PR 0406-02 en EU/US

CHAPTERS

2. Calcaneus Fracture

Background: the treatment of displaced intra-articular calcaneal fractures

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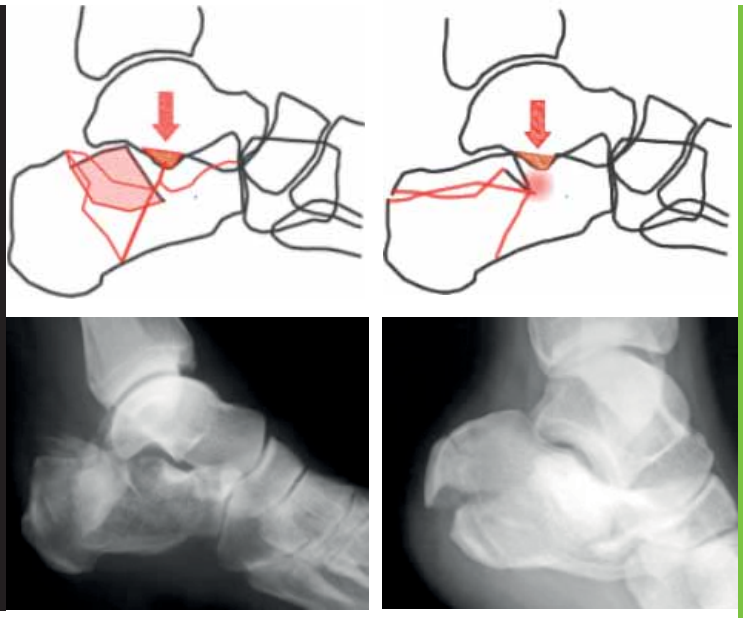


Joint-depression type Tongue type

Available at: www.foothyperbook.com/trauma/calcanealFx/calcanealFxClassn.html

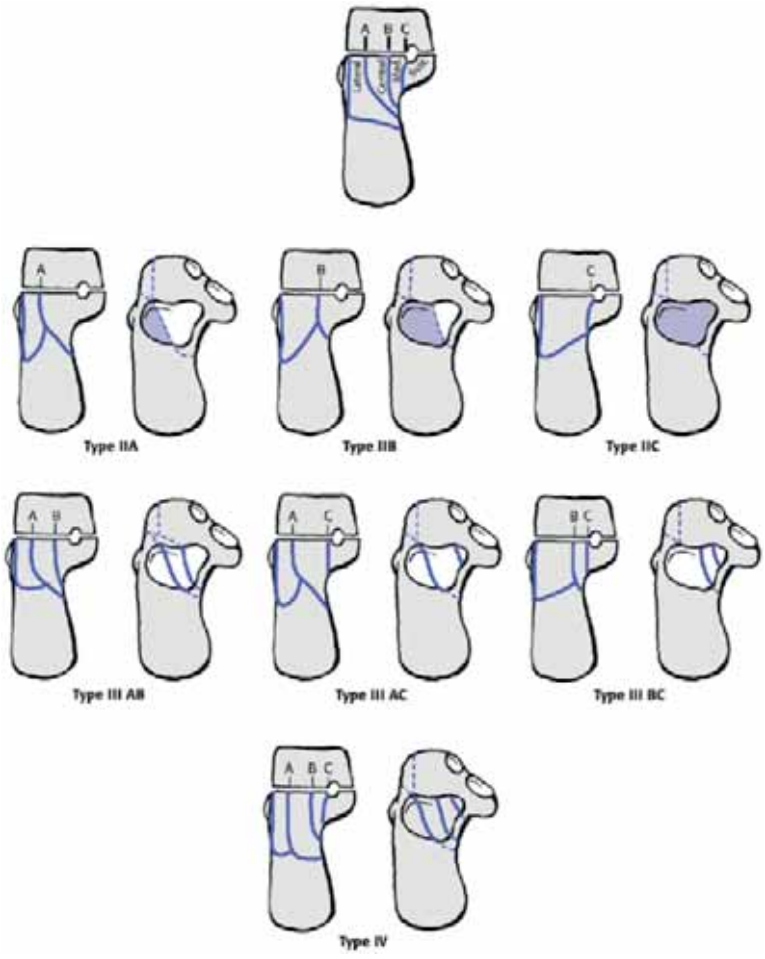
Background: Incidence of calcaneal fractures: 1-2% of all fractures [1], 60% of tarsal fractures.

Mechanism: Fall from height or motor vehicle accidents [2].

Classification: Essex-Lopresti [3]:
Joint-depression type
Tongue type

Sanders [4, 5] fracture pattern in coronal CT scan.

Type I: non-displaced fractures
Type II: displaced, 2 main fragments
Type III: displaced, 3 main fragments, impression of subtalar joint
Type IV: displaced and fragmented



Diagnostics: Clinical examination, X-rays ap. and lat., CT-scan.

Therapy
Conservative treatment: Indication: only non-displaced fractures (Sanders type I) or severe comorbidity of patient [6].

Bed rest for 3-4 days with cryotherapy, compression, elevation, pain management and medical antiphlogistic therapy (RICE-therapy: Rest, Ice, Compression, Elevation).

