

Staged surgical management of the sequelae of neonatal septic hip arthritis: a case report and review of the literature

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Abstract. Total necrosis of the femoral head is a common sequelae after septic hip arthritis in infancy. Septic hip dislocation may develop, with severe functional consequences on the growing child: limping and limb length discrepancy.

We present our staged surgical treatment of Choi's type IV A sequelae of septic hip arthritis in a 2-year old boy. Open reduction, followed by various reconstructive procedures, were performed. After 8 years of follow-up, the child has a stable, mobile hip, with good functional outcomes. Close follow-up is mandatory to ensure a good long-term outcome.

Our technique proved to be successful in the achievement of a functional hip by maintaining the remnants of the femoral head and creating the conditions to remodel them quasi-normal.

Key Words

Septic hip arthritis, Sequelae, Neonatal, Surgical reconstruction.

Introduction

Hips can suffer severe damage due to untreated developmental dysplasia, septic arthritis, tuberculosis, a neglected fracture of the neck of femur and neglected hip dislocation^{1,2}.

Acute septic arthritis involves the hip in 23-75% of the cases. The main cause is the haematogenous dissemination of the bacteria and, only in few cases, by direct inoculation. The microorganisms most commonly involved in septic osteoarthritis are *Staphylococcus aureus*, *Streptococcus pneumoniae*, and *Haemophilus influenzae*^{3,4}. Even in the cases where the diagnosis of septic arthritis is made early, the delays in the institution of treatment due to inadequacy of resources, socioeconomic reasons and/or ignorance, are frequent⁵⁻⁷. When the treatment is delayed, the complications of septic hip arthritis become inevitable^{1-3,5,6,8-10}.

The most severe complications of the septic arthritis of the hip in infancy and, especially, in newborns include significant joint damage and avascular necrosis of the femoral head. These complications can lead to severe sequelae such as partial or complete destruction of the proximal femoral epiphysis, the growth plate or both⁸⁻¹⁰.

The aim of surgical treatment is to restore joint congruency, ensure good stability and hip movement, correct limb length discrepancy, and enable painless gait^{3,8}.

Our goal in the current case report is to present our staged approach in the treatment of severe sequelae of neonatal septic arthritis of the hip, using various hip reconstructive and salvage procedures.

Case report

A 2-year-old boy was referred to our service in December, 2010. His legal guardians described painless limp on the left hip. The diagnosis was necrosis of the femoral head due to the hip infection. Child medical history showed sepsis during his first months of life due to infection with *Staphylococcus aureus*, secondary to intravenous treatment in the first week after birth. On clinical examination, we noticed muscle wasting at the left thigh and hip region. The Trendelenburg sign was positive on the left side, with 25° flexion, 20° internal rotation and 25° adduction contractures of the left hip. Limb length discrepancy measurement was done with the patient supine and standing, and the result was 2.7 cm shortening on the left side.

Plain radiographs of the pelvis were obtained at the time of referral. Preoperatively, the radiographs showed only a small lateral remnant of the femoral head on the left side, and the femur positioned considerably more proximal than nor-

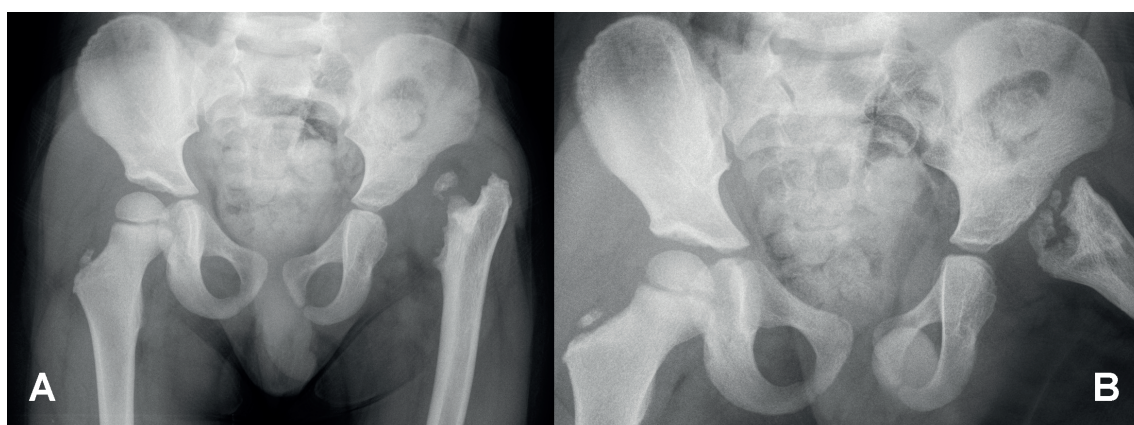


Figure 1. Preoperative radiographs showing a Choi type IV A septic sequelae of hip, with a totally luxated hip. **A**, Anterior-posterior view. **B**, Lateral view.

mal, outside of the acetabulum. According to the system suggested by Choi et al⁸, our patient was grouped under Choi's type IV A (Figure 1) with severe destruction of the femoral head and dislocation of the hip joint.

