Early and definitive treatment of Pilon fracture

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Pilon fracture definition ??

This presentation is about high-energy fractures where the talus acts an mortise to destroy the distal tibial articular surface (fracture type 43.C)
Pilon fracture characteristics

Intra-articular high energy fracture (often with bone loss) at an anatomic location where the soft-tissue envelope is very gracile and the blood supply is vulnerable

Different degree of vascularisation of the tibia

From: Femoral and tibial blood supply: A trigger for non-union?

Santolini E, Goumenos SD, Giannoudi M, Sanguineti F, Stella M, Giannoudis PV.
Injury. 2014 Nov;45(11):1665-73

Thomas Rüedi: "A fracture is first and foremost a soft-tissue injury in which the bone happens to be broken!"
High complication rates even when treated properly as result of "nature of the fracture".

Pollack et al. JBJS, 2003; 85A: "Outcomes after treatment of high energy tibial plafond fractures":

- 2 years follow-up: Pilon fractures had lower SF-36 scores than patients with pelvic fractures or patients with AIDS or coronary artery diseases
What goes wrong?

Insufficient soft-tissue handling:
  high risk of disaster (infection, amputation)

Insufficient fracture reduction and fixation:
  high risk of long-term complications (non-union with bone loss, osteoarthritis)
Treatment algorithm

2-staged treatment protocol:

1. Initial reduction and external fixation

2. Subsidence of soft-tissue swelling: definitive open reduction and fixation (external or internal)
Early treatment of Pilon fracture: span – scan – plan

External fixation from mid-tibia to calcaneus

• keep pins out of zone of injury and away from possible later incisions

• maybe: limited internal fixation of the fibular fracture (flexible intramedullary nail, fibular nail)
Definitive treatment of Pilon fracture

KNOW AND RESPECT YOUR LIMITATIONS

PLAN-PLAN-PLAN and re-PLAN
(plan A, plan B, plan C...)

Day-time surgery

Plan and perform the surgery with your traumatologist colleague
Individualized plan

When can definitive surgery be performed? How long can I wait before reducing the fracture/staged surgery?

How do I reduce the fracture?

How do I fix the fracture segments?

Treatment of bone loss?

Incisions? Sufficient space between incisions? Access to bone fragments without opening through compromised soft-tissues: antero-medial, antero-lateral, postero-lateral, postero-medial

Careful soft-tissue handling!! Post-operative handling of soft-tissues: Prevena-VAC on critical incisions
Open reduction

• In C3 Pilon fractures, the posterior fragment is often the key to reduction (1)

• Posterior fragment must be reduced to the posterior edge of the proximal tibial shaft; pinned in place in proper relation to the talus

• Medial and anterolateral fragments are reduced using the posterior malleol fragment and the dome of the talus as a template for reduction of joint surface

1) The pilon map: fracture lines and comminution zones in OTA/AO type 43C3 pilon fractures. Cole PA, Mehrle RK, Bhandari M, Zlowodzki M., J Orthop Trauma. 2013 Jul;27(7)
Intraoperative goals

• Proper length of fibula (plate, nail)
• Open reduction and internal fixation (screws) of articular fragments
• Medial support (prevent collapse of fracture into varus)
  – External fixation or
  – Plate
• Bone graft: metaphyseal/diaphyseal bone loss
Definitive treatment: circular frame or plates

*Pro circular frame:*

- More forgiven on soft-tissues
- Facilitates fracture reduction, even though open reduction is still needed
- Foot-frame kept for 8-12 weeks: avoids flexion contracture of the ankle joint

*Cons circular frame:*

- Clinical set-up
- Patient comfort
- Superficial wire infection
- Treatment of post-operative soft-tissue swelling
Definitive treatment: Open reduction and internal fixation with plates. (I do not have experience with this)

Timing of surgery, placement of incisions, soft-tissue handling becomes even more important!!

Staged plating (Sanders)

• Posterolateral approach
• Fibula plating and posterior tibial plating
• External fixation
• Wait: 7-14 days
• Anterior tibial plate
Management of high-energy tibial pilon fractures

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**Fig. 6** Treatment algorithm as used in the authors’ unit
2-staged treatment protocol:

1. Initial reduction and external fixation

2. Subsidence of soft-tissue swelling: definitive open reduction and fixation (external or internal)