20 Lower Extremity Diaphyseal + Atypical Fractures

PRO TIPS

- A nail will NOT reduce a fracture. The fracture must be reduced BOTH during reaming AND nail insertion.
- "Nails are like teenagers they like to go out early and stay out late" Toney Russell. The malalignment is entirely predictable.
- If your reduction after insertion of the nail is sub-optimal, take out the nail and:
    - Re-assess your entry hole, your initial guidewire placement may have been perfect, but your hole position may have been displaced by differential bone quality or soft tissues. Re-visit entry hole with entry reamer and side cut the hole into the right place creating an oval hole.
    - Have you created the space for the optimum trajectory of your nail. Repeat reaming and pay particular attention to removing the necessary bone.
    - Do you need to deny space to the nail? Blocking screws + wires are not a difficult technique, make sure you get someone to teach you the theory + practice.
- Beware of using a piriformis entry point nail in a patient with an open or recently fused femoral neck growth plate. AVN is a disappointing outcome in a young adult.
- Avoid varus. Using a piriformis entry point in the elderly is a useful way of reducing the risk of creating a varus deformity.
- The majority of femoral and tibial shaft non unions are secondary to lack of stability at the fracture site.
    - Exchange nailing to a larger nail increases stability but is much more successful in the tibia than the femur. Why? – Weight bearing loading is the same. Likely to be secondary to greater torsional loading at the femur.
    - Alternative ways of increasing stability in the setting of a nail and simple non-union involve interfragmentary screws or plate augmentation.

UK ISCP TRAUMA + ORTHOPAEDIC SYLLABUS

Knowledge

0 = No experience expected / 1= Has observed or knows of / 2= Can manage with assistance / 3 = Can manage whole but may need assistance / 4= Able to manage without assistance including potential common complications Green text = Oxford Trauma Service suggestions			
Topic	**CORE**	**ST3-ST8**	**>ST8**
Anatomy			
Clinical and functional anatomy with pathological and operative relevance	3	4	4
Surgical approaches to the limbs and axial skeleton	2	4	4
Treatment			
Femoral shaft fractures	2	4	4
Tibial shaft fractures	2	4	4
Operative			
Management of closed diaphyseal fractures	3	4	4

Technical

0 = No experience expected / 1= Has observed or knows of / 2= Can manage with assistance / 3 = Can manage whole but may need assistance / 4= Able to manage without assistance including potential common complications Green text = Oxford Trauma Service suggestions			
Topic	**CORE**	**ST3-ST8**	**>ST8**
Femur			
Diaphyseal femur fracture application of external fixator	0	3	4
Diaphyseal femur fracture intramedullary nailing	0	4	4
Diaphyseal femur fracture plate/screw fixation	0	4	4
Tibia & Fibula			
Diaphyseal tibial fracture external fixation (including frame)	1	3	4
Diaphyseal tibial fracture intramedullary nailing	1	4	4
Diaphyseal tibial fracture MUA & POP	1	4	4
Tibial shaft plating	0	3	4

Please find below, resources that cover the syllabus objectives.

DISCUSSION SLIDES

OTA Resident Lectures – Basic Principles of Internal Fixation
OTA Resident Lectures – Femoral Shaft Fractures
OTA Resident Lectures – Tibial Shaft Fractures

RECOMMENDED KNOWLEDGE REVIEW RESOURCES

FEMORAL SHAFT FRACTURES

- Rockwood + Green Chapter 56a: Femoral Shaft Fractures p2356-2429
- Orthobullets
- JBJS Clinical Summary

ATYPICAL FEMORAL FRACTURES

- Rockwood + Green Chapter 55a: Atypical Femur Fractures p2341-2355
- JBJS Clinical Summary

TIBIAL SHAFT FRACTURES

- Rockwood + Green Chapter 62a: Tibia and Fibula Shaft Fractures p2687-2751
- Orthobullets
- JBJS Clinical Summary
- Tibial Shaft Fractures, OTA Webinar Title, 2013 (58 mins)

SCORING / CLASSIFICATION SYSTEMS

- AO/OTA

RECOMMENDED TECHNICAL REVIEW RESOURCES

FEMORAL FRACTURES

- AO Surgery Reference
- Orthobullets – Title
- Shah – Nailing Femoral Shaft Fractures: Starting Point Tips and Tricks, FORE 2016
- (Review paper) Name – Title with Hyperlink to PubMed, Journal XXXX [Abstract]

