

Case Report:

Chondral Fracture of the Talar Dome and Diastasis of the Os Trigonum

Anna K. Chacko, MD; Charles P. Ho, PhD, MD

Steadman Philippon Research Institute, Vail, Colorado, USA

Patient history

We present the magnetic resonance (MR) images of the right ankle of a 34-year-old male police officer complaining specifically of pain deep in the right ankle for 4 years. He has had a history of several small uneventful injuries over the past several years, since high school. Physical activity such as running is hampered by the pain in the right ankle as well as the right knee. On physical examination of his ankles, there is mild tenderness along the anterior aspect of the ankle joints. He is more tender on the anterolateral ankle joint and lateral gutter. He has negative tenderness pos-

terior to his peroneal tendons. Anterior drawer and tilt tests were negative.

Imaging findings

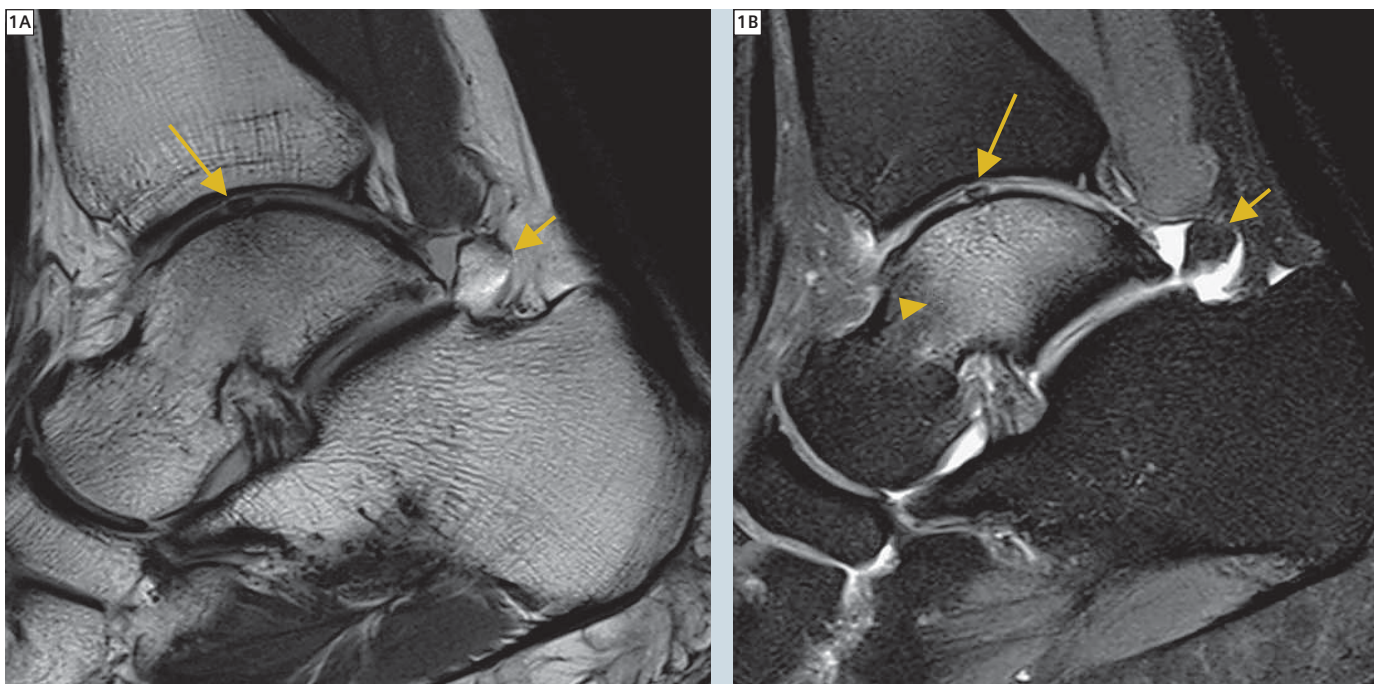
We present Magnetic Resonance images of the right ankle with significant findings related to his complaints in his right ankle.

The right ankle was imaged using a 3T MAGNETOM Verio MRI scanner (Siemens Healthcare, Erlangen, Germany) with a dedicated 8-channel ankle coil. The ankle was imaged in the sagittal, coronal and axial planes. These included proton density (PD), T2-weighted non fat sup-

pressed as well as fat suppressed images for the coronal and sagittal planes. Axial images were obtained with T2-weighting for the non-fat-suppressed images and PD-weighting for the fat suppressed images. We utilized slice thicknesses of 3 mm in all planes. Details of the techniques used are outlined in Table 1. Several abnormalities involving the ligaments in and around the ankle joint were noted on multiple images. However, there are two findings which are well demonstrated in this case. The first is the presence of the chondral fragment in situ noted on the images

