

ΚΑΤΑΓΜΑΤΑ ΜΗΡΟΥ ΚΝΗΜΗΣ ΣΕ ΠΑΙΔΙΑ

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Ορθοπαιδικής Παίδων ΑΠΘ

Κατάγματα μηριαίου σε παιδιά

Fractures of the Femoral Shaft in Children

INCIDENCE, MECHANISMS, AND SOCIODEMOGRAPHIC RISK FACTORS*

BY RICHARD Y. HINTON, M.D., M.P.H., M.E.D., P.T.†, ANDREW LINCOLN, M.S.E., MICHELE M. CROCKETT, B.S.E.,
PAUL SPONSELLER, M.D.‡, AND GORDON SMITH, M.B., CH.B., M.P.H.‡, BALTIMORE, MARYLAND

*Investigation performed at The Johns Hopkins School of Hygiene and Public Health,
The Union Memorial Hospital, and The Johns Hopkins Medical Institutions, Baltimore*

Abstract

years old; motor vehicle-pedestrian accidents, for those

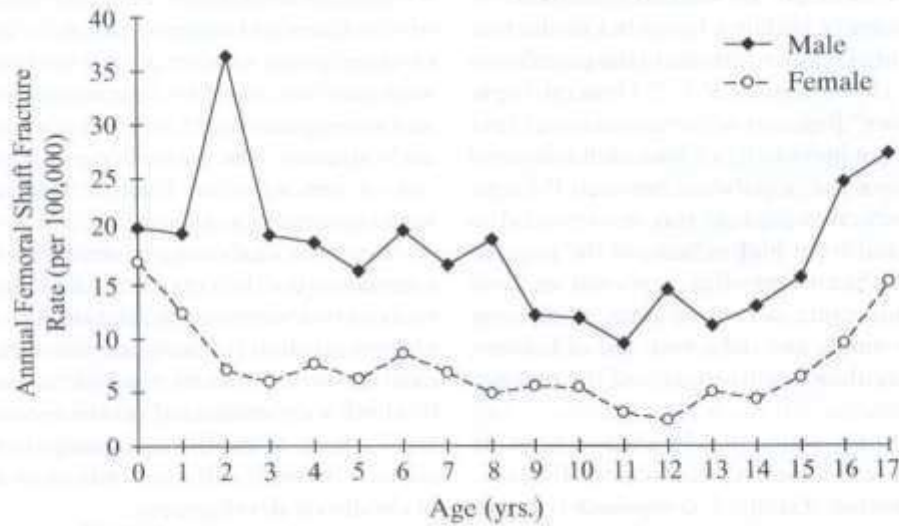
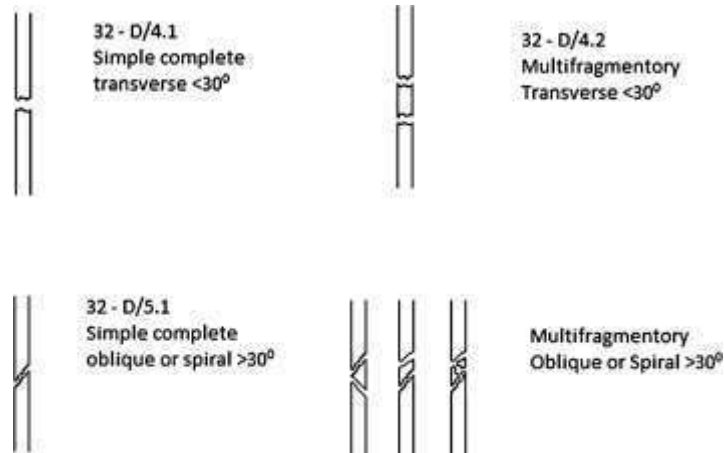


FIG. 1


Fracture rates by age and gender-specific rates of hospitalization from 1990 through 1996 for children living in Maryland who had a femoral

Κατάγματα μηριαίου σε παιδιά


- ▶ Slongo TF, Audigé L. Fracture and dislocation classification compendium for children: the AO pediatric comprehensive classification of long bone fractures (PCCF) J Orthop Trauma. 2007;21:S135-S160.
- ▶ D, M and E denoting diaphysis, metaphysis and epiphysis, respectively
- ▶ TRASVERSE or OBLIQUE or SPIRAL or MULTIFRAGMENTORY



Κατάγματα διάφυσης μηριαίου

- ▶ Διάκριση ανά ηλικία
 - ▶ Ανατομική εντόπιση
 - ▶ Παθολογικό υπόστρωμα
 - ▶ Μέγεθος του παιδιού
 - ▶ Κοινωνικο οικονομικοί παράγοντες
- 

Κατάγματα διάφυσης μηριαίου κατανομή ανά ηλικία

- ▶ Συντηρητική αντιμετώπιση έως τα 4-5 έτη
 - ▶ Σταθεροποίηση στις μεγαλύτερες ηλικίες
 - ▶ ΕΥΚΑΜΠΤΟΙ ΗΛΟΙ
 - ▶ Εξωτερική οστεοσύνθεση
 - ▶ Ενδομυελικοί ήλοι
 - ▶ ΠΛΑΚΑ – ΒΙΔΕΣ (submuscular plates)
- 

Κατάγματα διάφυσης μηριαίου παιδιά <5 ετών



Κατάγματα διάφυσης μηριαίου παιδιά <5 ετών δερματική έλξη



Κατάγματα διάφυσης μηριαίου παιδιά <5 ετών hip spica



Συντηρητική Θεραπεία

- ▶ Έλξη
- ▶ Hip spica
- ▶ [J Bone Joint Surg Am.](#) 2011 Dec 7;93(23):2196–202. doi: 10.2106/JBJS.J.01165.
- ▶ The treatment of low-energy femoral shaft fractures: a prospective study comparing the "walking spica" with the traditional spica cast.
- ▶ [Flynn JM](#)¹, [Garner MR](#), [Jones KJ](#), [D'Italia J](#), [Davidson RS](#), [Ganley TJ](#), [Horn BD](#), [Spiegel D](#), [Wells L](#).
- ▶ We studied forty-five consecutive low-energy femoral shaft fractures during a three-year period in children one to six years old.
- ▶ Surgeons and families should be aware that use of **a walking hip spica cast** rather than a traditional hip spica cast may be associated with a greater likelihood that wedge adjustment of the cast will be necessary to treat fracture malalignment.

Συντηρητική Θεραπεία

- ▶ Functional hip spica for the treatment of pediatric femoral fractures
 - ▶ N Laliotis, E Vlachos, N Veranis, S Theodorou
- ▶ 1st orthopaedic Dept Children's Hospital Aglaia Kiriakou Athens
 - ▶ EEXOT Athens 1987

Acta Chir Orthop Traumatol Cech. 2017;84(1):59–65.

