Proximal Tibia Fractures Plate Versus Nail
Is There A Difference In Outcomes?

- Knee Pain
- Rates Of Union
- Mal-Union
- Mal-Reduction
- Infection
- Implant Removal

J Orthop Trauma 23: 485-492, 2009

N=22 Nails  N=34 Plates
Outcome Measures: Union Rates, Malunion, Malreduction, Infection, & Implant Removal

No Distinct Advantage With Either Method Of Treatment
No Statistically Significant Differences in Outcome Measures
Apex Anterior Mal-Reduction Most Common Deformity In Both Groups
Implant Removal More Common In The Plate Group
### Proximal Tibia Fractures

**MIPPO / Concept / Theory**

- Minimize Surgical Footprint
  - And The Subsequent Biological Impact
    - Promote Healing
    - Decrease Infection
    - Improve Outcomes

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### Proximal Tibia Fractures

**MIPPO / Concept / Theory**

- Advances In Past 20 Years
  - Minimally Invasive Techniques
  - Peri-Articular Locked Plates
  - Adjunctive Reduction Tools
  - Better Intra-Operative Imaging
  - Early Rehabilitation Protocols

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### MIPPO Proximal Tibia

**Principals**

- **Articular Segment**
  - Open Reduction
  - Anatomic Articular Surface
  - Rigid Fixation Absolute Stability

- **Meta-Diaphyseal Segment**
  - Fracture Not Exposed
  - Controlled Distraction
  - Indirect Reduction Relative Stability
  - Adjunctive Reduction Tools
Proximal Tibia Fractures

4 Strong Indications For MIPPO Plating

- Severe Soft Tissue Injury
- Complex Fracture Patterns
  - Intra-Articular Fractures
  - Complex Extra-Articular Fxs
- Peri-Prosthetic Fractures
- Fractures Not Amenable To Nailing

#1

Proximal Tibia Fractures

Indication For MIPPO Plating

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#2

Proximal Tibia Fractures

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  - Peri-Articular Fractures
  - Complex Extra-Articular Fractures
- Peri-Prosthetic Fractures
- Fractures Not Amenable To Nailing
Proximal Tibia Fractures
Indications For MIPPO Plating

• Severe Soft Tissue Injury
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Proximal Tibia Fractures
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Proximal Tibia Fractures
MIPPO Requirements

• Works Best On Acute Fractures
• Reducible Fracture
• Understand Anatomy
  • Deforming Forces
  • Safe Zones / Implant Placement
• High Quality Imaging
Proximal Tibia Fractures
Pre-Op Planning

- Patient Positioning
- Create A Stable Platform
- Bone Foam Or Blanket Pack
- Unobstructed Lateral Imaging
- Move The C-Arm NOT Limb

Proximal Tibia Fractures
Pre-Op Planning

- Surgical Drawing Helpful
- Equipment
  - Peri-Articular Locking Plates
  - Reduction Tools
    • Ext Fix Or Femoral Distractor
    • Peri-Articular Clamps
    • Joysticks

Proximal Tibia Fractures
Operative Sequence

- Articular Reduction
- Controlled Distraction
- Restore Alignment
- Technical Tricks
- Understand Deforming Forces
- Submuscular Plating
- Span Zone Of Commination
Proximal Tibia Fractures
Operative Sequence

• Articular Reduction
  • Indirect Reduction If Non-Displaced
  • Direct Reduction When Displaced
  • Exposure As Necessary

Proximal Tibia Fractures
Operative Sequence

• Controlled Distraction
  • Traction
  • Femoral Distractor
  • External Fixation

Proximal Tibia Fractures
Operative Sequence

• Restore Limb Alignment
  • Length
  • Alignment
  • Rotation
Proximal Tibia Fractures
Operative Sequence

• Reduction Tools
  • Distractor Or Ex Fix
  • Strategic Bump
  • Schantz Pins / Joystick
  • Articulated Device
  • Peri-Articular Plate

Proximal Tibia Fractures
Operative Sequence

• Understand Deforming Forces
  • Hip & Proximal Femur
  • Distal Femur
  • Proximal Tibia
  • Distal Tibia