Table 1: Sequence details

Weighting and planes	FOV	TR	TE	Sequence	Slice thickness	Gap	Matrix size
T2-weighted axial	100	3860	108	Turbo Spin Echo	3 mm	0.3 mm	320 x 256
PD-weighted axial fat suppressed	100	3730	43	Turbo Spin Echo fat suppressed	3 mm	0.3 mm	320 x 256
PD-weighted sagittal fat suppressed	100	2910	43	Turbo Spin Echo fat suppressed	3 mm	0.3 mm	320 x 256
PD-weighted sagittal	100	2660	35	Turbo Spin Echo	3 mm	0.3 mm	384 x 326
PD-weighted coronal fat suppressed	100	4660	43	Turbo Spin Echo fat suppressed	3 mm	0.3 mm	320 x 256
PD-weighted coronal	100	4340	35	Turbo Spin Echo	3 mm	0.3 mm	384 x 326



1 Sagittal images of the ankle. **1A:** PD-weighted sagittal image which shows the chondral fragment on the talar dome (long arrow) and the diastased os trigonum (short arrow). **1B:** Fat suppressed PD-weighted TSE image which again demonstrates the chondral fragment (long arrow) and the diastased os trigonum (short arrow). The increased signal in the body of the talus (arrowhead) is consistent with edema in the bone marrow as a result of the repetitive irritation caused by instability and ongoing motion of the chondral fragment.

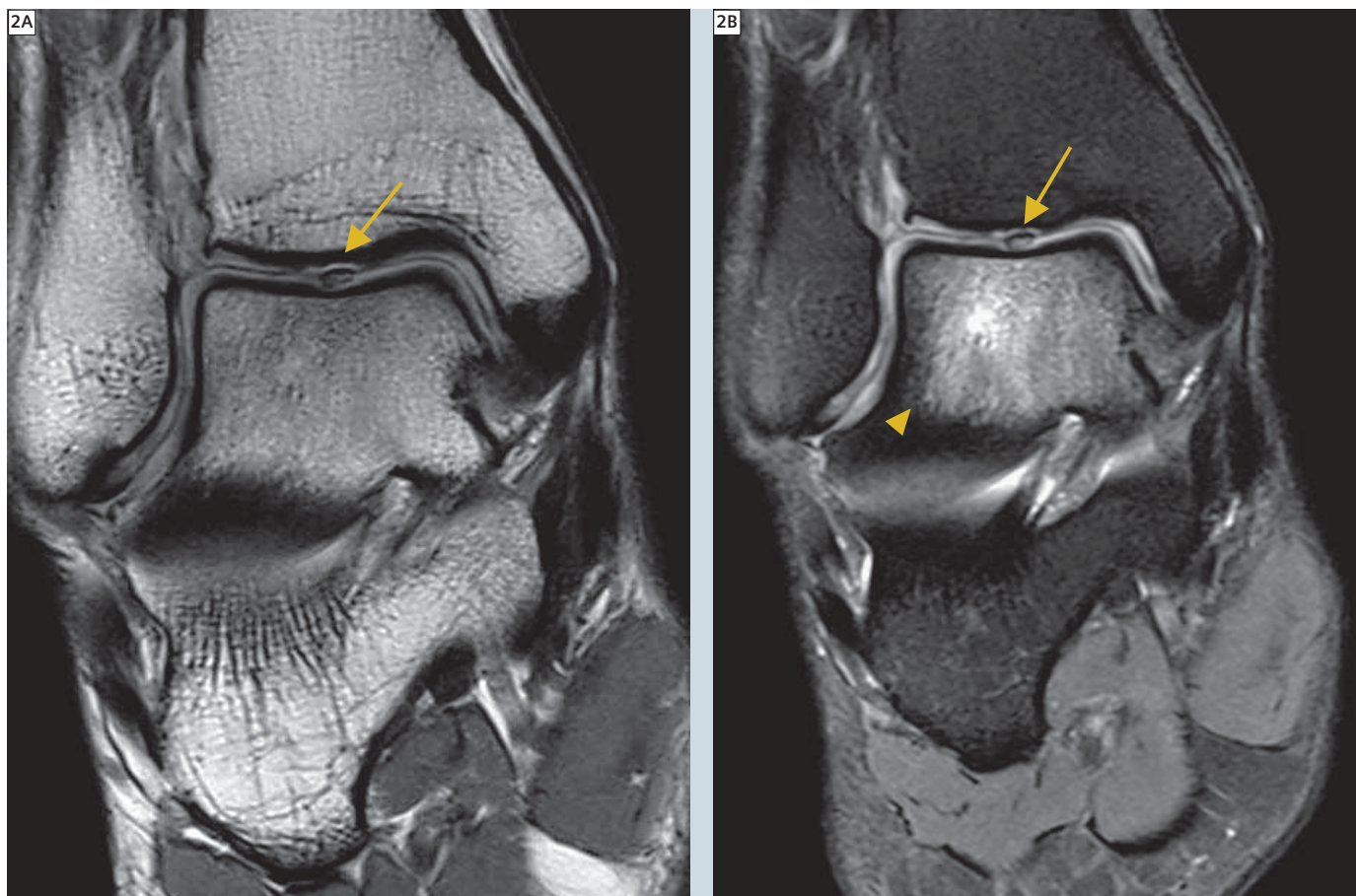
displayed in Figures 1 and 2. The chondral fragment is particularly well delineated by the contrast provided by the effusion surrounding the fragment and the extensive prominent underlying bone edema in the ankle joint and talar dome areas. The chondral fragment measures approximately 3–4 mm and is seen along the mid talar dome. There is underlying osseous irregularity, surrounding chondral focal fissuring. Extensive prominent increased signal is noted in the talar dome and the body which may be reactive stress-related edema and/or contusion and possible ongoing motion/instability of the fragment. The adjacent tibial plafond demonstrates chondral thinning and fissuring to bone (Grade IV – Outerbridge). Cortical irregularity, sclerosis and remodeling are also noted. The presence of increased signal in the body of the talus on the fat suppressed Turbo Spin Echo images (Figs. 1B and 2B) signifies the presence of bone edema which is most likely due to the irritation of the chondral fragment which is located at a

