

Osteochondral lesion of the talus

Anatomy & Pathophysiology

LESION MORPHOLOGY AND CLASSIFICATION

- Osteochondral fragments of the talus are often loose and turned upside down within the crater, with subchondral bone appearing yellowish and hard [1].
- The Pritsch et al. (1986) classification system for osteochondral lesions of the talus includes stages for intact overlying cartilage, soft overlying cartilage, and frayed overlying cartilage [3].
- The Cheng et al. (1995) classification system for osteochondral lesions of the talus includes stages for smooth/intact but soft or ballotable cartilage, rough surface, fibrillation/fissuring, flap present or bone exposed, loose undisplaced fragment, and displaced fragment [3].
- CT scans in the axial plane can show the crater and fragments of an osteochondral lesion [1].
- Coronal CT scans can locate a lesion as anterior, middle, or posterior, which is often difficult to determine on radiograph [1].
- CT with 2-mm cuts in the coronal and axial planes determines whether a lesion is in the anterior third, middle third, or posterior third of the talar dome [3].
- Lesion size measured on MRI does not accurately reflect arthroscopic measurement in talar osteochondral lesions [2].

ANATOMICAL CONSIDERATIONS FOR SURGICAL APPROACH

- The lateral malleolus is posterior to the tibia, allowing lateral lesions in the middle or posterior third to usually be approached anteriorly without osteotomy [3].
- Osteotomy of the medial malleolus is often necessary to expose posterior or posteromedial lesions of the talus [1, 3].
- An anteromedial approach can be used for posteromedial lesions by “grooving” the anteromedial distal tibial articular surface 6 to 8 mm to expose the lesion without osteotomy of the medial malleolus [3].
- A posteromedial arthrotomy through an anteromedial approach can expose posteromedial lesions of the talus and avoid a medial malleolar osteotomy [3].

- An approach to the posteromedial ankle through the posterior portion of the posterior tibial tendon sheath allows exposure of the talar dome and tibial articular surface while protecting posteromedial tendons, neurovascular structures, and deep posterior fibers of the deltoid ligament [3].
- If osteotomy of the medial malleolus is necessary, surgery on the medial side should be delayed until after closure of the physis [1].

PATHOPHYSIOLOGY AND HEALING

- Retrograde percutaneous drilling through the sinus tarsi preserves intact articular cartilage in early lesions [3].
- Bone grafts are used in conjunction with retrograde drilling to prevent articular collapse due to the difficulty of adequately filling the contours of the lesion [3].
- Surgical-grade calcium sulfate in liquid form can be injected into the defect after drilling to promote healing [3].
- Bone-marrow aspirate harvested from the iliac crest, centrifuged to isolate pluripotent cells, and mixed with calcium graft has been used to promote more rapid healing [3].
- Fibrocartilaginous tissue fills in the defect in the subchondral crater during the postoperative period [1].

Classification

RADIOGRAPHIC CLASSIFICATIONS

- Berndt and Harty published a four-part radiographic classification of osteochondral lesions of the talus in 1959 [4].
- In the Berndt and Harty classification, Stage I is described as a small subchondral trabecular compression fracture not seen radiographically [4].
- In the Berndt and Harty classification, Stage II is described as an incomplete avulsion or separation of the fragment [4].
- In the Berndt and Harty classification, Stage III is described as complete avulsion without displacement [4].
- In the Berndt and Harty classification, Stage IV is described as a fragment detached and rotated and possibly within the joint [4].
- The Berndt and Harty classification is based on radiographic criteria that may be difficult to interpret [4].
- The Berndt and Harty classification cannot distinguish a stage I lesion [4].
- Several authors modified the Berndt and Harty classification to include associated MRI findings [4].

ARTHROSCOPIC CLASSIFICATIONS

- Pritsch et al. (1986) classified the cartilage overlying the lesion into three grades based on visual appearance [3].
- In the Pritsch et al. classification, Grade 1 indicates intact overlying cartilage [3].