Proximal Tibia Fractures
Operative Sequence

• Submuscular Plating
  • Know Your Anatomy
  • Learn Safe Corridors
  • Confirm With C-Arm
Proximal Tibia Fractures
Operative Sequence

• Span Zones Of Comminution
  • Long Plates
  • Spaced Screws
  • Balanced Fixation
  • Stable Construct

Proximal Tibia Fractures
Operative Sequence

• Technique
  • Controlled Distraction
  • Anatomic Specific Plates
  • Reduction Tools
  • Skilled Assistant
  • High Quality Imaging

MIPPO Proximal Tibia
Concept Rather Than Technique

• Substantial Learning Curve
• Start With Less Complex Fractures
• Reduction Most Important Goal
• Size Of Incisions Less Critical
• Not A Faster Surgical Procedure
38 Year Male S/P Pedestrian Versus Motor Vehicle

Operative Sequence For MIPO Proximal Tibia

Proximal Fragment Fixation
Non-Locking Screw Distally To Bring Plate To Bone Followed By Lag Screw

Final Fixation Construct

42 Yr Male S/P 100 Kilogram Crate Fell Onto Leg At Work
Articular Extension: Nail Or Plate?

Percutaneous Submuscular Plating. Mild Residual Deformity

2 Year Follow-Up Healed And Working
Proximal Tibia Fractures
Intra-Medullary Nailing

• Advantages Of Nailing
  • Load Sharing Implant
  • Load Sharing Implant
  • Load Sharing Implant
  • Soft Tissue Friendly

Intra-Medullary Nailing
Problems & Challenges

• Classic Infra-Patellar Nailing With
  The Knee Flexed Leads To
  Predictable Deformities
    • Flexion (Apex Anterior)
    • Post Translation Distal Fragment
    • Valgus
  • 2° Pull Of Extensor Mechanism
Proximal Tibial Fractures
Challenges With Nailing

- Short Segment
- Wide Or No Medullary Canal
- Thin Metaphyseal Cortex
- Muscle / Deformity Factors
- Nail Cannot Reduce Fracture!

Intra-Medullary Nailing
Techniques To Overcome Deformity

- Supra-Patellar Nailing
- Correct Starting Point
- Implant With Very Proximal Bend
- Reduction Devices & Tools
  - Percutaneous Clamps
  - Uni-Cortical Plate
  - Blocking Screws
  - Distractor Or External Fixator
  - High Quality Imaging

Intra-Medullary Nailing
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# Intra-Medullary Nailing Techniques To Overcome Deformity

- Supra-Patellar Nailing
- Correct Starting Point
- Implant With Very Proximal Bend
- **Reduction Devices & Tools**
  - Percutaneous Clamps
  - Uni-Cortical Plate
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  - Distractor Or External Fixator
  - High Quality Imaging
Intra-Medullary Nailing
Techniques To Overcome Deformity

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- Correct Starting Point
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Key Technical Issues

- Reduction Before Nailing
- Ream With Fracture Reduced
- Maintain Reduction Thru Case
- Lock Proximal & Distal
- Not Always Easy

Clinical Cases

Intra-Medullary Nailing
Proximal Tibia Fractures
59 Yr Male Struck By Car Sustaining An Open Multifragmentary Segmental Fracture Of The Tibia

Uni-Cortical Plate & Locked Nail

18 Year Follow-Up

Segmental Tibia Fracture After A Motorcycle Accident

Reduction With A Percutaneous Clamp
Post-Op Nailing 8 Month Follow-Up

46 Yr Male S/P Peds vs Auto Accident Sustaining Multiple Injuries

Percutaneous Assisted Reduction; Closed Locked Nailing
Operative Sequence, Distal Screw Insertion, Black-Slap, Compress

Final Fixation With A Locked Intra-Medullary Nail

Proximal Tibial Fractures
Preventable Problems With Nailing

- Mal-Alignment
- Mal-Rotation
- Mal-Union
- Fixation Failure
- Non-Union
Proximal Tibia Fractures
Problems With Nailing

- IM Nailing Of Proximal Tibia Fractures Is Technically Difficult & Often Results In Mal-Alignment
- Surgeons Without Experience Nailing These Fractures Should Consider Other Fixation Techniques

Thank-You

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