[Long-Term Outcomes of the Treatment of Pediatric Femoral Shaft Fractures Treated with Bryant's Vertical Traction].

Urban J¹, Toufar P, Kloub M.

There was a total of 17 injured boys and 6 injured girls.

The mean age at the time of traction was 30.8 months (range 1–70 months). The injury most frequently occurred from various falls, altogether in 15 cases (65.2%). Traffic accidents were registered as the cause of injury in 3 cases (13%). No abuse was confirmed. The average duration of traction was 19.8 days (range 8–26 days). The total length of hospital stay took on average 23.6 days (range 9–33 days)

Skin excoriation and bullae due to irritation by the traction occurred in 21 children (91.3% cases). All the bullae healed, in 4 (17.4%) patients minor scars of 1x1 cm in size were formed around ankles

Acta Chir Orthop Traumatol Cech. 2017;84(1):59–65.

[Long-Term Outcomes of the Treatment of Pediatric Femoral Shaft Fractures Treated with Bryant's Vertical Traction].

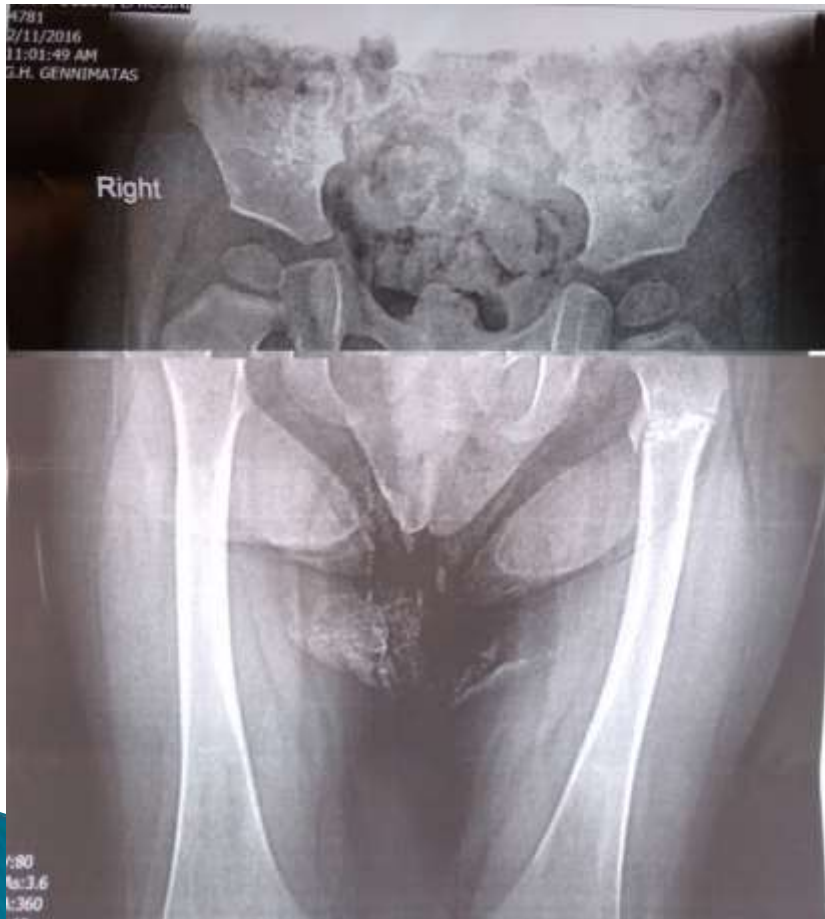
[Article in Czech]

Urban J¹, Toufar P, Kloub M.

CONCLUSIONS The treatment of femoral shaft fractures by Bryant's vertical traction, in children up to the weight of 15 kg, is a simple and safe method with excellent functional outcomes and minimum serious complications. When treating the children with the body weight more than 15 kg, the risk of bullae formation increases, therefore in this weight category treatment shall be decided upon on a case by case basis. The resulting average overgrowth of injured femur was 0.9 cm which corresponds with the findings of other authors. The treatment method using the Bryant's traction is well tolerated by parents, even though most of them would welcome the option of home traction. Key words: traction, femur fracture, overgrowth, children.

Διατροχαντήριο κάταγμα 18 μηνών

▶ Αιτιολογία



Διάγνωση ΑΔΥΝΑΜΙΑ ΣΤΗΡΙΞΗΣ

- ▶ Φυσιολογική ακτινολογική εξέταση



Διάγνωση ΑΔΥΝΑΜΙΑ ΣΤΗΡΙΞΗΣ

- ▶ Κάταγμα μηριαίου



Κατάγματα διάφυσης μηρού > 5 ετών

- ▶ Σταθεροποίηση
- ▶ Υπάρχει θέση στην συντηρητική θεραπεία?
- ▶ Επιλογή χειρουργικής μεθόδου

Κατάγματα διάφυσης μηρού 7 ετών



Κατάγματα διάφυσης μηρού 7 ετών



Κ

οσης μηρού 7 ετών

▶ ΣΤ



Αποθήκευση

Εκτύπωση

Κατάγματα διάφυσης μηριαίου

treatment methods

- ▶ [Cochrane Database Syst Rev.](#) 2014 Jul 29;(7)
- ▶ Interventions for treating femoral shaft fractures in children and adolescents.
- ▶ [Madhuri V¹](#), [Dutt V](#), [Gahukamble AD](#), [Tharyan P](#)
- ▶ **AUTHORS' CONCLUSIONS:**
- ▶ There is insufficient evidence to determine if long-term function differs between surgical and conservative treatment. Surgery results in lower rates of malunion in children aged 4 to 12 years, but may increase the risk of serious adverse events. Elastic stable intramedullary nailing may reduce recovery time. There is insufficient evidence from comparisons of different methods of conservative treatment or of different methods of surgical treatment to draw conclusions on the relative effects of the treatments compared in the included trials.


Methods of treatment

- ▶ [J Pediatr Orthop.](#) 2017 Apr 10.
- ▶ **Pediatric Femoral Shaft Fractures: A Multicenter Review of the AAOS Clinical Practice Guidelines Before and After 2009.**
- ▶ [Roaten JD](#)¹, [Kelly DM](#), [Yellin JL](#), [Flynn JM](#), [Cyr M](#), [Garg S](#), [Broom A](#), [Andras LM](#), [Sawyer JR](#).
- ▶ 1*Department of Orthopedic Surgery, Le Bonheur Children's Hospital, University of Tennessee–Campbell Clinic, Memphis, TN
†Harvard Combined Orthopaedic Residency, Boston, MA ‡Children's Hospital of Colorado Orthopedics Institute, University of Colorado, Aurora, CO §Children's Hospital of Los Angeles, Los Angeles, CA.