CQ HAND + UPPER LIMB

- In the Pritsch et al. classification, Grade 2 indicates soft overlying cartilage [3].
- In the Pritsch et al. classification, Grade 3 indicates frayed overlying cartilage [3].
- Cheng et al. (1995) classified the lesion into six stages based on arthroscopic appearance [3].
- In the Cheng et al. classification, Stage 1 is smooth, intact but soft or ballotable [3].
- In the Cheng et al. classification, Stage 2 is a rough surface [3].
- In the Cheng et al. classification, Stage 3 is fibrillation/fissuring [3].
- In the Cheng et al. classification, Stage 4 is a flap present or bone exposed [3].
- In the Cheng et al. classification, Stage 5 is a loose, undisplaced fragment [3].
- In the Cheng et al. classification, Stage 6 is a displaced fragment [3].
- Pritsch and colleagues reported poor correlation between the radiographic appearance of the lesion and the state of the overlying cartilage [4].
- Treatment of osteochondral lesions was based on the visual appearance of the cartilage according to Pritsch and colleagues [4].

IMAGING ASSESSMENT

- MRI allows identification of stage I lesions [4].
- MRI findings in stable osteochondral lesions include decreased signal intensity on T1-weighted images [4].
- MRI findings in stable osteochondral lesions include either low or increased signal on T2-weighted images [4].
- MRI may be most useful in assessment of stage II osteochondral lesions for evaluation of chondral and subchondral discontinuity indicating lesion instability [4].
- MRI may be most useful in assessment of stage II osteochondral lesions for evaluation of the presence of subchondral cysts [4].
- MRI may overestimate stability [4].
- A combination of MRI assessment and arthroscopic examination may be required to determine stability and treatment requirements [4].
- MRI or CT is the preferred imaging for complete evaluation of a suspected lesion [4].
- The continuity of cartilage and subchondral cortex can be assessed by MRI or CT as an indicator of stability [4].
- Lesion depth can be evaluated by MRI or CT [4].
- Subchondral cysts may be evaluated by MRI [4].
- Signal intensity patterns and cyst size may progress or regress over time [4].
- Signal intensity patterns and cyst size may be less reliable indicators of lesion stability than surface continuity [4].
- CT with 2-mm cuts in the coronal and axial planes determines whether the lesion is in the anterior third, middle third, or posterior third of the talar dome [3].

Clinical Presentation

- Osteochondral lesions of the talus are often difficult to determine as anterior, middle, or posterior on radiograph [1].
- Coronal CT scans locate the lesion whether it is anterior, middle, or posterior [1].
- Axial CT scans show the crater and fragments of the osteochondral lesion [1].
- A “floating” fragment in an osteochondral lesion is a loose fragment turned upside down in the crater [1].
- The subchondral bone in an osteochondral lesion is yellowish and hard [1].
- The fragment in an osteochondral lesion is often loose [1].

Investigations

- Coronal CT scans locate talar osteochondral lesions as anterior, middle, or posterior, a distinction that is often difficult to determine on radiograph [1].
- Axial CT scans demonstrate the crater and fragments of talar osteochondral lesions [1].
- The diagnosis of talar osteochondral lesions involves history, physical examination, and arthroscopy [2].

Treatment

OPEN SURGICAL TECHNIQUE

- A longitudinal incision 7 cm long is made over the antero-medial aspect of the ankle, placed far enough medially to allow for medial malleolar osteotomy if necessary [1].
- The foot is plantarflexed as much as possible to visualize the lesion, and an osteotomy is usually necessary if the lesion is posterior [1].
- An osteotomy is made obliquely across the medial malleolus at the ankle joint level perpendicular to a predrilled hole for a cancellous screw [1].
- The medial malleolus is turned distally using a towel clip, and the ankle is everted to expose the medial and posterior aspects of the talar dome [1].
- The central necrotic area is removed with a small curet, and the crater and fragment are removed with copious irrigation [1].
- Four or five holes are made in the subchondral crater with a small drill to promote vascular ingrowth [1].
- The medial malleolar osteotomy is realigned and secured with a cancellous bone screw, with radiographs taken to check for anatomic alignment [1].
- Postoperatively, the patient wears a cast or patellar tendon-bearing brace for 6 to 8 weeks [1].
- The patient remains non-weight bearing for a total of 8 to 12 weeks while fibrocartilaginous tissue fills the defect [1].

