

Case Report

Humeral lengthening by Ilizarov technique due post neonatal septic arthritis: a case report

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ABSTRACT

Septic arthritis is an acute infection that occurs more frequently in children, is monoarticular, and most frequently affects the knee and hip. The main long-term sequelae of shoulder septic arthritis is shortening of the humerus and deformity of the affected joint. Humeral lengthening, whether unilateral or bilateral, is a valid method that improves the outcome following arm shortening and deformity correction. We presented the case of a teenager with sequelae of septic arthritis of the shoulder. He had dysmetria of the upper limbs of 120 mm, with shortening of the left humerus and humeral head subluxation. He underwent humerus osteotomy and humeral lengthening according to the Ilizarov technique. Currently, he presents some dysmetria, but have normal mobility. Radiologically we achieved 80 mm lengthening and reduce the humeral head, which was initially dislocated. Diagnosis of neonatal septic arthritis requires a high index of clinical suspicion. Humeral lengthening in post-septic shortening with the application of Ilizarov fixator is an effective, safe, reliable method.

Keywords: Septic arthritis, Humeral lengthening, Shortening, Ilizarov

INTRODUCTION

Septic arthritis is an acute infection that occurs more frequently in children, is monoarticular, and most frequently affects the knee and hip.¹ Neonatal septic arthritis is a serious condition that can result in dysfunction or deformity of the affected limbs. There are few studies regarding this topic in the literature, but the reported incidence of neonatal septic arthritis varies between geographical regions. The incidence of septic arthritis in Europe is 2-7/100.000 children.²

Hematogenous dissemination through transphyseal vessels is more common in children.^{2,3} The immaturity of the immune system causes the faster spread and the clinical signs and laboratory findings are subtle.²

Neonatal septic arthritis of the shoulder is diagnosed less frequently than other joints, representing 2 to 7% of all neonatal septic arthritis, according to the available studies.^{2,3}

Shoulder septic arthritis can be treated with drainage of the joint by arthrocentesis, arthroscopy, or arthrotomy followed by intravenous antibiotic therapy.^{3,4}

Delays in diagnosis and treatment can lead to sepsis, osteomyelitis and destruction of articular cartilage and ossification nuclei. The main long-term sequelae of this last complication is shortening of the humerus and deformity of the affected joint.^{3,5,6}

Humeral lengthening, whether unilateral or bilateral, is a valid method that improves the outcome following arm shortening and deformity correction, including angulation

and rotation.⁷⁻⁹ Complication rate is low and results are gratifying. Ilizarov fixator is very stable for lengthening of humerus with less pain.^{7,8}

We presented the case of a teenager with sequelae of septic arthritis of the shoulder. He underwent bone lengthening of the humerus according to the Ilizarov technique, with good functional results.

CASE REPORT

Our patient is a male, born prematurely at 33 weeks and 6 days, by cesarean, 2620 g and Apgar score of 5/7/8. Five days after birth, he developed septic shock with fever, hypotension, hemorrhagic suffusions and meningitis. He started and completed 21 days of vancomycin and cefuroxime, without microbial isolation in blood cultures. He was hospitalized for approximately 8 weeks. No reference about changes in limb motion.

At 3 years old, he was referred to an orthopedic consultation due to coxa vara. Physical assessment revealed dysmetria of the lower and upper limbs, and a retrospective diagnosis of multifocal septic arthritis was made with involvement of the left shoulder, left hip and left knee.

The patient had multiple surgical interventions- in 2016, underwent left distal femoral osteotomy to knee flexion correction; in 2019, underwent lengthening of the left radius and epiphysiodesis of the left ulna; in 2020, underwent osteosynthesis material extraction from the radius, ulna shortening osteotomy and epiphysiodesis according to the Bowen technique; in 2022, underwent osteotomy of the femur and tibia and application of a hexapodal external fixator to gradually correct the shortening and angulation of the left lower limb according to the Ilizarov technique.

In March 2023, with 16 years old, he presented good morphology of the lower limbs, good mobility of the left wrist, but he had dysmetria of the upper limbs of 120 mm, with shortening of the left humerus and humeral head subluxation. Clinically, he had limited anterior elevation, abduction, internal and external rotation (Figure 1 and 2). The Quick-DASH was 34.1.

In July 2023, he underwent humerus osteotomy and humeral lengthening according to the Ilizarov technique. We started physiotherapy on the next day. Distraction started on the 7th day post-operative day. We follow up every 14 days during distraction phase, with clinical evaluation and x-ray during every visit. During the end of distraction phase, we must see the axis of the bone. Before dismantling the Ilizarov fixator, we must see 3 cortices of good regenerate bone.

The total time of lengthening was about 6 months, but we kept the fixator for 8 months. A temporary plaster was applied for 2 weeks after removal of the Ilizarov apparatus.