The open reduction was performed through an anterior iliofemoral approach. The interval between the sartorius and the tensor fasciae latae was developed. The straight head of the rectus femoris was tagged with a suture and released from its origin at the anterior inferior iliac spine. The anterior hip capsule was then excised, in order to remove all interposing tissues in the acetabulum. The iliopsoas tendon was released from the lesser trochanter, and the small unossified cartilaginous cap was introduced in the acetabular cavity. After testing the stability, the capsulorraphy was performed, and the patient was placed in a hip spica cast for 8 weeks (Figure 2).

1-year follow-up radiograph showed re-dislocation of the left hip, with the enlargement of the remnant of the femoral head. Computed tomography (CT) scanning of the left hip showed the ossified remnant of the femoral head, with pseudarthrosis at the base of the femoral neck, and irregularities around the femoral head (Figure 3).

Open reduction was performed again using the anterior iliofemoral approach. After opening the left hip capsule, the femoral neck periosteal flap was developed using the Bernese group technique¹¹⁻¹⁵ through the osteotomy at the base of the greater trochanter. Direct visualization of the femoral head and neck permitted the resection of all bony spurs around the remnant of the femoral cap. The stability of the reduction was assessed, and the distal advancement of the greater

trochanter was stabilized using a fully threaded screw. The patient was placed again in the hip spica cast for 8 weeks (Figure 4).

Follow-up radiograph showed consolidation of the greater trochanter osteotomy, with the remodeling of the femoral head and neck, but with the development of coxa vara at the level of the neck-shaft junction (Figure 5).

Using a lateral approach to the proximal femur, the valgus osteotomy was performed at the inter-trochanteric level, using a pediatric valgisation LCP plate (Synthes, West Chester, PA, USA).

At the last follow-up, the radiograph showed remodeling of the femoral head in a spherical shape, with the restoration of the femoral neck length, and consolidation of the femoral neck pseudarthrosis. Clinically, the boy exhibited a slightly reduced hip range of motion (90° flexion,

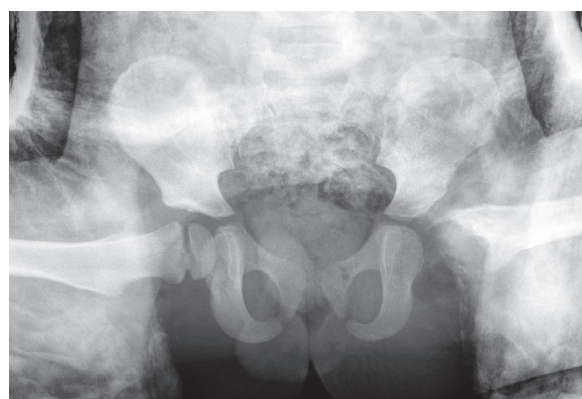


Figure 2. Postoperative radiograph showing adequate open reduction of the left hip dislocation.

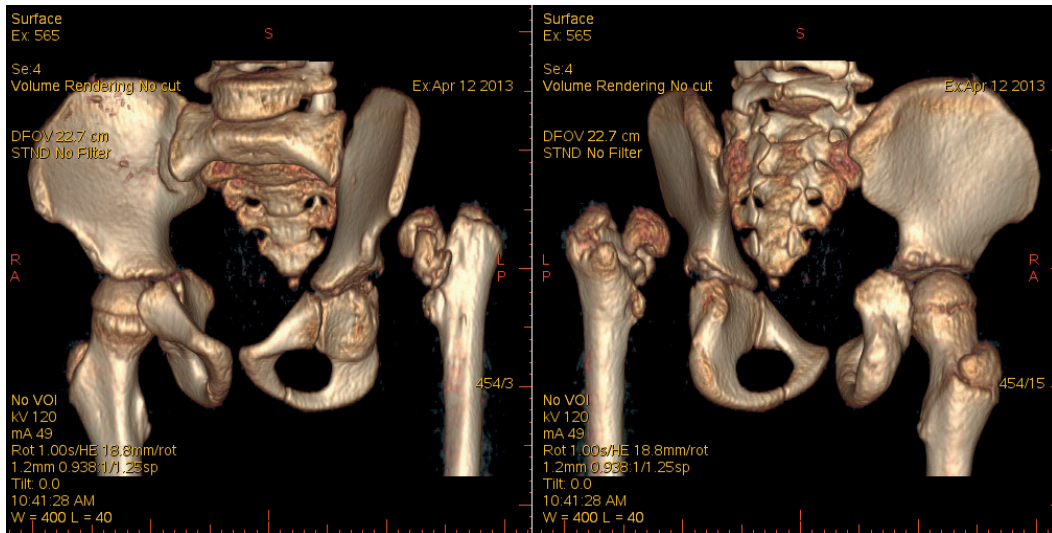


Figure 3. Preoperative CT-scan of the left hip: dislocated remnants of the left femoral neck, covered by cartilaginous cap.

