

## Brief Communication

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## Our Experience in the Management of Subtrochanteric Femoral Fractures in Children

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### Abstract

Subtrochanteric fractures in pediatric age represent a rare event, they are mostly associated with high-energy trauma or polytrauma; the incidence is highest in puberty. The use of plate synthesis does not find large case studies in the literature unlike the synthesis with TEN nails. In the literature there are no statistically significant long-term differences reported between the use of plates and the use of TEN nails but in the short term the use of plates has been shown to be advantageous for pain control, for faster healing and for the possibility of granting early loading. In the Orthopedics and Traumatology Unit of Pescara from January 2016 to December 2018, 36 fractures of the femur were surgically treated in pediatric patients, of which 2 patients had subtrochanteric fractures in puberty and were treated with plate and screws. The aim of our study is to report our experience for the treatment of subtrochanteric fractures in pediatric age with dedicated plates.

**Keywords:** Pediatric traumatology; Subtrochanteric plates; Traumatology

### Introduction

Pediatric subtrochanteric fractures present a rare event, are mostly associated with high energy trauma or polytrauma; the incidence is highest in puberty. In very young patients the treatment consists in the application of a trans-skeletal transmission and a podalic pelvis plaster. In older patients, a difference in adults [1], a cause of the presence of growth plates, osteosynthesis with intramedullary nail is not recommended, there is a preference for osteosynthesis with dedicated plate and screws or retrograde with ten nails. The use of plate synthesis does not find ample cases in the literature [2] unlike the synthesis with ten nails. There are no statistically significant long-term differences between plate procedures and ten nail instructions in the literature, but short-term plate assistance is beneficial for pain control, faster healing and the possibility of grant an early load. In the orthopedics and traumatology operative unit of Pescara from January 2016 to December 2018, 36 femoral fractures were treated surgically in pediatric patients of these 2 patients presented with subtrochanteric fractures in pediatric age and were treated with plate and screws.

The purpose of our study is to report our experience for the treatment of pediatric subtrochanteric fractures with dedicated plates.

### Patients and Methods

In 2017 a 7-year-old girl and in 2018 an 11-year-old boy arrived at our hospital after a traffic accident, both had an subtrochanteric fracture of the femur. The child had involved the right lower limb and the female the left lower limb. None of them had injuries to other devices. At the boy a trans-skeletal traction was applied immediately and at the girl was applied a open valve pelvis-podalic device waiting for the intervention. Surgery took place after 2 days for both. After the surgery, the young patients were left without any protection with the only indication of bed rest; have been monitored for body temperature, anemia and pain. Neither patient had a fever and no post-operative antibiotic administration was necessary; the anemia was limited and blood transfusions were not necessary; pain control was done with intravenous paracetamol and was judged satisfactory by patients. After 2 days from the surgery, post-operative radiographs were performed, the patients was put on his feet without load and began a cautious kinesis in bed [3] (Figure 1).



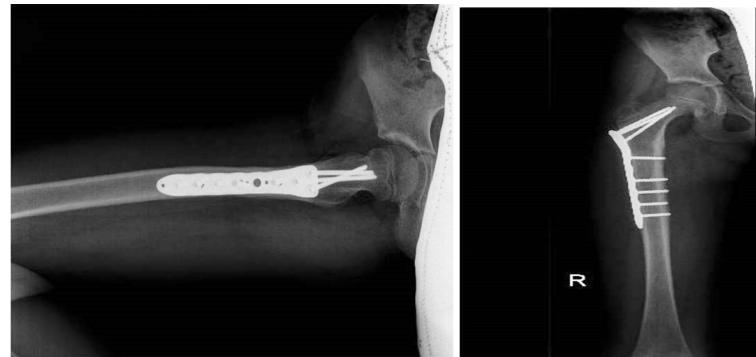
**Figure 1a:** 7-year-old girl, pre-operative x-ray in anterior-posterior and lateral projection.