strategic point trapped at the mid weight bearing portion of the talar dome. The second is the separation and posterior tilting of the os trigonum. The os trigonum appears diastased by approximately 3 mm from the lateral tubercle of the posterior process with high signal widening of the synchondrosis. This is most likely related to injury and chronic separation at the synchondrosis. The findings of the diastased os trigonum are visualized on the sagittal images seen in Figures 1A and B.

Discussion

1. Chondral or osteochondral fracture of the talar dome: Ligamentous injuries of the ankle are among some of the most common sports related injuries involving the ankle. When the pain becomes chronic or persistent, associated osteochondral contusion or fracture should be considered. Opposing lesions which involve the plafond and the adjacent talar dome as in this patient should be sought. While the clinical significance of bone contusion

has not been established [1] osteochondral fractures do need to be treated. Of the 146 ankles imaged in the series analyzed by Sijbrandij et al., it was found that bone contusion occurred in the tibial plafond while osteochondral fractures occurred more commonly in the talar dome. They conclude that the opposing lesions occur due to impaction of the talus on the tibia. In this case, however the lack of bone contusion in the plafond suggests that the plafond injury is chronic with resolution of the edema. The presence of the talar edema with the osteochondral fracture of the talar dome suggests that ongoing local movement and instability of the osteochondral fragment could be producing a localized bone injury and consequent stress related edema. Sijbrandij also opined that the explanations for the higher occurrence of the subchondral fractures in the talus rather in the plafond is most likely due to the fact that the osteochondral lesions are more commonly observed on convex



2 Coronal images of the ankle. **2A:** PD-weighted image which shows the chondral fragment on the talar dome (long arrow). **2B:** Fat suppressed PD-weighted TSE image which again demonstrates the chondral fragment (long arrow). The increased signal in the body of the talus (arrowhead) is consistent with edema in the bone marrow as a result of the repetitive irritation caused by the chondral fragment.

surfaces with preferentially sparing of the concave surfaces.

2. Os trigonum injury: The os trigonum is believed to be analogous to a secondary ossification center being formed from a cartilaginous extension of the posterior portion of the talus [2, 3]. It appears between 7–13 years of age, fusing with the posterior process of the talus within 1 year of appearance. In 7–14% patients it remains as a separate ossicle – often present bilaterally. A cartilaginous synchondrosis develops in this region in those adults where it remains separate. A painful os trigonum may be due either from an acute injury or, as likely in this case from a chronic repetitive micro-trauma and resulting chronic diastasis of the synchondrosis [4]. The proximity of the flexor hallucis long tendon is a

feature of which one has to be mindful since pressure from the diastased os trigonum can lead to tenosynovitis. When the involvement of the flexor hallucis tendon becomes chronic and there is degeneration/tendinosis and fibrosis of the tendon between the medial and lateral tubercles of the talus, there can be reduced flexion of the great toe.

References

- 1 Sijbrandij ES, van Gils APG et al Posttraumatic Subchondral Bone Contusions and Fractures of the Talotibial Joint: Occurrence of "Kissing" Lesions. *AJR* 2000; 175: 1707-1710.
- 2 Magee TH, Ginson GW Usefulness of MR Imaging in the detection of talar dome injuries. *AJR* 1998; 170: 1227-1230.
- 3 Karasick D, Schweitzer ME Pictorial Essay The Os trigonum Syndrome: Imaging Features *AJR* 1996; 166: 125-129.
- 4 Grogan DP, Walling AK et al Anatomy of the os trigonum *J Pediatr Orthop* 1990; 10:618-622
- 5 Hedrick MR, McBryde AM Posterior ankle impingement *Foot Ankle* 1994; 15: 2-8.

Contact

Charles P. Ho, PhD, MD
Steadman Philippon Research Institute
181 W. Meadow Dr. Suite 1000
Vail, CO 81657
USA
Karen.briggs@sprivail.org