0° extension, 45° abduction, 10° adduction, 20° external rotation, 15° internal rotation), with a resolution of the Trendelenburg gait, and a limb length discrepancy of 7.6 cm (Figure 6).

The patient is scheduled for future acetabuloplasty to correct the acetabular dysplasia, prior to the lengthening procedures.

Discussion

Acute septic hip arthritis in neonates represents a surgical emergency, which requires early detection (within 4 days) and adequate treatment (decompression and antibiotics)^{3,4,16}.

Failure in early diagnosis and treatment leads to catastrophic effects on the hip, especially if there are other risk factors: prematurity, age less than 6 months, type of bacteria, concurrent osteomyelitis of femur, and septic dislocation of the hip joint. The degree of damage and the subsequent sequelae are difficult to predict even after appropriate treatment^{3,4}.

Radiographic classifications of residual sequelae after septic hip arthritis have been proposed by various authors^{8,17}. Choi et al⁸ reported the distribution of sequelae severity in septic hip arthritis in children. Nearly 60% of cases were



Figure 4. Postoperative radiograph showing deep-seated femoral head inside the acetabulum, following surgical hip dislocation, osteochondroplasty and distal advancement of the greater trochanter.



Figure 5. Development of neck pseudarthrosis and coxa vara.

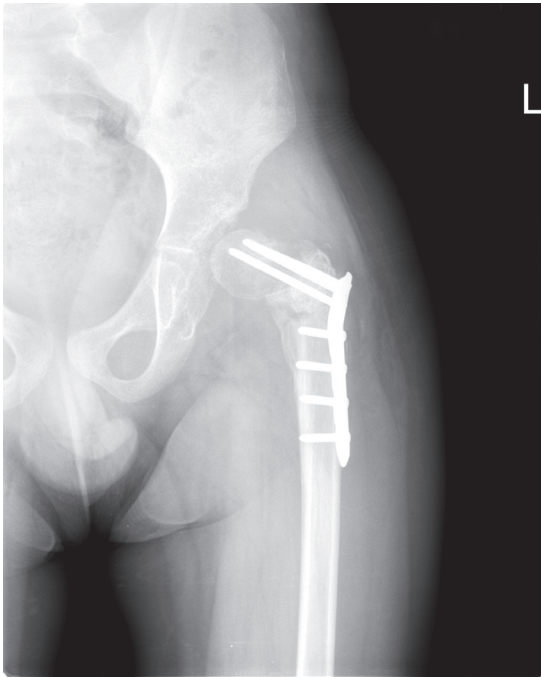


Figure 6. Postoperative radiograph showing consolidation of the pseudarthrosis and restoration of the neck length and head shape after valgisation osteotomy of the proximal femur.

less severe type (Choi type I, II, and III) and 38% of patients had the most severe type IV. More recently, Forlin et al¹⁸ published their report where 41% of children had the severe Choi type IV.

Patients affected by sequelae of the septic hip arthritis type IV have severe anatomical deformities. The remnant of the head and neck is

covered with a cartilaginous cap and usually is dislocated. The dislocation of the hip in sepsis is different from the developmental hip dysplasia. Intra-articular fibrosis restricts further dislocation, and the laxity is due to the misshaped femoral head. Moreover, the triradiate physis may be damaged, resulting in loss of remodeling of the acetabulum, and also the capsule is thick, adherent, and fibrous³. Other possible deformities are: flexion-adduction contracture, marked limb length discrepancy, and severe functional limitation when walking⁹.

Before undertaking any reconstructive procedure, the infection must have settled down. The desirable aims and objectives of the treatment are (1) restoration of the hip stability; (2) deformity correction of the hip joint; (3) shortening correction; (4) maintain mobility of the hip; (5) relieve pain. Maintenance of the hip joint mobility is very important, and the restoration of the stability at the expense of mobility is not desirable.

Some authors have reported that the patients may do well non-operatively for several years. Fabry et al¹⁹ reported on 29 children with hip septic arthritis. They concluded that the desired anatomical and functional improvement was not always obtained by surgical procedures. Wopperer et al²⁰ and Betz et al²¹ reported independently that the Harris hip scores were not better in the surgically treated patients and they advised against reconstructive surgery of the hip. They recommended only contralateral epiphysiodesis in adolescence to compensate the limb length discrepancy.