Methods of treatment

- ▶ Of 2646 fractures, **1476 (55.8%) were treated nonoperatively** and 1170 fractures operatively. Of the operative group, flexible intramedullary nails (IMN) were used for 568 patients (21.5%), locked intramedullary nails (LIMNs) for 309 (11.7%), and plating for 188 (7.1%). In total, 105 fractures were treated with external fixation or skeletal traction. Analysis before and after the CPG publication revealed a significant increase in the use of interlocked IMNs in patients younger than 11 years (0.5% before, 3.8% after; $P < 0.001$).
- ▶ Over the same time period there was an increase in surgical management, regardless of technique, for patients younger than 5 years (6.4% before, 8.4% after; $P = 0.206$)
- ▶ **CONCLUSIONS:**
- ▶ Following publication of the AAOS CPG, there was a significant increase in the use of LIMNs in patients younger than 11 years old and a trend toward surgical treatment in patients younger than 5 years

Narayanan UG, Hyman JE, Wainwright AM, Rang M, Alman BA. Complications of elastic stable intramedullary nail fixation of pediatric femoral fractures, and how to avoid them. J Pediatr Orthop. 2004;24:363-369.

- ▶ Inappropriate method iatrogenic
 - ▶ Comminuted fractures
 - ▶ subtrochanteric
- 

Complications of Elastic Stable Intramedullary Nail Fixation of Pediatric Femoral Fractures, and How to Avoid Them

Unni G. Narayanan, MD,* Joshua E. Hyman, MD,† Andrew M. Wainwright, FRCS,§
Mercer Rang, FRCSC,||† and Benjamin A. Alman, MD||



FIGURE 3. A: Immediate postoperative radiographs of fracture stabilized with nails of different diameters. B: At follow-up, valgus angulation has occurred, influenced by the thicker lateral nail.



FIGURE 4. A: Immediate postoperative radiograph of fracture with 50% comminution stabilized with nails of mismatched diameters. B: Subsequent loss of reduction with shortening

Επιπλοκές ESIN

Complications of Elastic Stable Intramedullary Nail Fixation of Pediatric Femoral Fractures, and How to Avoid Them

Unni G. Narayanan, MD, Joshua E. Hyman, MD,† Andrew M. Wainwright, FRCS,§
Mercer Rang, FRCSC,||† and Benjamin A. Alman, MD||*



FIGURE 5. Close inspection of the AP radiograph reveals that the nail tip overlaps the femoral neck cortex. The nail tip protrusion confirmed on the lateral radiograph could have been avoided with proper intraoperative imaging.

World J Orthop. 2017 Feb 18;8(2):156–162. 2017 Feb 18.
Titanium elastic nailing in diaphyseal femoral fractures of children below six years of age.

Donati F¹, Mazzitelli G¹, Lillo M¹, Menghi A¹, Conti C¹, Valassina A¹, Marzetti E¹, Maccauro G¹

Orthopedic and Traumatology Institute, Catholic University of the Sacred Heart, 00168 Rome, Italy

- ▶ A retrospective analysis of 27 diaphyseal femoral fractures in children younger than six years treated with TEN between 2005 and 2015 was conducted. Patients were immobilized in a cast for 5 wk and the nails were removed from 6 to 12 wk after surgery.
- ▶ The mean limb lengthening was 0.3 cm. Four cases experienced limb lengthening greater than 1 cm and always minor than 2 cm. Twelve point five percent of the cases showed an angulation $< 10^\circ$

World J Orthop. 2017 Feb 18;8(2):156–162. 2017 Feb 18.
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- ▶ Complications included two cases of superficial infection of the TEN entry point, one case of refracture following a new trauma, and one TEN mobilization
- ▶ **CONCLUSION:**
- ▶ TEN is as a safe, mini-invasive and surgeon-friendly technique and, considering specific inclusion criteria, it represents a useful and efficacy option for the treatment of diaphyseal femoral fractures even in patients younger than six years of age

- ▶ Flynn JM, Luedtke LM, Ganley TJ, Dawson J, Davidson RS, Dormans JP, Ecker ML, Gregg JR, Horn BD, Drummond DS. Comparison of titanium elastic nails with traction and a spica cast to treat femoral fractures in children. *J Bone Joint Surg Am.* 2004;86-A:770-777
- ▶ Khoriaty AA, Jones C, Gelfer Y, Trompeter A. The management of paediatric diaphyseal femoral fractures: a modern approach. *Strategies Trauma Limb Reconstr.* 2016;11:87-97
- ▶ Flynn JM, Hresko T, Reynolds RA, Blasier RD, Davidson R, Kasser J. Titanium elastic nails for pediatric femur fractures: a multicenter study of early results with analysis of complications. *J Pediatr Orthop.* 2001;21:4-8.
- ▶ Metaizeau JP. Stable elastic intramedullary nailing for fractures of the femur in children. *J Bone Joint Surg Br.* 2004;86:954-957

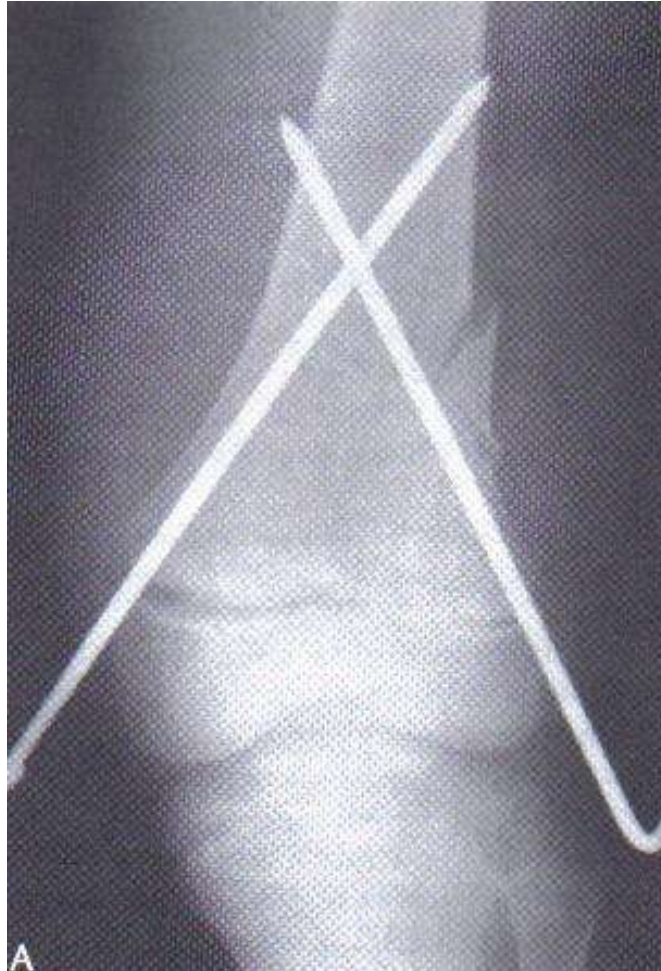
Υποτροχαντήριο κάταγμα μηριαίου Πλάκα και βίδες