Next short leg casting and no weight bearing for 2 weeks, followed by range-of-motion exercises. Partial weight bearing (15 kg) by 3-6 weeks, progressive weight bearing should begin at 6-8 weeks, with full weight bearing by 8-12 weeks according to radiographic controls [2, 6, 7].

Operative treatment: All displaced calcaneus fractures (> 1 mm) [1]. Open Reduction and Internal Fixation (ORIF).

Aims of ORIF [6]:

1. Restore normal orientation of anterior processus.
2. Reconstruct posterior facet (and attach it to the anterior processus).
3. Correct shortening and varus.
4. Reattach the tuber calcanei to posterior facet.
5. Fill cancellous void as needed.
6. Stabilize fragments with internal fixation.
7. Close soft tissues without tension in two layers.

In joint depression type fractures loss of cancellous bone is quite common.

Treatment options in bone voids: There is still a lack of evidence to determine the best method for treating bone defects after calcaneus fractures [8 - 12]. Different treatment options exist, some are listed below:

- Autologous bone graft [8, 9].
- Demineralised bone matrix [10].
- Bone substitutes [11, 12].

Literature:

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9. Singh AK, Vinay K. Surgical treatment of displaced intra-articular calcaneal fractures: is bone grafting necessary? J Orthop Traumatol. 2013; 14: 299 - 305.
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Surgical positioning and preoperative procedures:

- Mark the site of surgery while informed consent of patient is obtained
- The use of a radiolucent table is recommended
- Prepare mobile C-arm
- Antibiotic prophylaxis 30 min before incision
- Place the patient in a lateral position
- Place a pneumatic thigh tourniquet and activate it
- Skin preparation and draping as usual
- Team time-out


Figure 1.


Figure 2.


Figure 3.


Figure 4.


Figure 5.


Figure 6.

Fig. 1-6: Images reproduced by kind permission of Dr Damiano Papadia and Dr Paolo Cristofolini, Ospedale Santa Chiara, Trento Italy.

Surgery:

- Use a standard lateral L-shaped incision approach (Fig. 1).
- Elevate a full-thickness periostal-skin flap.
- Preparation of the lateral wall; in some cases opening of lateral wall is required. (Fig. 2).
- Reduction of impacted parts of the posterior facet with Freer's elevatorium or a bone spike. A 4,0mm Schanz-screw in the tuber calcanei can be used to support reduction by traction of the fragments.
- Temporal fixation of the fragments by several 1.4 or 1.6 K-wires (Fig. 3).
- The sustentaculum fragment is usually not displaced and can be used as reference for stable fixation.
- Use a calcaneus plate (low profile, anatomically shaped, LCP) for internal fixation (combined with separate lag screws) (Fig. 4).
- Place two or three screws to stabilize the fragments and hold the plate in place.
- Mix CERAMENT™|BONE VOID FILLER as per Instructions For Use.
- Wait for three minutes when the material will be more viscous.
- Inject CERAMENT™ in the cancellous void with a backfill technique under fluoroscopy – starting at the distal part of the void and inject as you withdraw proximally (Fig. 4,5).
- Place an abdominal cloth on the hardening CERAMENT™ with gentle pressure.
- Wait for 15 minutes until CERAMENT™ has hardened.
- Before soft tissue closure complete the fixation of the plate with more screws as required, place the screws into the bone.
- Release the surgical tourniquet and achieve hemostasis.
- Follow normal surgical practice and if applicable use a drain with contact to the hardened CERAMENT™.
- Reposition the periost-skin flap.
- Perform a two-layered closure: deep periostal suture and skin closure.

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Follow Up:

- Clinical and radiographic controls

Figure a) and b): pre surgery.

Figure c) and d): post surgery.

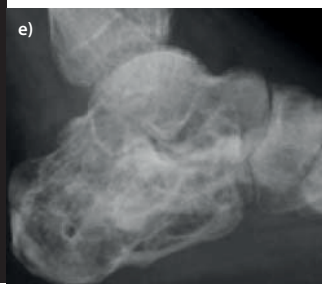

Figure e) and f): plate removal at five months after surgery due to discomfort.

Figure g): Full weight bearing achieved months after surgery due to discomfort.

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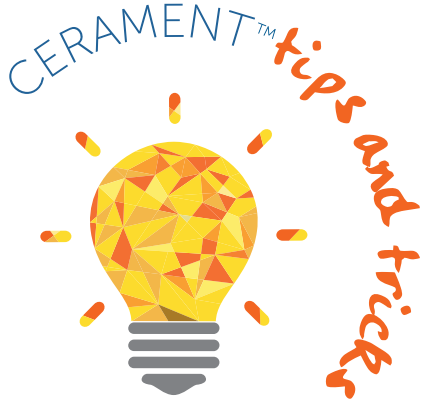

- Ensure good contact with cancellous bone
- Wait three minutes after mixing till you start to inject CERAMENT™|BONE VOID FILLER ('Spaghetti-test')
- Control bleeding during surgery
  - Extensive bleeding might result in intermixing of blood with the CERAMENT™ paste
  - Consider using a tourniquet
- Follow normal surgical practice and if applicable use a drain with contact to the hardened CERAMENT™
  - The drain may draw white coloured fluid some hours after surgery, which does not endanger or jeopardise the success of surgery
- Close soft tissue and skin in two layers: Place all deep sutures first and then tighten them all together