PREVALENCE OF LESIONS OF THE TALUS: WITH A SPECIAL LOOK AT “TRAM TRACK LESIONS”

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Introduction The ankle joint, although subject to great weight-bearing than other joints of the body, is not prone to symptomatic arthritis, as compared to the hip and knee joints. Furthermore, the cartilage thickness of the talar dome is thinner than that within the knee joint. When osteoarthritic lesions of the ankle do occur, however, they may develop from different stimuli, i.e. trauma, and perhaps follow a different course than in other joints. In fact, it was previously reported that the frequency of talar cartilage lesions is much higher than expected if the degeneration represents pre-osteoarthritis (-OA). Osteochondral lesions of the talus have been basically described and classified by various investigators1,2,3,4 according to what can be identified through radiology, or through a combination of radiology and Magnetic Resonance Imaging (MRI). This previous work, however, has focused on the identification of talar lesions through diagnostic techniques and none has taken in-depth look at the most common lesions and their morphological characteristics. Here we present unique talar lesions that, to our knowledge, have not been previously described in their gross appearance or incidence.

Methods: A total of 105 human tali from 68 donors were either obtained from the Human Organ and Tissue Donor Network of Illinois or from the medical student’s gross anatomy laboratory. Mean donor age was 69.7yrs. The tali were examined under a stereomicroscope for lesions according to a previously published scale5. Osteochondral specimens displaying unique degeneration, were observed with confocal microscopy. Representative samples of each grade of cartilage degeneration, as well as of those specimens displaying unique degeneration, were observed with confocal and conventional light microscopy.

Results: Results of the gross morphological grading of the talar dome can be seen in Fig. 1. All tali had at least some articular surfaces displaying normal cartilage. It was the middle-central (MC) region that displayed the fewest and least severe cartilage lesions. The region displaying the most severe degeneration was the anterior-medial (AM) dome, but still no Grade 4 lesions. Lateral lesions were more frequent and severe anteriorly than posteriorly (84% versus 56%). Medial lesions were nearly the same anteriorly (97%) vs. posteriorly (92%) but with a few more severe lesions located anteriorly. The same trends for location and severity of lesions existed between the right and left tali, with the right tali exhibiting a few more grade 3 lesions than the left (64% of donors have the same highest grade lesion on left and right talar domes). Females and males exhibited the same location and severity of cartilage lesions, with the exception that 11 of 12 so-called “tram track” lesions were found on the tali of male donors. These lesions were of significance because of longitudinally oriented grooves in the cartilage, running from anterior to posterior (Fig. 2-a), and in nearly all cases, a longitudinal subchondral bone projection at the bottom of the longitudinal cartilage groove (Fig. 2-b). We found that the tibial articulations displayed small osteophytes on the anterior articular margin that exactly corresponded to their articulation with the talar cartilage grooves as the ankle moved through plantar flexion and dorsiflexion.

Discussion: 75% of the load of the body is distributed through the talar dome during the gait cycle. In the present study it was found that the talar, indeed, displayed lesions directly associated with its dorsiflexion and plantar flexion movements. In particular, some talar lesions were apparently the result of abnormal contact with the tibial component of the ankle joint during motion. The most frequent and striking of these were the so-called “tram track” lesions on the talar dome in which the anterior articular border of the articulating tibia exhibited osteophytosis that impinged upon the talus while it glided across during flexion, thus creating longitudinal grooves (anterior to posterior) through the talar articular cartilage. Histologically, the subchondral bone projections of these tram tracks, with their frequent multiple tidemarks, were characteristic of remodeling. Our speculation as to the mechanism involved at these sites is that the tibial osteophytes are formed first, and subsequently place undue stress and friction on the talus at articulating sites thus leading to cartilage erosion, subchondral bony fracture or loading changes, and subsequent remodeling. Overall, we found that the talar lesion sites were fairly representative of the talar regions that were either bearing the greatest load, that appeared to be rubbing inconguently with their articulating surface, or that were under a destructive influence from articulating osteophytes of the tibia.


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Fig. 1. Results of the gross morphological grading (G0 – G4) of the regions of the talar dome. The regions with the most numerous of a specific grade of lesion are shown in bold type. The anterior and medial dome displayed the most severe grades of cartilage degeneration.

Fig. 2 (a). A “tram track” lesion with its unique longitudinally oriented groove (at arrow) in the cartilage of talar dome, running from anterior to posterior; (b). A representative histological (100x) example of a tram track lesion in coronal section showing the cartilage lesion (CL) overlying a subchondral bony projection (SCBP).