Υπερκονδύλιο κάταγμα μηριαίου



Υπερκονδύλιο κάταγμα μηριαίου



ΠΡΟΒΛΗΜΑΤΙΣΜΟΙ στην αντιμετώπιση καταγμάτων διάφυσης μηριαίου

- ▶ Ανισοσκελία
- ▶ Παραμόρφωση γωνίωση σε επίπεδα
- ▶ Στροφική παραμόρφωση

2012 Σπειροειδές κάταγμα μηριαίου

- ▶ Αντιμετώπιση



2012 Σπειροειδές κάταγμα μηριαίου

- ▶ Αντιμετώπιση



2012 Σπειροειδές κάταγμα μηριαίου

- ▶ Αντιμετώπιση



2014 Σπειροειδές κάταγμα μηριαίου

- ▶ Αντιμετώπιση



2017

▶ Αντιμετ
πιση



Ανισοσκελία

- ▶ Βράχυνση του μηριαίου
- ▶ Αυξημένη ανάπτυξη overgrowth τους πρώτους 18-24 μήνες
- ▶ Μικρότερες ηλικίες <10 έτη
- ▶ Υπερανάπτυξη 0,8 έως 2 εκ
- ▶ ΑΠΟΔΕΚΤΗ ΒΡΑΧΥΝΣΗ 1.5 – 2 εκ

Απόκλιση του άξονα ραιβότητα βλαιοσότητα

- ▶ Ανάλογα με την ηλικία και την θέση του κατάγματος
- ▶ Αποδεκτή απόκλιση έως 25μ
- ▶ Μικρότερη ανοχή σε ΣΤΟΦΙΚΗ ΠΑΡΑΜΟΡΦΩΣΗ που δεν διορθώνεται ΑΛΛΑ έχει (ιδίως η έξω στροφή) μικρή επιβάρυνση στην βάδιση

Strategies Trauma Limb Reconstr. 2016 Aug; 11(2): 87-97.

The management of paediatric diaphyseal femoral fractures: a modern approach
Al-achraf Khoriaty,¹ Carl Jones,² Yael Gelfer,¹ and Alex Trompeter¹

St George's Hospital, 68 Daybrook Road, London, SW19 3DH UK

²Royal County Surrey, Guildford, UK

- ▶ Between 1991 and 2002, the incidence of these fractures decreased from 0.33 to 0.22 femoral fractures/1000/year. It is speculated that this may be due to improved road safety or reduced levels of physical activity and outdoor play time in recent years
- ▶ The paediatric femur, in contrast to the adult femur, has a high capacity for remodelling and as such **will tolerate up to 25 degrees of angulation in any plane** . Rotational deformity is less well tolerated although studies have reported that up to 25 % of malrotation is accepted. **A shortening of up to 1 cm** in those under the age of 10 is accepted due to overgrowth which is caused by the vessel-rich periosteum being stimulated in response to local injury

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- ▶ Treatment of fractures by age group
- ▶ The neonate and infant

- ▶ Young children and toddlers aged 18 months to 5 years
- ▶ Traction is the preferred method in most instances

- ▶ Hip spica casting may be initiated following an initial period of traction. This reduces the risk of malunion—a recognised complication associated with spica casting [19, 20]. In this age group, the femur still retains a good capacity for remodelling. Fifteen degrees of varus or valgus angulation and 25 degrees of flexion or extension may be tolerated

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- ▶ **Intramedullary fixation**
- ▶ Flexible intramedullary nailing using either stainless steel or titanium nails has increased in popularity and is now the technique of choice in the management of most femoral diaphyseal fractures as it is minimally invasive, offers a shorter hospital stay and allows earlier mobilisation. Weight bearing is restricted initially and advanced to partial from 2 to 3 weeks. Some advocate a more cautious approach in patients with unstable fracture patterns

Strategies Trauma Limb Reconstr. 2016 Aug; 11(2): 87-97.

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- ▶ Minimally invasive or submuscular techniques have a role to play in the management of comminuted fractures although they can be used in most fracture patterns



▶ Plate fixation

- ▶ There has been a recent trend in both paediatric and adult trauma towards the management of fractures of the femoral diaphysis with minimally invasive bridge plates.
 - ▶ This method carries the advantage of less soft tissue damage and a smaller scar. It has been suggested that bridge plating is superior to conventional plating because it preserves the periosteal blood supply and disturbs the soft tissue envelope minimally .
 - ▶ Kanlic et al. proposed the concept that submuscular bridge plating combined the advantages of both conservative and surgical treatment methods. With bridge plating, the preservation of biology at the fracture site was achieved without sacrificing alignment, early mobilisation and ease of care.
 - ▶ Small plate (3.5 mm) systems are used typically in children as opposed to the larger 4.5 mm systems employed in adults.
- 

- ▶ **External fixation**
 - ▶ External fixation is a straightforward, technically easy method of stabilising femoral fractures. External fixators were first used in the management of paediatric femoral fractures in the late 1970s and became popular in the late 1980s to mid-1990s. A number of publications have reported excellent results with minimal complications [[25](#), [38-40](#)].
 - ▶ Despite allowing an early return of function, external fixators can lead to longer union times than elastic nailing or plating.
- 

- ▶ **The older child and the adolescent**
- ▶ In this group, operative management is favoured. The use of traction or casting is impractical as these methods cannot control the fracture fragments adequately and time to union is longer than in the younger groups.
- ▶ Intramedullary fixation is the mainstay of treatment with the decision whether or not to use elastic nails or a locked intramedullary nail.
- ▶ The key determinant is the size of the child.



- ▶ The use of adult type intramedullary nails in older children remains **controversial**. There is little doubt as to **the efficacy** of these devices in treating femoral fractures in adolescents [46–48] with length, alignment and union all easily achieved.
- ▶ **The main risk** associated with their use is the possibility of **developing avascular necrosis of the femoral head**; prior to physeal closure in the capital epiphysis, the blood supply to the femoral head originates from the region of the piriformis fossa which is coincidentally the entry portal of the standard intramedullary nail. Although there is no device on the market that can guarantee avoidance of this complication, some nails have been devised with **alternative trochanteric entry points** [49, 50]. Unfortunately, these have been associated with **proximal growth disturbance** in the femur related to damage to the trochanteric apophysis



Orthopedics. 2016 Nov 1;39(6):353–358.

