Pediatric Femoral Shaft Fractures

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Pediatric Femoral Shaft Fractures

• Common lower extremity fracture in children
• 1.4-1.7% of all pediatric fractures
• Often requires hospital admission
• Treatment dependent on age of patient
• Boys>girls
• Bimodal distribution
• Toddlers from simple falls
• Adolescents from high energy trauma
Treatment

• Pavlik harness
• Hip spica cast
• Internal fixation
• Flexible nails
• Rigid nail
• Plate and screws
• External fixation
Treatment by Age

• AAOS Clinical Practice Guidelines on the Treatment of Pediatric Diaphyseal Femur Fractures

• 0-6 months
• 6 months – 5 years
• 5 – 11 years
• >11 years
0 – 36 months of age

- Children younger than 36 months of age with a diaphyseal femur fracture should be evaluated for child abuse
- 14% of femur fractures in children age 0-12 months are due to abuse
- Most important aspect of care is a thorough history and physical exam with attention to signs and symptoms of child abuse
- Consult child abuse team if available or pediatricians
- Skeletal survey when appropriate
0 – 6 months of age

- Treat with Pavlik harness or hip spica cast
- Patients this age heal quickly and remodel deformity quickly
- Pick option that provides ease of care for the family
- Spica cast occasionally can have skin complications in this age group, only potential downside to spica
6 months – 5 years

- Early spica casting is mainstay of modern treatment
- In the past traction followed by spica casting was standard
- Early spica casting is now common as it decreases hospital length of stay and cost of treatment with no change in outcomes compared to traction with delayed spica casting
- Varus/valgus deformity tolerated less than flexion/extension deformity, no good studies on remodeling and what is an “acceptable” reduction
- Up to 30 degrees of malrotation can be tolerated
6 months – 5 years

- 2 year old male
- Fell off of slide
- Early 1 ½ hip spica cast treatment, 1 day in hospital
- X-rays in cast and at the end of cast treatment
6 months – 5 years

- **< 2 cm of shortening**
  - Early spica casting

- **> 2 cm of shortening**
  - Can perform traction or continue with spica casting
  - No sufficient evidence to recommend changing treatment plans per AAOS guidelines
  - Can consider external fixation
    - Decreases incidence of malunion especially in the older children in this age group
  - Don’t forget children in this age group tend to have overgrowth of the femur which can be unpredictable
6 months – 5 years

- A 2015 study by Jaafar et al published in JPO found patients age 1-3 years of age treated with single leg hip spica cast for femoral shaft fractures had decrease skin problems at 10.2% compared to 31.4% with the double leg spica cast. They found good to excellent alignment in 93% of patients and mild residual angulation in 6% of patients in both double and single leg spica cast patients with no significant difference between the two.

- Therefore patients age 1-3 years of age may be safely treated in either a double or single leg spica cast for femoral shaft fracture

5 – 11 years of age

• Spica casting not well tolerated due to increase in patient size and discomfort

• Flexible intramedullary nails
  – Patients >11 years of age or who weigh >49 KG are increased risk of poor outcome with flexible nailing
  – May not be appropriate for length unstable fractures, or some proximal 1/3 or distal 1/3 fractures

• Submuscular plating

• External fixation
5 – 11 years of age

- Main stay is flexible intramedullary nails
- Can insert antegrade or retrograde (more common)
- Outcomes best with stable fracture patterns
- Most common complication is irritation at the distal insertion site
- Routine removal after fracture healing

- Submuscular plating an option
- Can perform open reduction versus minimally invasive
- Can use for both stable and unstable fracture patterns
- May need plate removal after fracture healing
5 – 11 years of age

- 5 year old male
- Fell 5 feet off playground equipment
- Left femur fracture
- Closed reduction, flexible nails
> 11 years of age

- Rigid lateral trochanteric entry/ trochanteric entry nail
  - Piriformis entry nail associated with avascular necrosis in children at a rate of 4%
- Submuscular plating
- External fixation
  - An option in open fractures or unstable fracture patterns
  - Higher complications rates
  - Less desirable option compared to rigid trochanteric entry nail
> 11 years of age

- 13 year old male
- Hit by bus
- Left femoral shaft fracture
- Treated with rigid trochanteric entry nail
- Post-op x-ray at 3 months
Rigid Femoral Nail

- A study published in 2009 by Keeler et al evaluated lateral trochanteric antegrade intramedullary nailing of pediatric femoral fractures.
- They had 78 patients with 80 fractures.
- The mean age was 12.9 years (8.2-18.4 years).
- Mean weight 70 kg (45-106 kg).
- Mean hospital stay 4.7 days (1-56 days), isolated femoral shaft fracture mean stay was 2.8 days (2-6).
- No non-unions, average time to union 7 weeks (5-13 weeks).
- Overall good alignment, no more than 10 degrees in any plane.
- No avascular necrosis.
- In conclusion lateral trochanteric entry rigid nailing is safe and effective for adolescent femoral shaft fractures with open physes.

References

- American Academy of Orthopaedic Surgeons Clinical Practice Guideline on Treatment of Pediatric Diaphyseal Femur Fracture. 2010
For questions or comments, please send to ota@ota.org