomography allows better analysis of bone fragmentation, fissures, joint incongruity, and perinavicular osteoarthritis. Weight-bearing CT is of particular interest in studying threedimensional changes in foot alignment [4,13]. It becomes especially relevant when symptoms persist or when surgical treatment is considered.

The Maceira and Rochera radiographic classification comprises five stages based mainly on changes in the longitudinal arch and Meary's angle on lateral weight-bearing radiographs [2]. Stage II corresponds to an increase in Meary's angle related to dorsal displacement of the talar head, without major collapse of the arch, and the comma-shaped appearance

of the navicular. The classification of our patient as stage II is compatible with a relatively early form.

The main differential diagnoses include navicular stress fracture, secondary osteonecrosis, posttraumatic talonavicular osteoarthritis, symptomatic accessory navicular, tarsal coalitions, neuropathic arthropathy, and inflammatory arthropathies [3–6,11]. Köhler disease must also be distinguished from MWD, but it occurs in childhood. In our patient, adulthood, absence of trauma, the strictly mechanical nature of the pain, compression of the lateral portion, slight osteosclerosis of its superior surface, a comma-shaped appearance of the right navicular bone, and absence of navicular fragmentation were compatible with Müller-Weiss disease.

The etiological investigation found no trauma, corticosteroid exposure, history of sickle cell disease, or inflammatory, metabolic, or endocrine disease likely to explain secondary osteonecrosis. The inflammatory, thyroid, lipid, and glycemic assessments were normal. These results support the idiopathic nature of the involvement. Nevertheless, no isolated radiological or biological abnormality can formally demonstrate the primary mechanism of the disease. It therefore appears more rigorous to retain the diagnosis of idiopathic Müller-Weiss disease rather than that of definitively proven primary osteonecrosis [5,8].

Treatment should be determined mainly by symptom intensity, functional impact, and the joints involved, rather than by radiographic stage alone [1,5,6]. Conservative treatment is the first-line approach. It combines temporary reduction of weight-bearing, activity modification, analgesics or anti-inflammatory drugs in the absence of contraindications, as well as appropriate footwear and rigid orthoses supporting the medial arch [1,5,14]. Monteagudo and Maceira particularly recommend a rigid insole with medial arch support, possibly combined with a lateral heel wedge to reduce the stresses exerted on the navicular [1].

In our patient, temporary offloading using forearm crutches, short-term anti-inflammatory treatment, and the subsequent introduction of a plantar orthosis resulted in rapid improvement. A reduction in pain was observed from the third week, followed by progressive resumption of weight-bearing at six weeks. At three months, exertional pain had almost disappeared and functional recovery was satisfactory. This favorable outcome supports the value of conservative treatment in forms diagnosed early and without advanced perinavicular osteoarthritis.

This response contrasts with numerous publications devoted to longstanding or advanced forms that failed conservative treatment and required arthrodesis or midfoot reconstruction [15–20]. Tosun *et al.,* reported resolution of pain after resection of necrotic bone and bone grafting in a 43year-old man [18]. Fornaciari *et al.,* obtained functional improvement after talonavicular arthrodesis in patients mainly presenting with stages III and IV [16]. Cao *et al.,* reported favorable outcomes of perinavicular arthrodesis in stage III forms [17]. These situations differ from our observation, in which no surgical intervention was necessary.

However, the response to conservative treatment is not always durable. In a series of 68 patients, Harnroongroj *et al.,* showed that flatfoot, marked dorsal protrusion of the navicular, and talonavicular osteoarthritis were associated with failure of nonsurgical treatment [14]. Our patient had collapse of the medial arch and a dorsomedial navicular prominence. These features justify prolonged clinical and radiographic monitoring despite the improvement obtained.

In cases of persistent pain despite well-conducted conservative treatment, several surgical options may be discussed: calcaneal osteotomy, isolated talonavicular arthrodesis, talonaviculocuneiform arthrodesis, perinavicular arthrodesis, or reconstruction with bone grafting [15–20]. The choice depends on the deformity, the location of osteoarthritis, and the condition of adjacent joints. Li *et al.,* reported a reduction in pain after calcaneal osteotomy in 13 patients, without secondary recourse to arthrodesis during follow-up [15]. However, the available data are mainly derived from retrospective series and case reports, which does not allow the superiority of one technique to be established.

Our patient's BMI was 25.76 kg/m², corresponding to overweight according to World Health Organization thresholds, but not obesity. No direct causal relationship between this moderate overweight and Müller-Weiss disease can be asserted. Nevertheless, cautious weight optimization may help reduce the mechanical stresses exerted on the midfoot and facilitate the effectiveness of orthotic measures.

The interest of this observation therefore lies in the relatively early diagnosis of MWD in a man, without any identified traumatic, iatrogenic, or systemic risk factor. It differs from the main series by its apparently unilateral nature, the short duration of symptoms, and the rapidly favorable course with conservative treatment. In contrast, the initial intensity of pain and limitation of walking distance do not allow it to be described as a mildly symptomatic form.

The main limitations of this observation are the follow-up of only three months and the absence of a validated functional score. Longer follow-up, including a standardized clinical evaluation and comparative weight-bearing radiographs, is necessary to verify maintenance of the improvement and absence of progression of the navicular deformity.

CONCLUSION

This observation emphasizes that Müller-Weiss disease should be considered in any adult presenting with chronic mechanical midfoot pain, even in a man and in the absence of classic risk factors. Weight-bearing radiographs remain essential for diagnosis and classification, while MRI specifies bone activity and differential diagnoses. In early forms, conservative treatment may provide significant clinical improvement and avoid or delay recourse to surgery. However, the durability of this response must be confirmed by medium- and long-term follow-up.

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