Pediatric Diaphyseal Femur Fractures: Submuscular Plating Compared With Intramedullary Nailing.

Sutphen SA, Mendoza JD, Mundy AC, Yang JG, Beebe AC, Samora WP 3rd, Klinge KE.

- ▶ A retrospective review was conducted of skeletally immature **patients 8 years and older** who were treated for femur fracture with submuscular plating, flexible intramedullary nailing, or rigid intramedullary nailing from 2001 to 2014 with a minimum 12-week follow-up.
- ▶ The study identified 198 femur fractures in 196 patients , **mean age, 11.9 years**
- ▶ Each femur fracture was treated with submuscular plating (35), flexible intramedullary nailing (61), or rigid intramedullary nailing (102)

Orthopedics. 2016 Nov 1;39(6):353–358.

Pediatric Diaphyseal Femur Fractures: Submuscular Plating Compared With Intramedullary Nailing.

Sutphen SA, Mendoza JD, Mundy AC, Yang JG, Beebe AC, Samora WP 3rd, Klinge KE.

- ▶ Submuscular plating resulted in faster times to union and full weight bearing, with minimal complication rates.
- ▶ Rigid intramedullary nailing with trochanteric entry resulted in a lower incidence of malunion and hardware-related complications; however, these patients had an increased incidence of heterotopic ossification and residual limp postoperatively.
- ▶ **Flexible retrograde intramedullary nailing** resulted in the highest rates of malunion and hardware irritation and the longest time to full weight bearing.

J Pediatr Orthop. 2013 Apr–May;33(3):232–8.

Comparison of titanium elastic nail and plate fixation of pediatric subtrochanteric femur fractures.

Li Y¹, Heyworth BE, Glitzbecker M, Seeley M, Suppan CA, Gagnier J,
VanderHave KL, Caird MS, Farley FA, Hedequist D.

¹Department of Orthopaedic Surgery, C.S. Mott Children's Hospital, University of Michigan, Ann Arbor, MI 48109–4241, USA.

- ▶ A total of 54 children aged 5 to 12 years with subtrochanteric femur fractures treated with titanium elastic nails or plating at 2 institutions between 2003 and 2010 were identified. We retrospectively compared 25 children treated with titanium elastic nails to 29 children treated with either open plating or submuscular plating

J Pediatr Orthop. 2013 Apr–May;33(3):232–8.

Comparison of titanium elastic nail and plate fixation of pediatric subtrochanteric femur fractures.

Li Y¹, Heyworth BE, Glitzbecker M, Seeley M, Suppan CA, Gagnier J, VanderHave KL, Caird MS, Farley FA, Hedequist D.

- ▶ The overall complication rate **was significantly higher** in the **titanium elastic nails** group (48%; 12 of 25) when compared with the plating group (14%; 4 of 29) (P=0.008)
- ▶ **CONCLUSIONS:**
- ▶ Our results indicate that plate fixation of pediatric subtrochanteric femur fractures is associated with better outcome scores and a lower overall complication rate when compared with titanium elastic nails