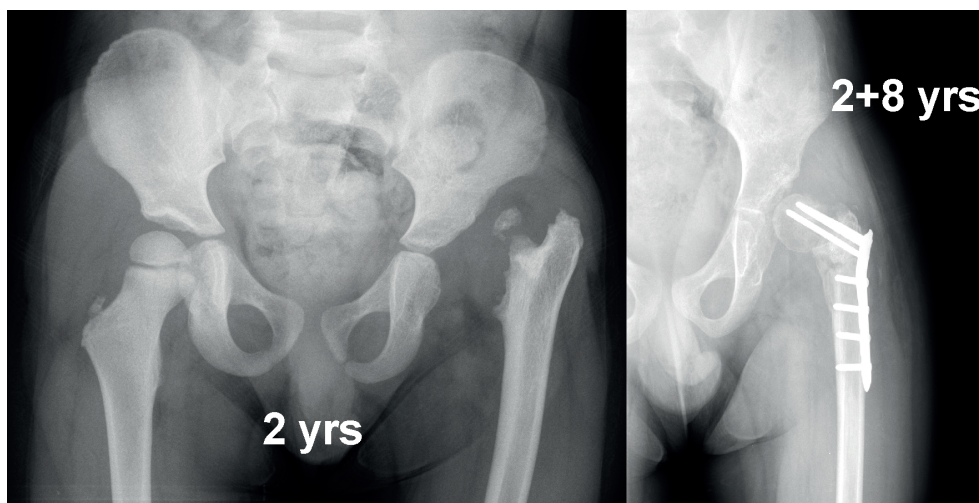


Figure 7. Ossified femoral head, located inside the dysplastic acetabulum, with adequate femoral neck length and inclination angle, 8 years after the initial surgery.

Later series have shown that late reconstructions and replacement arthroplasty become difficult because of loss of bone stock³. Various forms of reconstructive procedures have been described in the attempt to salvage the hip joint with the objective to obtain a stable painless joint.

Closed reduction can be attempted but, in most cases, this is prone to failure. In our patient, the open reduction was performed at the beginning, but even so, the redislocation appeared. Due to the particularity of the septic dislocation, with a lot of fibrous tissues in the hip joint, we advise for open reduction of the hip, with careful debridement of the scary tissues and excision of all redundant capsule. In the presence of redislocation, careful imagistic examination of the hip is recommended. In our case, CT scanning of the hip showed the presence of remnants of the femoral head and neck, with numerous bony spurs. Careful excision of the bony irregularities followed by proximal femoral osteotomies will allow the restoration of the quasi-normal anatomical and functional properties of the proximal femur.

Other reports advised for trochanteroplasty as a surgical procedure to restore the stability and mobility of the hip, preparing the area for future prosthetic reconstruction of the hip. Abrishami et al⁶ achieved satisfactory results in all 9 patients undergoing trochanteroplasty under 3 years of age. Stability of the hip was achieved in all cases with a resolution of abductor lurches, but mobility decreased in variable grades in all patients. The authors concluded that a stable, functional, painless hip can be achieved when performing trochanteroplasty earlier than 3 years of age. Ferrari et al⁹ evaluated 11 patients treated by trochanteroplasty before 10 years of age. They achieved stability and mobility of the hip in 8 out of 11 patients and concluded that satisfactory independence is generally restored with some inevitable functional limitations. El-Rosasy et al¹ reported their results with the pelvic support osteotomy (PSO). 16 adult patients underwent this type of reconstructive surgery with significant improvement of Harris hip score in all patients. PSO is a valuable and durable solution for adult patients suffering of sequelae of septic hip arthritis²².

The particularities of the reported case consist of the combined and staged surgical management of Choi type IV A sequelae of septic hip arthritis. Initial open reduction restored the normal position of the head remnant in the affected acetabulum, creating the conditions for future

remodeling of the acetabulum. The increase in size and shape of the femoral cap permitted the trimming and the lengthening of the femoral neck through the method described by the Bernese group. This resulted in a deep-seated femoral head, with sufficient length of the femoral neck to allow resolution of the Trendelenburg gait. The stability and mobility of the hip were achieved allowing the future lengthening procedures of the femur (Figure 7).

Conclusions

Careful clinical and imagistic evaluation is recommended preoperatively to assess correctly all the patient particularities. Based on the final evaluation, a reconstructive plan can be developed individually for each patient in order to achieve the hip joint stability and mobility which will allow future prosthetic replacement.

Acknowledgements

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Conflict of Interests

The authors declare that they have no conflicts of interest.

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