TIBIAL SHAFT FRACTURES

- AO Surgery Reference
- Orthobullets – Title
- Sanders - Modern Concepts in IM Nailing of the Proximal Tibia, FORE 2016
- Pulley – Suprapatellar vs. Standard Nailing of Tibial Shaft Fractures, VuMedi

SMITH + NEPHEW

- Trauma Education
- Trauma Products + Guides

STRYKER

- Surgeon Education
- Trauma Products + Guides

DEPUY SYNTHES

- Educational Material
- Trauma Products + Guides

GUIDES + PROTOCOLS

NICE (NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE)

- Trauma (QS166)
- Fractures (non-complex): assessment and management (NG38)

ABSTRACTS + FULL TEXT PAPERS

FEMORAL SHAFT FRACTURES

Technique

- Sarmiento – A functional below-the-knee brace for tibial fractures: a report on its use in one hundred and thirty-five cases. 1970, J Bone Joint Surg Am 2007
  Indications, technique for plaster application and early weight bearing regime explained.
- Apivatthakakul – Safe Zones and a Technical Guide for Cerclage Wiring of the Femur: A Computed Topographic Angiogram (CTA) Study, Arch Orthop Trauma Surg 2018 Jan;138(1):43-50. doi: 10.1007/s00402-017-2804-x. Epub 2017 Sep 27
- Wolinsky – Reduction Techniques for Diaphyseal Femur Fractures, J Am Acad Orthop Surg 2017
- Jones – Diagnosis and Management of Ipsilateral Femoral Neck and Shaft Fractures, J Am Acad Orthop Surg 2018

ATYPICAL FEMORAL FRACTURES

Technique

- Name – Title with Hyperlink to PubMed, Journal XXXX
- Berkes – Medialized Trochanteric Starting Point and Focused Lateral Endosteal Beak Reaming to Optimize Success of Intramedullary Nailing in Atypical Femur Fractures: A Technical Trick and Case Series, J Orthop Trauma 2019
- Spinelli – Atypical Diaphyseal Femoral Fractures: Considerations on Surgical Technique, Injury 2019
- Tan – Intramedullary Nailing of Abnormally Bowed Atypical Femoral Shaft Fractures: Surgical Technique Arch Orthop Trauma Surg 2020

TIBIAL SHAFT FRACTURES

Technique

- Semenistyy – Fixator-assisted Nailing of Tibial Fractures: New Surgical Technique and Presentation of First 30 Cases, Injury 2019
- Frihagen – Taylor Spatial Frame™ or reamed intramedullary nailing for closed fractures of the tibial shaft. A randomized controlled trial, JOTrauma 2020

Outcome

- Singh – Supra-patellar Nailing for Isolated Closed Tibial Shaft Fractures: Medium Term Functional Outcomes From an Academic Level 1 Trauma Centre, Injury 2020
- Cazzato – Intramedullary Nailing of Tibial Shaft Fractures in the Semi-Extended Position Using a Suprapatellar Approach: A Retrospective Case Series, Injury 2018
- Ibrahim – Improved Outcomes With Semi-extended Nailing of Tibial Fractures? A Systematic Review, J Orthop Trauma 2019
- Morris – Measuring Outcomes Following Tibial Fracture, Injury 2019
- Bishop – Knee Pain After Intramedullary Nailing of Tibia Fractures: Prevalence, Etiology, and Treatment, J Am Acad Orthop Surg 2018
- Corey – Segmental Tibia Fractures: An Analysis of Complication and Healing Rates, J Orthop Trauma 2018
- Morshed – Open Reduction and Medullary Nailing of Closed Tibial Shaft Fractures Is Not Benign, J Orthop Trauma 2017
- Ko – Trajectory of Short- And Long-Term Recovery of Tibial Shaft Fractures After Intramedullary Nail Fixation, J Orthop Trauma 2017
- O'Toole – A Prospective Randomized Trial to Assess Fixation Strategies for Severe Open Tibia Fractures: Modern Ring External Fixators Versus Internal Fixation (FIXIT Study), JOT 2017

NON UNION

- Serrano – Effect of Nail Size, Insertion, and Δ Canal-Nail on the Development of a Nonunion After Intramedullary Nailing of Femoral Shaft Fractures, J Orthop Trauma 2019
- Birjandinejad – Augmentation plate fixation for the treatment of femoral and tibial non- union after intramedullary nailing. Orthopedics. 2009
- Nadkarni – Use of locking compression plates for long bone nonunions without removing existing intramedullary nail: review of literature and our experience, J Trauma. 2008
- Kim – Exchange Nailing With Enhanced Distal Fixation Is Effective for the Treatment of Infraisthmal Femoral Nonunions Arch Orthop Trauma Surg 2018