Neonatal fractured femur ακτινολογική απεικόνιση



- ▶ **N Laliotis et al Neonatal femoral fractures**
- ▶ **EFFORT 2016**

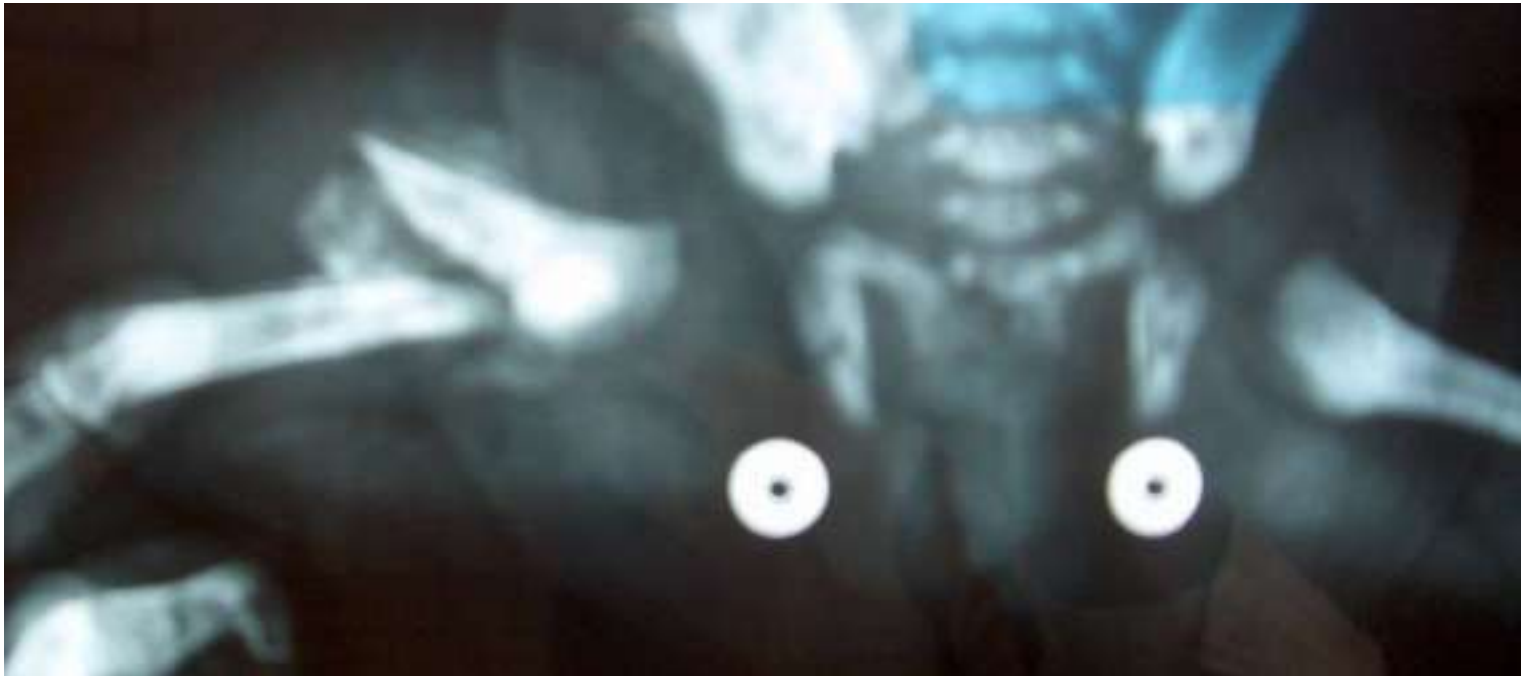
Neonatal fractured femur



Neonatal fractured femur υπερηχογραφική καταγραφή



Neonatal fractured femur callus formation



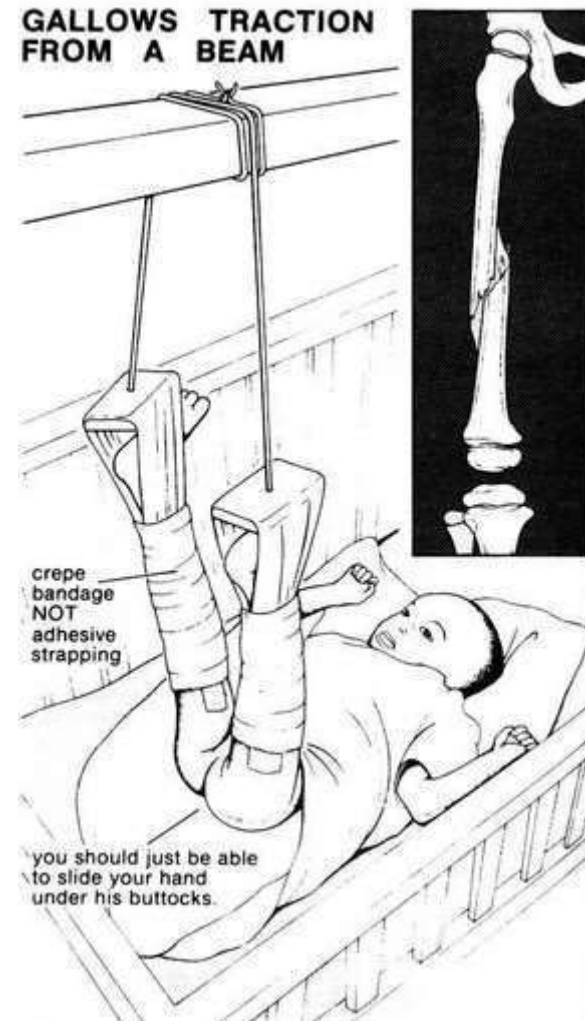
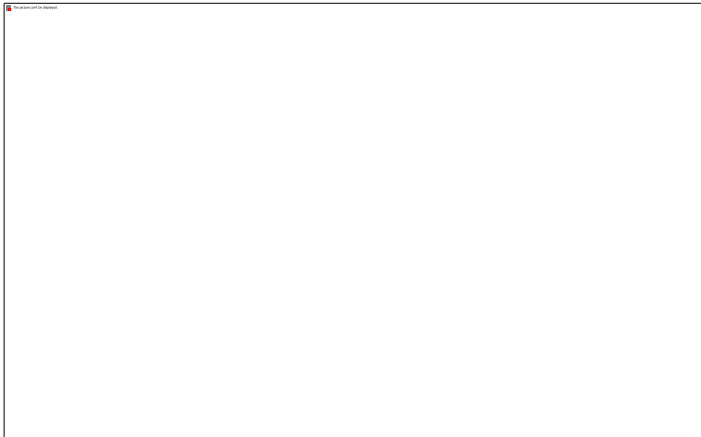
Healed neonatal femur



Healed neonatal femur 12 months



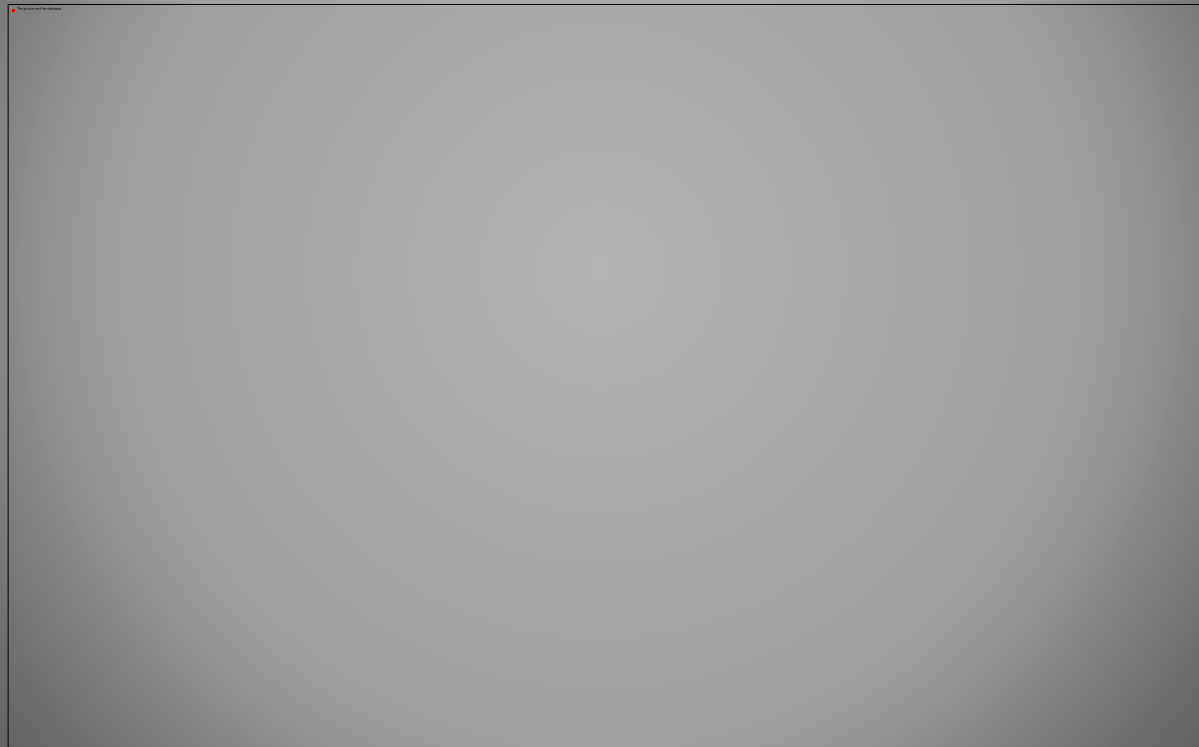
Unreduced neonatal fractured femur after 5 days in Gallow s traction



νοσηλεία στην ΜΕΝΝ



Unreduced neonatal fractured femur after 5 days in Gallow s traction



Neonatal fractured femur



Unreduced neonatal fractured femur



ΝΕΟΓΝΙΚΑ ΚΑΤΑΓΜΑΤΑ ΜΗΡΙΑΙΟΥ

Συμπέρασμα Τα νεογνικά κατάγματα αφορούν την διάφυση του μηριαίου, έχουν αυξημένη συχνότητα στην επείγουσα καισαρική τομή, έχουν πολύ καλή πρόγνωση με την συντηρητική θεραπεία.

