TEST YOURSELF: ANSWER

Chronic stiff, aching left foot

Thomas Bean¹ • Asif Saifuddin²

Published online: 27 July 2017
© ISS 2017

Discussion

Tarsal coalition is a congenital abnormality in which there are varying degrees of fusion between one or more bones in the foot. Reported to occur in 1–2% of the population, it is thought to result from a failure of mesenchymal separation during the first 8 weeks of embryonic development leading to failure of tarsal separation. A cartilaginous bridge persists between the tarsal bones, which can ossify spontaneously during maturation or because of activity-related mechanical stress. As a result, tarsal bridging coalition can be cartilaginous (synchondrosis), fibrous (syndesmosis) or osseous (synostosis) [1, 2].

The lateral surface of the navicular bone is rough and irregular, affording attachment of the cubo-navicular ligament, which also attaches to the dorsal and posteromedial surfaces of the cuboid. Usually, the anteromedial surface of the cuboid provides an articulating facet for the lateral cuneiform, but frequently there is an additional articulation with the navicular, divided from the lateral cuneiform articulation by a small vertical ridge. Similarly, the rough lateral surface of the navicular can provide an articulating facet for the cuboid bone [3]. Coalition of this articulation results in rigidity and potentially altered morphology of the hindfoot, commonly manifesting as a congenital flatfoot deformity. The altered biomechanics and rigidity of this deformity can result in a variety of extra-

articular soft tissue and osseous ankle impingement syndromes, potentially progressing to early onset degenerative arthritis [4].

Tarsal coalition is often asymptomatic but usually presents in adolescence as a painful foot, exacerbated by exercise. Talo-calcaneal and calcaneo-navicular coalitions account for over 90% of cases and talo-navicular and calcaneo-cuboid coalitions for approximately 1% each. However, coalition between the cuboid and navicular is rare, with few reported cases in the literature [1, 5–7]. Conventional radiography is often sufficient for the diagnosis of more common tarsal coalitions, with a number of characteristic secondary radiographic signs described including the classical ‘anteater nose’ sign seen in calcaneo-navicular coalition. Clues to the existence of less common coalitions may also be seen with plain film such as subtle posterior facet irregularity in cases of posteromedial subtalar coalition [8]. Non-osseous or rarer coalitions may require cross-sectional imaging for diagnosis. MR imaging should be performed in three planes, with at least one fat-suppressed sequence to identify bone marrow oedema. Osseous coalitions will show marrow bridging across the coalesced articulation and the joint space will often be reduced. Cartilaginous bridges return signal similar to articular cartilage and fibrous coalitions return intermediate-to-low signal intensity. Fat-suppressed fluid-sensitive sequences may show marrow oedema along the fused articulation [1].

We present a patient with an insidious onset of pain in his left foot, which was particularly severe following exercise or working on his feet for long periods of time. MRI revealed a non-osseous coalition between the cuboid and navicular bones and a valgus flatfoot deformity. Whilst articular cartilage was preserved, there was florid bone marrow oedema throughout the talus and calcaneus due to excessive biomechanical stress through the subtalar joint as a consequence of the rigid flatfoot with hindfoot valgus deformity causing a lateral shift of the main weight-bearing forces at the ankle [9].

The case presentation can be found at doi: [10.1007/s00256-017-2719-1](https://doi.org/10.1007/s00256-017-2719-1)

✉ Thomas Bean
t.bean@nhs.net

¹ Derriford Hospitals NHS Trust, Plymouth, UK

² Royal National Orthopaedic Hospital NHS Trust, Stanmore, UK

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

References

1. Newman J, Newberg A. Congenital tarsal coalition: multimodality evaluation with emphasis on CT and MR imaging. *Radiographics*. 2000;20(2):321–32.
2. Lawrence D, Rolen M, Haims A, Zayour Z, Moukaddam H. Tarsal coalitions: radiographic, CT, and MR imaging findings. *HSS J*. 2014;10(2):153–66.
3. Williams P, Warwick R. *Gray's Anatomy*. 36th ed. New York: Churchill Livingstone; 1980.
4. Malicky E, Crary J, Houghton M, Agel J, Hansen S, Sangeorzan B. Talocalcaneal and subfibular impingement in symptomatic flatfoot in adults. *J Bone Jt Surg Am*. 2002;84(11):2005–9.
5. Johnson T, Mizel M, Temple H. Cuboid-navicular tarsal coalition—presentation and treatment: a case report and review of the literature. *Foot Ankle Int*. 2005;26(3):264–6.
6. Awan O, Graham J. The rare cuboid-navicular coalition presenting as chronic foot pain. *Case Rep Radiol*. 2015;2015:1–4.
7. Prado M, Mendes A, Olivi R, Amodio D. Cuboid-navicular tarsal coalition. *Rev Bras Ortop (Engl Ed)*. 2010;45(5):497–9.
8. McNally E. Posteromedial subtalar coalition: imaging appearances in three cases. *Skelet Radiol*. 1999;28(12):691–5.
9. Friedman M, Draganich L, Toolan B, Brage M. The effects of adult acquired flatfoot deformity on tibiotalar joint contact characteristics. *Foot Ankle Int*. 2001;22(3):241–6.