

Extraarticular Distal Tibia Fractures OTA 43.A

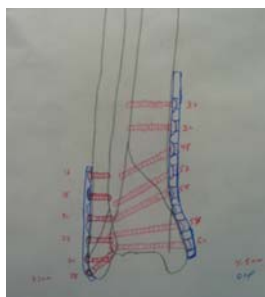
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- Speaker/family has no contractual relationships with any manufacturer, commercial organization, or for-profit retail organization
- Speaker has received no financial gifts from any manufacturer, commercial organization, or for-profit retail organization, and has no bank accounts in Zurich or the Caymans
- Speaker is for sale, and with the economy in the tank, I think we can work something out cheaply
- Does anyone actually read the disclosures?

Objectives

- Review relevant anatomy
- Discuss difficulties in managing these fractures
- Define options for management
- Tricks and traps



Injury X Rays



The rest of the story



The Problem: Distal 1/4th fractures

- Achieve/maintain reduction
- Control distal fragment (short)
- Avoid soft tissue injury
- Consider subtle fracture extensions
 - INTO THE JOINT
- Need to fix the fibula ?



Goals

- Obtain/maintain alignment and length
- Encourage healing
- Allow early motion of adjacent joints
- Avoid complications:
 - Skin
 - Nonunion
 - Infection
 - Stiffness



The Problem Getting Reduction

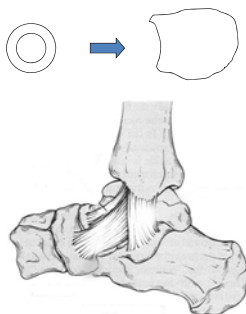
- Spiral oblique fractures:
 - Rotational displacement
 - Short (through rotation)
- Both deformities must be corrected for an anatomic fracture reduction
- Barriers:
 - Interposed material
 - Persistent loss of length (lateral column)



Anatomic Features

Distal tibia

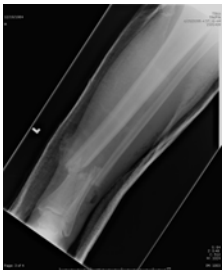
- Transition from diaphysis to articular surface
- Orientation of articular surface determines joint position
- Congruence of joint surface critical to longevity



The Problem

Getting Reduction (cont'd)


- Anatomical consideration:
- Transition from diaphysis to metaphysis
- Lack of supportive structures
 - Fibula-
 - Length
 - Rotation



The Problem

Avoiding Additional Soft Tissue Injury


- Thin envelope
- High energy transfer to surrounding tissues
- Poor tissue vascularity
 - Diabetes
 - PVD
 - Burns
 - Abrasions
 - Traumatic laceration



The Problem

Fracture Extensions


- Linear cracks
- Nondisplaced
- Multiplanar
- Does this represent a risk:
 - Malreduction
 - Loss of alignment



The Problem

Fix the Fibula?

- Reduction barrier?
 - Reduction aid
- Stability problem?
 - Stability solution
- Occult syndesmotic ankle injury?
 - Obligated to test the syndesmosis




Evolution of Treatment

No Good Deed Goes Unpunished

Treatment	Problem
• Closed reduction/LLC	• Stiffness
• External fixator <ul style="list-style-type: none"> – Joint spanning 	• Infection, stiffness
• Hybrid fixators <ul style="list-style-type: none"> – Juxtaarticular 	• Pin tract infections, septic arthritis, stiffness
• Plate osteosynthesis	• Infections
• IM nails	• Malunions, nonunions
• MIPPO	• Infections, nonunions

Closed Reduction Long Leg Cast

- Difficult to obtain/maintain reduction
- OR/ER?
- Frequent Xray checks
- Re-reductions
- Residual length/rotation deformities
- Ankle/subtalar stiffness
- DVT



Giving birth to a reduction

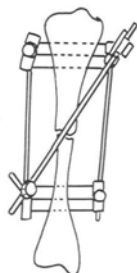
Pins and Plaster

- K wires transfixing proximal and distal segments
- PTB applied, closed reduction while cast wet
- **Problems:** pin tract infections, compartment syndromes



Hoffman-Vidal Frame

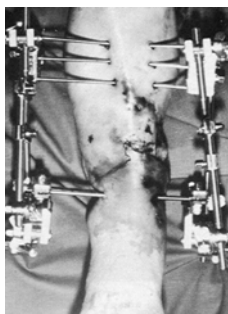
- Transfixion Shantz pins
- Rigid frame:
 - Ability to distract, compress
 - Allow for early partial weight-bearing



Hoffman-Vidal Frame

Clinical Problems

- Pin tract infections:
 - Cellulitis
 - Ring sequestra
- Soft tissue tethering / contractures
- Delayed / nonunions



Hammer Acta 1985

Modern Joint Spanning Ex Fix

- Provisional
- Keep pins away from the potential incisions
- Limit construct design
- Allow for soft tissue care