No complications occurred during the treatment time. Currently, the patient presents some dysmetria, but has a satisfactory active range of movement (Figure 3). Radiologically, we achieved 80 mm lengthening and the reduction of the humeral head, which was initially dislocated (Figure 4). The patient was satisfied with the functional and aesthetic results obtained with the correction of dysmetria. His initial Quick-DASH, prior to lengthening was 34.1, and now is 18.2.



Figure 1 (a-c): Clinical presentation before humeral lengthening.



Figure 2 (a-c): Radiological presentation of patient before humeral lengthening.

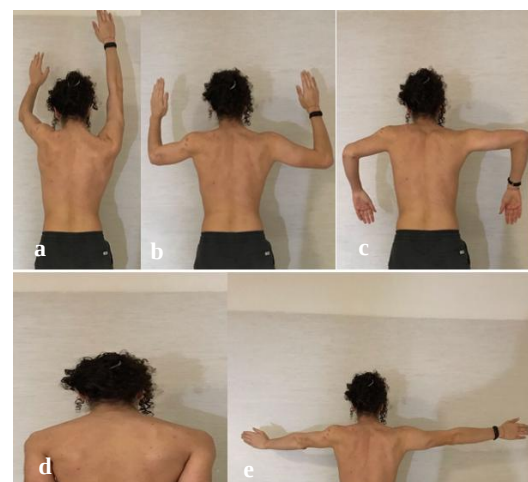


Figure 3 (a-e): Clinical presentation after humeral lengthening.

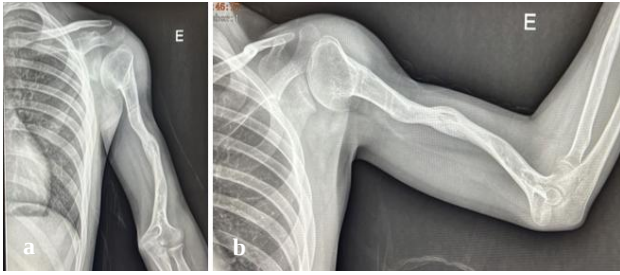


Figure 4 (a and b): Radiological images of patient 2 years after humeral lengthening.

DISCUSSION

Diagnosis of neonatal septic arthritis requires a high index of clinical suspicion.⁶ Early diagnosis and treatment are essential to prevent joint destruction, physeal damage, osteonecrosis or sepsis.^{2,6}

Proximal humeral physis is responsible for approximately 80% of the humeral length.⁹ Therefore, in cases of septic epiphysitis or trauma, the physis can suffer damage and cause premature fusion and shortening.⁹ When occur premature closure of the medial part and continuation of growth of the lateral part, this can lead to varus angulation.⁸

Humeral lengthening has been used to correct arm length discrepancy secondary to different etiologic factors—congenital humerus varus, enchondromatosis, multiple exostosis and acquired lesions of the humeral growth plate secondary to trauma, sepsis, surgery and radiotherapy.^{6,8} Humeral lengthening is usually performed to correct deformities where angulation is >20 degrees or rotational and limb length dysmetria is >5 cm.⁸

The first case of humeral lengthening was reported by Dick and Tietjen in 1978, in a boy with septic humeral hypoplasia. In that case, a Wagner apparatus was used in association with a shoulder spica over the elbow.^{7,8}

There are three techniques for filling the bone defect created by distraction after osteotomy: limb lengthening with cancellous bone graft and plating of the distracted gap (Wagner technique); limb lengthening without bone grafting of the distraction gap (Ilizarov's technique) and limb lengthening with cortical allograft of the distracted gap.^{6,7}

The Ilizarov technique bases on the principles of distraction osteogenesis. A corticotomy is performed in the metaphysis, without bone grafting, and the bone is gradually distracted. This promotes the bone union through progressive bone histogenesis.¹⁰ With this technique, was possible achieve distraction, compression and translation, so besides lengthening, is possible achieve angular and rotational correction.⁷ In this specific case, in addition to the lengthening, was possible to re-center the head of the humerus in the center of the joint.

In Ilizarov's technique, the use of small diameter Kirschner wires, makes replacement easily in case of breakage or local infection, under local anesthesia without interrupting the treatment.

A stable circular fixation, a percutaneous corticotomy, and a slow distraction with three-dimensional correction possibilities, makes the correction and lengthening of the upper limb safer and easier.⁷

CONCLUSION

Septic arthritis is considered an orthopedic emergency that involves early diagnosis and immediate treatment to avoid irreversible joint damage. Diagnosis of neonatal septic arthritis requires a high index of clinical suspicion. In newborns, the diagnosis is more challenging given the frequent absence of obvious clinical signs. Humeral lengthening in post-septic shortening with the application of Ilizarov fixator is an effective, safe, reliable method. Lengthening of humerus improves function and cosmesis. For angular deformity correction with length and rotation, Ilizarov's technique is the best option.

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