

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

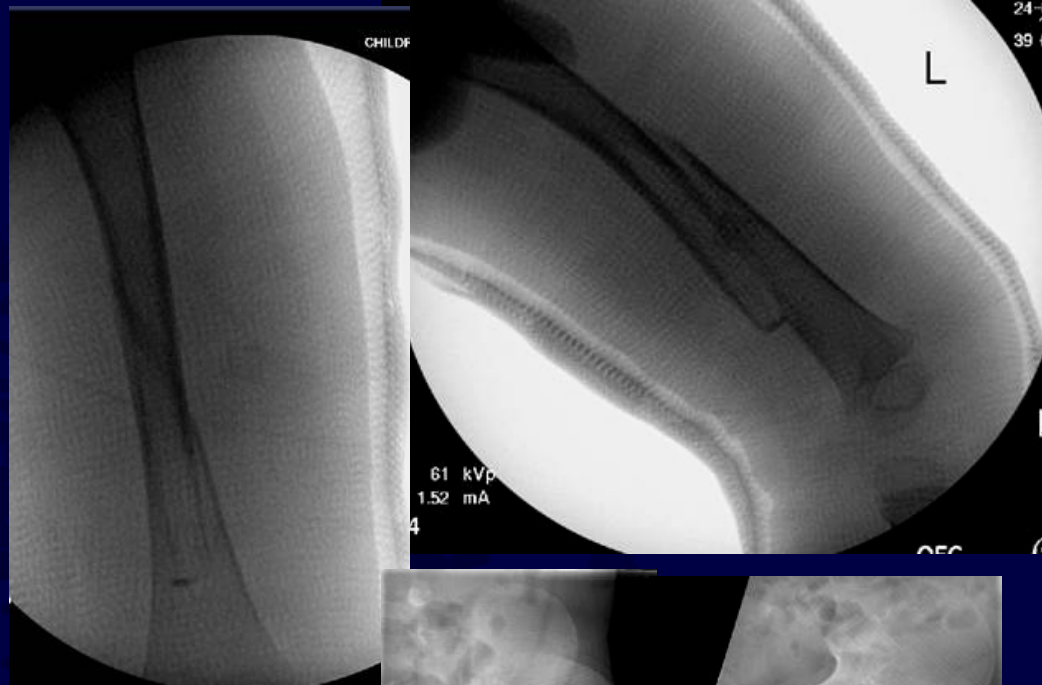
6 months – 5 years

- 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

Jaafar et al. Four Weeks in a Single-Leg Weight-Bearing Hip Spica Cast is Sufficient Treatment for Isolated Femoral Shaft Fractures in Children Aged 1 to 3 Years. J Pediatr Orthop. 2015 ahead of print.

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

Keeler et al. Antegrade Intramedullary Nailing of Pediatric Femoral Fractures Using an Interlocking Pediatric Femoral Nail and a Lateral Trochanteric Entry Point. J Pediatr Orthop. 2009;29:345-351.

References

- Jaafar et al. Four Weeks in a Single-Leg Weight-Bearing Hip Spica Cast is Sufficient Treatment for Isolated Femoral Shaft Fractures in Children Aged 1 to 3 Years. *J Pediatr Orthop*. 2015 ahead of print.
- Keeler et al. Antegrade Intramedullary Nailing of Pediatric Femoral Fractures Using an Interlocking Pediatric Femoral Nail and a Lateral Trochanteric Entry Point. *J Pediatr Orthop*. 2009;29:345-351
- American Academy of Orthopaedic Surgeons Clinical Practice Guideline on Treatment of Pediatric Diaphyseal Femur Fracture. 2010
- Pediatric Femoral Shaft Fractures: A System for Decision Making. Flynn JM and Curatolo E. *Instructional Course Lecture* 2015;64:453-460.
- Kocher et al. Treatment of Pediatric Diaphyseal Femur Fractures. AAOS Clinical Practice Guideline Summary. *J Am Acad Orthop Surg* 2009;17:718-725.

- For questions or comments, please send to ota@ota.org