Small Wire Fixation

- Advantages:
 - Rigid control of fragments
 - Indirect reduction using olive wires
- Indications:
 - Segmental fractures
 - Intraarticular extension
 - Poor skin
- Disadvantages:
 - Pin tract infections
 - Septic arthritis
 - Joint stiffness




Closed Reduction/IM Nail

- Anatomic/mechanical challenges
- Assistive devices:
 - Triangle
 - Distractor
 - Blocking screws
 - ORIF Fibula



Historic AO Principles
Surgical Strategy


- Open extensile approach
 - Anteromedial
- Anatomic reduction with resolution of fracture lines
 - Primary bone healing
- Dynamic compression plates and screws
 - Compression at fracture site
- Interfragmentary compression
 - Lag screws



Early US Experience
Open Fixation Distal Tibia Fractures

Teeny et al

- Distal tibia fractures
- AO principles:
 - Early operative management
 - Rigid internal fixation
- Significant infection rate (11-30%)
- Wound breakdown



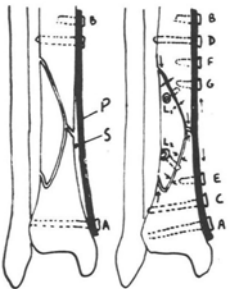
Open Reduction
Modern Fixation Strategies

- AO Teaching (Problems)
- Early US Experiences (Problems)

- Second generation plating
 - MIPPO
 - Anatomically contoured plates
 - Alternative surgical approaches
 - Facilitative adjuncts to reduction


ORIF Current Philosophy

- Avoid large incisions
- Relative stability
 - Locked plates
 - Internal Ex Fix
- Adjunctive reduction
- Advantages:
 - Early motion
 - Rigid fixation
 - Anatomic reduction




Minimally Invasive Technique

- Small medial incisions
 - For insertion and positioning
- Non-destructive plating
 - Leave periosteum intact
 - Cautious skin handling / closure
- Indirect reduction
 - Plate will not reduce the fracture




Percutaneous Plating Early Experiences

- Initial implants
 - ½ tubular plates
 - Pounded flat
 - 4.5mm screws
 - Indirect reduction
 - Small incisions
- Problems:
 - 20% superficial infection rate
 - Prominent hardware
 - Focus on implant rather than reduction




MIPPO

- Minimally invasive
- Small incisions
- Relative stability
- Requires facilitated reduction:
 - Push-pull
 - Distractor
- Disadvantages:
 - REDUCTION
 - Avoid OIF

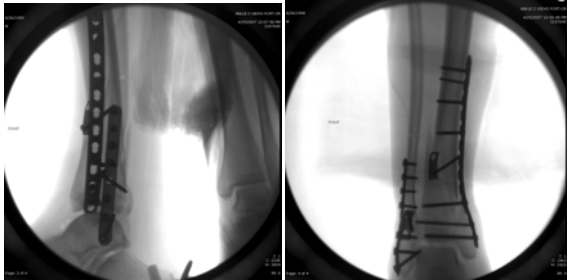


Example: Open Comminuted Tibia and Fibula Fx



In femoral distractorFibula fixation, Metaphyseal plate on Tibia

Minimally Invasive Plating Definitive Fixation



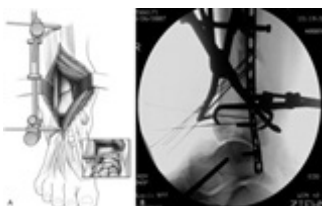
Anterolateral Distal Tibial Plate

- Distal 1/3 and Pilon Fx
- Lateral incision
- Spares medial skin
 - Earlier ORIF?
- Can fix fibula through same incision
 - Ex fix
 - Delayed ORIF

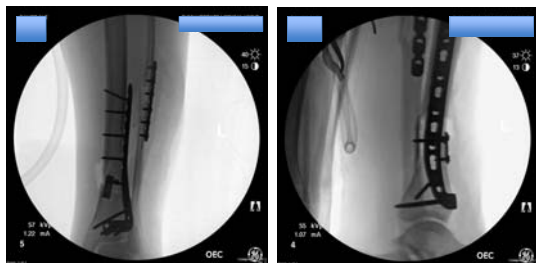


Anterolateral Incision

- Grose JOT 2007
- Anterolateral incision
- 44 pts
- 93% anatomic reduction
- 2 infections (4.5%)



Example



Fibula

Fix or don't?

- Aid in reduction:
 - Length
 - Coronal plane
 - Rotation
- Aid in stability
- Offers an excuse to do simultaneous fasciotomy
- Test for syndesmotic stability



Suggestions:

- Become familiar with means of facilitated reduction
 - Femoral distractor
 - Blocking screws
 - Mini ORIF
 - Fixing the fibula
- Modern surgical approaches, implants



Summary

- Methods evolving
- Goals unchanged
 - Anatomic alignment
 - Stable reduction
 - Allow early ankle motion
 - Minimize skin/soft tissue complications



The device is not designed to replace the surgeon. You still have to reduce the fracture
