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age was 11.99 years. Pin fixation was performed in 20 cases and screw fixation in 6 children. In the SH IV group (n:32, 21 boys–11 girls) the mean age was 12.38 years. In the second group pin fixation was performed in 21 cases whereas screw fixation only in 11 cases. The clinical part of the modified Weber protocol (Pain: 0–4, walking: 0–4, activity: 0–4, function of the ankle joint: 0–4) was used to evaluate the clinical outcome that was classified as excellent (zero points), good (1–2 points), fair (3–4 points) or poor (> 4 points). Lateral and anteroposterior radiographs were made for the detection of PPC, varus or valgus deformity as well as of any osteoarthritic changes. Statistical analysis was conducted with Fisher exact test for categorical data (incidence of PPC). At the latest follow-up, children were also assessed for any leg-length discrepancy.

Results: Average follow-up was 39 months (range, 23–184). In the SH III group the clinical outcome was considered excellent in 21 patients, good in 3 and fair in 2 cases. In this group 4 children developed PPC and two of them subsequent angular deformity; all 4 children had their fracture fixed with K-wires. We had no complications in the screw fixation subgroup. In the SH IV group the clinical outcome was considered excellent in 22 cases, good in 6, fair in 3 and poor in 1 case. In the pin fixation subgroup (n: 21) PPC was revealed in 5 patients (24%) and subsequent angular deformity was developed in two of them. In the screw fixation subgroup PPC was revealed in 2 cases (18%).

Conclusions: The incidence of PPC in children with SH IV distal tibial injury after anatomical reduction and internal fixation is higher (22%) than in those who sustained SH III (15%). In SH III group the incidence of PPC between the two subgroups was different but the difference was not statistically significant ($P > 0.05$). Likewise, in SH IV group the difference of PPC between K-wire fixation and screw fixation subgroups was not statistically significant ($P > 0.05$).

Significance: SH III and IV distal tibial physeal injuries predispose to PPC. Although not statistically significant a difference between K-wire and screw fixation does exist. Therefore anatomic reduction and stable fixation using screws that do not cross the physis instead of K-wire fixation is recommended.

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FRACTURE TYPE PRIMARILY INFLUENCES THE FINAL OUTCOME IN PEDIATRIC HIP FRACTURES

Hakan Omeroglu, Ulukan Inan, Nusret Kose

Purpose: The aim of this retrospective study was to assess the effects of several preoperative and intraoperative factors on the final clinical and radiological outcomes in pediatric hip fractures.

Methods: Forty-four pediatric patients with a hip fracture were treated at our department between January 1998 and September 2004. Thirty-nine patients with a minimum follow-up period of 1 year were included the study. Three patients were lost to follow-up and two died at the early postoperative period. Mean age of 39 patients were 11.1 (4–16) years. There were 22 boys and 17 girls. The two main etiologic factors were traffic accident (17) and fall from height (13). Associated injury was present in 15 patients and the pelvis (7) distal radius (4) fractures were the two most common. The type of the hip fracture according to the Delbet classification was type II in 21, type III in 14 and type IV in 4 patients. Two patients were treated by a hip spica under general anesthesia and 37 were surgically treated by internal fixation using mostly 3 cancellous screws. Ratliff's clinical and radiological assessment system was used to assess the final outcome and Ratliff's classification was used for grading the avascular necrosis of the femoral head (AVN). The effects of patient age, gender, fracture type, fracture displacement, laterality, intervention time and capsulotomy on the final outcome were evaluated and a P value less than 0.05 was considered significant.

Results: Mean follow-up was 3.1 (1–9.5) years and the final outcome was good in 28 (72%), fair in 4 (10%) and poor) in 7 (18%) patients. Thus, a satisfactory outcome was obtained in 28 patients. AVN was observed in 11 (28%) patients and 8 were type 1, 1 type 2 and 2 type 3. No significant correlation was found between the final outcome and age (<=10 yrs vs. &gt10 yrs; $P = 0.288$), laterality ($P = 0.477$), gender ($P = 0.158$), intervention time (<=24 hours vs. &gt24 hours; $P = 1.0$), capsulotomy ($P = 0.609$) or amount of displacement (displaced vs. non-displaced; $P = 0.078$). However there was a significant correlation between the final outcome and fracture type (worst in type II; $P = 0.014$). Of 11 patients with AVN, 10 had an unsatisfactory outcome. Hip arthrodesis was performed in 2 and total hip arthroplasty in 1 patient with unsatisfactory outcome.