Δεν φαίνεται να υπάρχει σαφής αιτιολογία για την δημιουργία του κατάγματος αλλά η πιθανότητα για εμφάνιση μεταβολικής νόσου δεν μπορεί να αποκλεισθεί.

Fractures in full-term neonates

Groenendaal F, Hukkelhoven C

Ned Tijdschr Geneesk. 2007 Feb 17;151(7):424

In 1997-2004, 158,035 full-term neonates were admitted. In 1174 of these (0.74%), fractures were demonstrated. In 227 of these 1174 neonates (19%), no cause for the fracture could be found: obvious trauma during birth or congenital bone disease was excluded

In 12 of the 227 full-term infants with an uneventful birth a fracture of the humerus was found, and in 3 a fracture of the femur. In all other cases there was a fracture of the clavicle.

Κατάγματα σε παθολογικό υπόστρωμα

- ▶ Εγκεφαλική παράλυση
 - ▶ Μηνιγγοκήλη
 - ▶ Νευρομυικές παθήσεις
 - ▶ ΟΣΤΕΟΠΟΡΩΣΗ
 - ▶ Ατελής οστεογένεση
-
- ▶ **FRAGILITY OF BONES IN CHILDREN WITH**
 - ▶ **MOTOR DEFICIENCY**
 - ▶ **Nickolaos Laliotis**
 - ▶ **JFSF Vol 1, No 4, December 2016, p.66-7**



ΜΗΝΙΓΓΟΚΗΛΗ

- ▶ Διόγκωση μηριαίου, απουσία πόνου



meningocele


- ▶ absence of pain
- ▶ Swelling
- ▶ N Laliotis Orthopaedic management of meningocele
- ▶ Orthopaedics 2000



incidence of fractures in CP

- ▶ Fractures are not uncommon in children with CP. In one series, 39% of children with quadriplegic CP gave a history of fracture.
- ▶ The prevalence rate was 6% in 1637 patients with CP, and 12% in another 763 children with CP.
- ▶ A higher prevalence rate of 23% was reported in 88 children with quadriplegic CP.
- ▶ Thus, the fracture incidence in children with CP is much higher than that in the general paediatric population.
- ▶ [Mergler S¹, Evenhuis HM, Boot AM, De Man SA, Bindels-De Heus KG, Huijbers WA, Penning C.](#)
- ▶ Epidemiology of low bone mineral density and fractures in children with severe cerebral palsy: a systematic review.
- ▶ [Dev Med Child Neurol.](#) 2009 Oct;51(10):773-8. do

osteoporotic fractures in CP

- ▶ The causes of fracture were not identified for 55% of individuals in one series.
 - ▶ These fractures occur with minimal trauma or are ‘spontaneous’ with no apparent history of injury. The diagnosis is thus delayed or even missed in those patients who cannot communicate.
 - ▶ Even when there is clinical suspicion of a fracture, some low-energy metaphyseal fractures do not show up on plain radiography and can only be diagnosed with whole-body bone scanning.
 - ▶ Thus, bone fragility seems to be an underlying problem related to these ‘spontaneous’ fractures.
- 

Fracture rate in children with cerebral palsy.

[Stevenson RD](#)¹, [Conaway M](#), [Barrington JW](#), [Cuthill SL](#), [Worley G](#), [Henderson RC](#).

- ▶ As in most series, the most common site of fractures was the lower limb, almost 80% of fractures occurring around the knee and being metaphyseal fractures of the lower limb.

One-third of children had recurrent fractures, and 17% of fractures occurred within 1 year after lower limb surgery.