ARTHROSCOPIC AND PERCUTANEOUS TECHNIQUES

- Percutaneous arthroscopic drilling is recommended as an alternative to surgical excision for early stages, medial lesions, and lesions in children that have not healed [3].
- Arthroscopic drilling for medial osteochondral lesions does not require osteotomy of the medial malleolus or postoperative immobilization [3].
- Arthroscopic drilling allows for early resumption of daily activities and sports [3].
- The procedure is reported to be as effective and useful in young patients, especially those with open physes [3].
- A specific indication for arthroscopic drilling is an early lesion with mild osteosclerosis of the surrounding talar bone, continuity of the cartilaginous surface, and stability of the osteochondral fragment [3].
- Retrograde percutaneous drilling through the sinus tarsi preserves the intact articular cartilage [3].
- Bone grafts are used in conjunction with retrograde drilling to prevent articular collapse due to difficulty in filling the contours of the lesion [3].
- Surgical-grade calcium sulfate in liquid form has been injected into the defect after drilling [3].
- Bone-marrow aspirate harvested from the iliac crest, centrifuged to isolate pluripotent cells, has been mixed with calcium graft to promote more rapid healing [3].
- CT with 2-mm cuts in the coronal and axial planes determines whether the lesion is in the anterior, middle, or posterior third of the talar dome [3].
- Lateral lesions, even when in the middle or posterior third, usually can be approached anteriorly and removed without an osteotomy [3].
- An anteromedial approach for posteromedial lesions involves “grooving” the anteromedial distal tibial articular surface 6 to 8 mm to expose the lesion without osteotomy of the medial malleolus [3].
- A posteromedial arthrotomy through an anteromedial approach can be used to expose posteromedial lesions of the talus and avoid a medial malleolar osteotomy [3].
- An approach to the posteromedial ankle through the posterior portion of the posterior tibial tendon sheath allows exposure of the talar dome and tibial articular surface while protecting posteromedial tendons, neurovascular structures, and deep posterior deltoid ligament fibers [3].
- Patients undergoing medial malleolar osteotomy are immobilized in a walking boot for 6 weeks and then allowed weight bearing in a walking boot until 12 weeks after surgery [3].
- A patellar tendon-bearing brace is sometimes used after surgery to unload the ankle joint [3].

CLASSIFICATION SYSTEMS

- The Pritsch et al. (1986) classification includes stages for intact overlying cartilage, soft overlying cartilage, and frayed overlying cartilage [3].
- The Cheng et al. (1995) classification includes stages for smooth/intact but soft or ballotable cartilage, rough surface, fibrillation/fissuring, flap present or bone exposed, loose undisplaced fragment, and displaced fragment [3].

Complications

- Previous bone marrow stimulation may negatively affect clinical outcome in patients undergoing autologous osteochondral transplantation for osteochondral lesions of the talus [2].
- Arthroscopic quantification of syndesmotic instability is possible in a cadaveric model [2].
- The arthroscopic syndesmotic assessment tool can differentiate between stable and unstable ankle syndesmoses [2].
- Chronic tibiofibular syndesmosis injury has diagnostic efficacy with magnetic resonance imaging and comparative operative treatment options [2].
- Arthroscopic suture anchor repair of the lateral ligament ankle complex has been evaluated in a cadaveric study [2].
- Arthroscopic Brostrom repair with Gould augmentation via an accessory anterolateral port is a technique for lateral instability of the ankle [2].
- Arthroscopic anatomic reconstruction of the lateral ligaments of the ankle with gracilis autograft is a described technique [2].
- Arthroscopic-assisted lateral ligamentous reconstruction is used in combined ankle and subtalar instability [2].
- Arthroscopic treatment of chronic ankle instability has been evaluated in a prospective study of 286 patients [2].
- Activity level and function 2 years after anterior talofibular repair can be compared between arthroscopic repair and open repair procedures [2].
- Combination of modified Brostrom procedure with ankle arthroscopy is used for ankle instability accompanied by intra-articular symptoms [2].
- Open and arthroscopic lateral ligament repair for treatment of chronic ankle instability has been subject to a systematic review [2].
- Arthroscopic repair of chronic lateral ankle instability is a described procedure [2].
- Arthroscopic findings and long-term results are documented for chronic lateral instability [2].

References

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