Plantar Talar Head Contusions and Osteochondral Fractures: A Predictor of Ligamentous and Osseous Injury in Ankle Trauma?

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BACKGROUND

• Bone bruises and fractures are common findings on ankle MRI in setting of trauma

• Studied by multiple investigators (22 articles)
  – Patterns of bone bruises and associations with ligamentous injuries

• We encountered a distinct pattern of focal bone bruising and osteochondral fractures of the plantar aspect of the talar head
Osteochondral fracture of the plantar aspect of the talar head:

25-year-old male with ankle pain after acute trauma
BACKGROUND

Literature on plantar talar head contusion/fracture

“MRI of Rupture of the Spring Ligament Complex with Talo-Cuboid Impaction. Case report.”

“Insufficiency and Nondisplaced Fractures of the Talar Head: MRI Appearances”

“The Spring Ligament Recess of the Talocalcaneonavicular Joint”

Kavanagh et al. Skeletal Radiol 2007

Long et al. AJR 2012

Desai et al. AJR 2011
PURPOSE

- Examine the relationship between
  - Bone bruises and/or osteochondral fractures of the plantar talar head and
  - Ligamentous and other osseous abnormalities on ankle MRI

- Hypothesize a mechanism of injury
Methods and Materials

- Electronic database search:
  - Ankle MRI studies with reported osseous injuries
  - 5 years
  - 589 cases

- Inclusion criteria:
  - Bone bruises / osteochondral fractures involving the plantar aspect of the talar head
  - History of acute trauma within the past 6 months
METHODS AND MATERIALS

- Excluded:
  - Diffuse midfoot marrow edema
  - Diffuse talar head edema
  - Talar head osteonecrosis
  - Calcaneonavicular coalition
  - Gross talar head fractures
  - Periarticular marrow edema with effusion and synovitis
  - Follow up MRI studies of the same ankle
METHODS AND MATERIALS

Structures Evaluated

Osseous:
- Talus
- Medial malleolus
- Lateral malleolus/Distal fibula
- Posterior malleolus
- Calcaneus
- Navicular
- Cuboid

Ligamentous:
- Lateral ligamentous complex
  - Anterior talofibular lig
  - Calcaneofibular lig
  - Posterior talofibular lig
- Deltoid lig
- Spring lig
- Syndesmotic lig

Other:
- Medial tendons
- Peroneal tendons
- Extensor digitorum brevis
- Achilles tendon
RESULTS

- 37 of 589 studies met inclusion criteria

- Age 29.4 ± 16.0, mean age 23

- 20 ♂, 17 ♀

- Delay from injury to imaging
  - Mean ± SD = \(25.2\) days ± 32.6
  - Range 1 to 168 days
RESULTS
Talar contusions, location

Anteromedial  Posteromedial  Neck  Medial and Lateral Domes
RESULTS

Talar contusions, location

- Med Dome: 3%
- Lat Dome: 11%
- Post Med: 49%
- Ant Med: 68%
- Neck: 11%
RESULTS
Other contusions

Calcaneus

Salter-Harris fracture of distal fibula

Cuboid

Navicular
RESULTS
Other contusions

* 11 of 14 cases involved the **anterior process of the calcaneus**
** 5 of 9 patients age ≤ 16 had **Salter-Harris type fractures of the distal fibula**
RESULTS

Ligaments

Intact           Partial tear       Complete tear

% total abnormal = 76%
RESULTS

Ligaments

- Calcaneofibular ligament
- Deltoid ligament
- Spring ligament

Graph showing:
- CF: 41%
- Deltoid Lig: 19%
- Spring Lig: 14%
RESULTS
Extensor digitorum brevis

- 27% had strain or avulsion
- 16% had both
RESULTS
Summary

- 86% (32/37) had other concurrent osseous injuries
- 76% (28/37) showed lateral ankle ligamentous sprain
- 51% had multi-ligamentous injuries
CASE EXAMPLE
57yo female, twisting injury to left ankle 10 days prior

- Osteochondral fracture of plantar talar head
- Contusion of anterior process of calcaneus and cuboid
- Medial malleolus fracture
- ATFL complete tear
- EDB strain
CASE EXAMPLE
13yo male with ankle pain, injury 10 days ago

Salter-Harris type fracture of distal fibula with subperiosteal hematoma

Bone contusion of plantar talar head
DISCUSSION

Patterns of talar contusions most frequently described in literature involve the talar dome, body, and neck

- Labovtiz et al. Foot Ankle Int 1998
- Elias et al. BMC Musculoskeletal Disorders 2008

Nishimura et al described 4 patterns of bone bruising and correlation between talar contusions and lateral ligamentous injuries

- Does not address plantar talar head contusion

Desai et al studied spring ligament recess

- 16 of 49 patients had “talar head impaction injury”
- 15 of those had lateral ankle sprain
- 4 had spring ligament tear
DISCUSSION

- Plantar talar head contusion implies *increased severity of ankle injury*
  - Multiple other contusions
  - Multi-ligamentous injury

- Probably due to *inversion-supination mechanism*
  - Medial distribution of bony contusions
  - High prevalence of injuries to the lateral ankle ligaments
LIMITATIONS

• Retrospective review

• No control group

• Variable time from injury to imaging
  • different healing time for various abnormalities

• No long term clinical or imaging follow-up to determine the outcome
CLINICAL RELEVANCE

Plantar Talar head contusion

- Search for concurrent osseous and ligamentous injuries
- In adolescents, they can be associated with Salter-Harris type injury to distal fibula
REFERENCES