Cerebral palsy 1



Cerebral palsy 2



Cerebral palsy 3



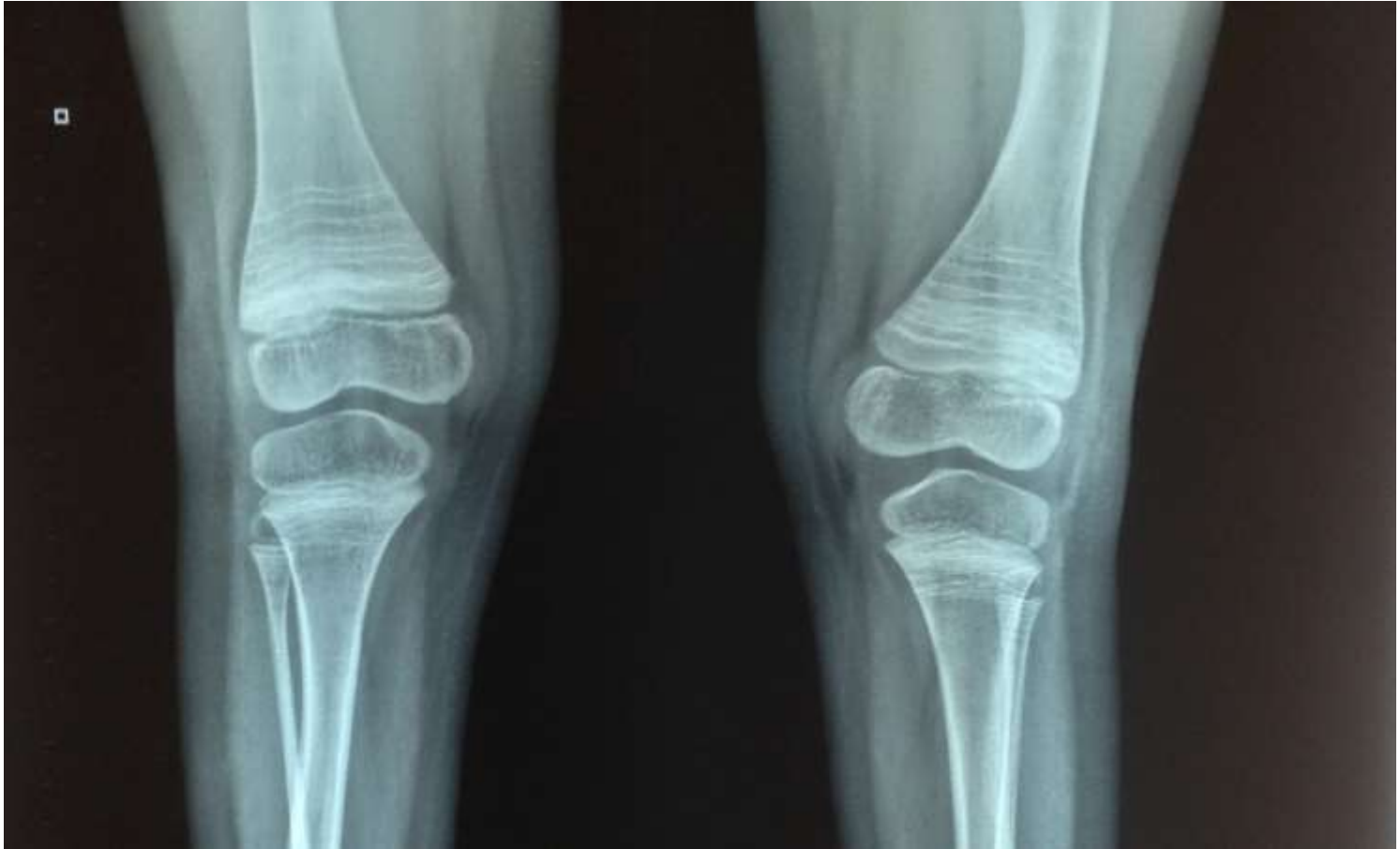
Ατελής οστεογένεση πολλαπλά κατάγματα




Ατελής οστεογένεση πολλαπλά κατάγματα κνήμης



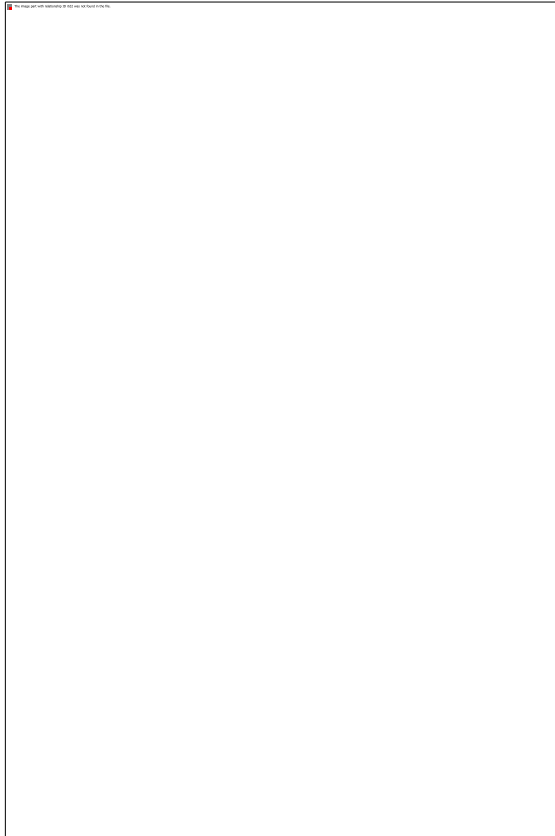
Zebra lines



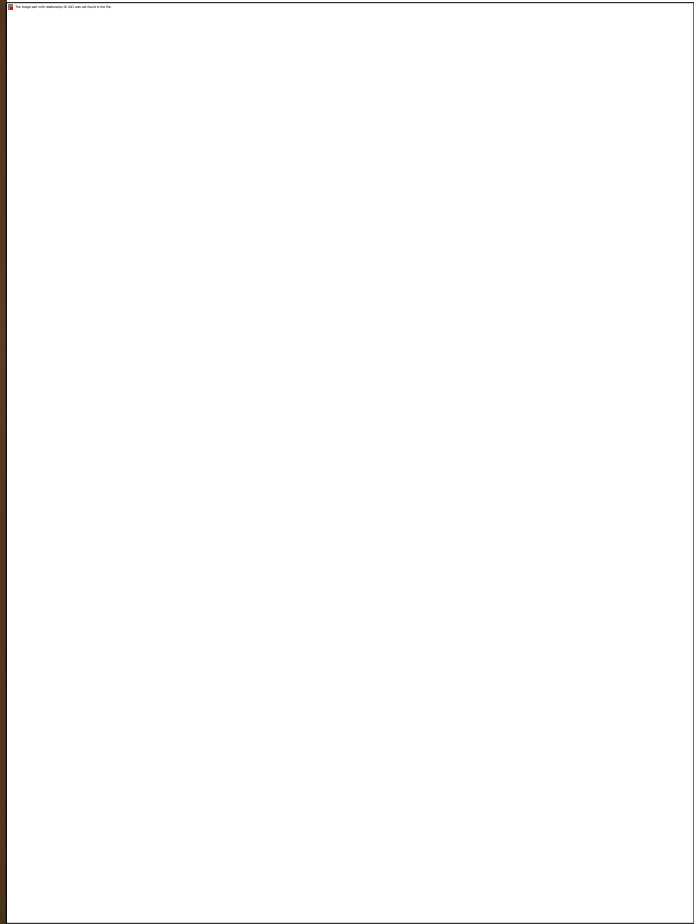
κατάγματα κνήμης

- ▶ Ηλικιακή κατανομή
 - ▶ Σταθερά Ασταθή
 - ▶ Ακέραια ή όχι περόνη
 - ▶ ΣΥΝΤΗΡΗΤΙΚΗ ΘΕΡΑΠΕΙΑ ο κανόνας
 - ▶ ΛΙΓΟΤΕΡΟ ΕΠΙΘΕΤΙΚΗ ΑΝΤΙΜΕΤΩΠΙΣΗ σε σύγκριση με τα κατάγματα του μηριαίου
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Κάκωση άνω επίφυσης κνήμης



Κάκωση άνω επίφυσης κνήμης



Κάκωση άνω επίφυσης κνήμης



ΑΠΑΡΕΚΤΟΠΙΣΤΟ ΚΑΤΑΓΜΑ ΑΝΩ ΜΕΤΑΦΥΣΗΣ ΚΝΗΜΗΣ ΣΕ ΠΑΙΔΙ ΚΑΤΩ ΤΩΝ 4 ΕΤΩΝ



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9 ετών, ακέραια περόνη



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9 ετών, ακέραια περόνη



The management of open tibial fractures in children
a retrospective case series of eight years' experience of 61 cases at a paediatric
specialist centre

R. S. Nandra, F. Wu, A. Gaffey, C. E. Bache

Bone Joint J 2017;99-B:544-53.

- ▶ A retrospective review was performed on 61 children who between 2007 and 2015 presented with an open tibia fracture. Their mean age was nine years (2 to 16)
- ▶ The initial method of stabilisation comprised: casting in nine cases (15%); elastic nailing in 19 (31%); Kirschner (K)-wiring in 13 (21%); intramedullary nailing in one (2%); open reduction and plate fixation in four (7%); and external fixation in 15 (25%).
- ▶ We report a low infection rate in the open tibial fractures of children; superficial (6.6%) and deep (4.9%), as well as a low risk of nonunion.
- ▶ – We would discourage use of open reduction and internal fixation with a plate device.

THANK YOU