Conclusions: The risk of AVN is nearly 30% in pediatric hip fractures. Existence of AVN is the main determinant of the final outcome in such fractures. The final radiological and clinical outcomes are correlated significantly with fracture type. Besides, fracture displacement may influence the final outcome.

Significance: Cervical femoral neck fractures (mainly displaced) have a higher risk of unsatisfactory outcome in children and the patients and parents should initially be warned about this subject.

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COMPLEX TIBIAL SHAFT FRACTURES IN PEDIATRIC POPULATION: TREATMENT WITH EXTERNAL FIXATION

Vito Pavone, Roberto Varsalona, Gianclaudio Caputo, Fulvio Carluzzo, Giuseppe Sessa

Purpose: Fractures of the tibia diaphysis, in subjects of paediatric age, are relatively frequent accounting for approximatively 15% of long bone fractures. The therapeutic approach is based on several options: patient age, fracture pattern, concomitant injuries, associated soft tissue and neurovascular damage, surgeon experience and ability, parents expectations. Treatment options include conservative method with or without Kirschner wire fixation, external fixation, and intramedullary nail fixation.

Aim of the present study was to evaluate clinically and radiographically the diaphyseal tibia fractures in subjects of paediatric age treated with external fixation and early mobilization.

Methods: At the Orthopaedic Clinical of the University of Catania, between January 1999 and December 2007, 72 subjects, with a mean age of 13 years (range 3–16 years), affected by tibia shaft fractures, were treated with external fixation. According to AO classification there were 32 fractures type A, 29 type B and 11 type C. 35 patients presented open fractures and precisely 18 cases were type I according to Gustilo –Anderson, 12 type II and 5 type IIIA. 30% of the study group presented associated injury including other skeletal injuries, closed head injury, abdominal and thoracic trauma.

Results: The mean follow up was 4 years (range 1–8 years). All the fractures healed and consolidated in a mean time of 81 days. Minor complication comprised infection of the pin tract in 16% of cases, while major complications included refracture (6%) following low energy trauma, angular deformity (5%) and delay of consolidation (3%). There were no cases of significant limb length discrepancy.

Conclusions: External fixation for the tibia diaphyseal fractures in paediatric age can be considered a valid option of treatment especially in case of comminuted and unstable fracture pattern, those with associated soft tissue injury, open fractures and multiple injured

subjects. It showed good results, both clinically and radiographically, without important complications, demonstrating to reduce the times of immobilization and hospitalization.
Significance: External fixation in paediatric age is a useful method of treatment for the complex tibia shaft fractures.

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TYPE III OPEN FRACTURES OF THE TIBIA IN CHILDREN

Jung Ryul Kim, Hyung Seok Lee

Purpose: Thirty children with acute type III open fractures of the tibia were retrospectively studied.
Methods: The average age was 9 years, 5 month (range, 2 years, 9 months to 15 years, 5 months. There were eleven type IIIA fractures, fourteen type IIIB fractures, and five type IIIC fractures, according to the classification of Gustilo et al.. Ten fractures were initially treated with flexible intramedullary nailing, twenty with external fixation.
Results: The average time to fracture healing was 26 weeks, and the median time to fracture healing was 18 weeks (range, 10–98). All were successfully treated. Four patients had delayed union, and two additional patients had nonunion. Osteomyelitis with nonunion developed in one patient. Four patients treated with external fixation had leg-length discrepancies of more than 1.5 cm, with the injured extremity longer in all cases. There were no late amputations. Two patients had an angular malunion of more than 10 degrees.
Conclusions: This retrospective study showed that Type III open fractures of the tibia in children are associated with a high incidence of complications.
Significance: Good anatomical and functional results should be expected with aggressive management of the soft tissue injury and adequate stabilization in type III pedicatric open tibial fractures.

DICHIARAZIONE SOSTITUTIVA DI ATTO DI NOTORIETÁ
(Artt 19 e 47 del D.P.R. 28.12.2000, n. 445)

Il sottoscritto Dott. Fulvio Carluzzo, nato a Butera (CL) il 18/11/1974 e residente a Catania (CT) in Via S. Quasimodo n. 2, consapevole che ai sensi del D.P.R. 445/2000, dichiarazioni mendaci, formazione o uso di atti falsi sono puniti ai sensi del codice penale e delle leggi speciali in materia,

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Il sottoscritto dichiara di essere informato che ai sensi del decreto legislativo n. 196/2003, i dati sopra riportati verranno utilizzati nell'ambito del procedimento per il quale la presente dichiarazione viene resa.

Catania, 18 Ottobre 2021

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