**Figure 1b:** 7-year-old girl, post-operative x-ray in anterior-posterior and lateral projection.



**Figure 1c:** 7-year-old girl, x-ray one month after surgery in antero-posterior and lateral projection.



**Figure 1d:** 7-year-old girl, x-ray 3 months after surgery in antero-posterior and lateral projection.



**Figure 1e:** 7-year-old girl, x-ray 9 months after surgery in anteroposterior and lateral projection.

## Results

Clinical and radiographic checks were performed at 1 month, 3 months, 5 months, 9 months. After 2 years from the trauma, the boy had the plate removal without particular difficulties and complications and for the girl has yet to be carried out. To carry out osteosynthesis we used dedicated “orthopediatric pediloc” pediatric proximal femur plates. The young patients were placed in a supine position on the orthopedic bed in traction. For the surgical sterile field a transparent adhesive cloth was applied vertically on the thigh. The surgical approach used is the lateral one, directed to the subtrochanteric area of the femur, which provides for anterior displacement of the vast lateral muscle after incision of the fascia lata. Once the bone plane was reached a fracture reduction was carried out which was maintained with reduction pliers then the angular stability screws were introduced by the plate (Figure 2).



**Figure 2a:** 11-year-old child, pre-operative radiographs performed in an emergency.



**Figure 2b:** 11-year-old child, post-operative radiographs in antero-posterior and latero-lateral projection.



**Figure 2c:** 11-year-old child, radiographs at 1 month of surgery in antero-posterior and latero-lateral projection.



**Figure 2d:** 11-year-old child, radiographs at 2 months of surgery in antero-posterior and latero-lateral projection.



**Figure 2e:** 11-year-old child, radiographs at 5 months of surgery in antero-posterior and latero-lateral projection.



**Figure 2f:** 11-year-old child, radiographs at 9 months of surgery in antero-posterior and latero-lateral projection.

## Discussion

Subtrochanteric fractures in pediatric age are very rare and represent between 4 and 10% of all pediatric femur fractures, for this reason the cases currently existing in the literature are very small and there is no unanimity on the indication for treatment [4,5]. Young males are more affected due to sports trauma or high energy road trauma. In literature there is no agreement on the definition of subtrochanteric region; some define the subtrochanteric region as the fracture that occurs within one tenth of the total length of the femur under the lesser trochanter, others instead define it as the fracture between 2 and 5 cm below the lesser trochanter. In any case this is an anatomical region in which it is very difficult to obtain and to maintain an adequate reduction due to the conformation of the femur and due to the muscular action of the gluteal muscles, ileus psoas and adductors. There is enough agreement in the literature regarding the treatment of patients under the age of 6 [6].

From 6 years onwards the therapeutic options are multiplying and at the present time there is evidence that one treatment is superior to the other [7]. In our opinion in this anatomical region an optimal reduction associated with a stable synthesis allows numerous advantages over the intramedullary elastic synthesis with ten nails. In the short term, osteosynthesis with elastic

intramedullary nails must be associated with pelvic plaster, these, as well as being difficult to manage, can cause skin lesions from bedsores, may require numerous maintenance interventions and involve prolonged bed immobilization throughout the period; however, after an osteosynthesis with angular stability plate, no plaster protection is necessary. The risk of bleeding is also very low in osteosynthesis with plates if is performing good hemostasis control and a clean surgical approach [8]. The recovery of the upright position, the recovery of the physiological mobility of the limbs, the muscle tone and the walking are faster with the osteosynthesis with plate and screws compared to intramedullary elastic nails osteosynthesis associated with pelvic plaster. Long-term in literature there are no significant differences between the two surgical techniques.

## Conclusion

The low incidence of subtrochanteric fractures in pediatric age leads to little attention in literature, leading doubts on the most appropriate treatment, especially in age of over 6 years. The use of the plates provides significant biomechanical advantages in maintaining the length of the femur and stabilizing the reduction obtained by preserving the growth cartilage. In our experience Treatment with subtrochanteric plates in the short and medium

term shows benefits in patient management without increase of complications. The small number of cases does not allow the formulation of absolute indications for fractures in this specific area of the femur in pediatric age

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