

# Arthroscopic Treatment for Septic Arthritis of the Shoulders in Neonates: A Case Report

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Septic arthritis in neonates is a rare condition. A failure to make an early diagnosis of septic arthritis in neonates may leave a permanent disability as a result of a delayed treatment. Thus, septic arthritis, requires a prompt diagnosis and a timely treatment especially in this subset of patients. In this case report, we describe our treatment protocol for septic arthritis and concurrent osteomyelitis in the right shoulder of a 28-day-old newborn. Using 2.4 mm wrist arthroscopy, we performed an arthroscopic irrigation and drainage, to remove intra-articular debris and inflammatory tissue, and multiple drilling. We report a satisfactory clinical outcome without any postoperative complications or side effects.

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**Key Words:** Neonate; Shoulder joint; Septic arthritis; Osteomyelitis; Arthroscopy

In neonates, the prevalence of septic arthritis in the shoulders is extremely rare.<sup>1)</sup> The consequences of a delayed diagnosis of this condition in neonates that may occur if the clinical symptoms associated with this condition are ambiguous and nonspecific are grave. For instance, a delayed diagnosis can lead to an irreversible, debilitating damage or deformity of the shoulders as a result of an injured epiphyseal plate of the proximal humerus or ossification center: thus, early diagnosis and intervention are imperative.<sup>2)</sup> Here, we describe a case of septic arthritis with concomitant osteomyelitis in the proximal humerus of the right shoulder of a 28-day-old neonate. As treatment, we performed irrigation and drainage through 2.4 mm wrist arthroscopy and multiple drilling through a lumbar puncture needle. After an 18-month postoperative follow-up, we found satisfactory clinical outcomes showing neither postoperative complications nor residual symptoms. Altogether, our findings, as well as our review of the literature, suggest that our approach is effective for the treatment of septic arthritis with concomitant osteomyelitis in the shoulders of neonates.

## Case Report

A 28-day-old male neonate was admitted to our hospital for distress and agitation specifically caused when a range of motion (ROM) of the right shoulder joint was conducted. The neonate who was conceived through in vitro fertilization pre-embryo transfer was one of twin babies born on the second day of the 36th gestational week by cesarean delivery, weighing 2,700 g. Medical records show that the neonate did not show any signs of abnormalities during the month in which he was cared at the postnatal care center. But after leaving the postnatal care center and two days before admission to our hospital, the neonate was provoked into a sudden outburst of cry as his caregiver tried to lift his right shoulder whilst giving him a bath. At the time of admission, physical examination of the neonate showed an edema in the right shoulder, slight flares, and a passive ROM that induced the neonate into a cry. His body temperature was 37.1°, his white blood cell (WBC) level was increased at 15,020/μl (normal range, 4,000–10,000/μl), and his C-reactive protein (CRP) level was substantially increased at 3.94 mm/dl (normal

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range, 0–0.29 mm/dl). Plain radiography taken at the time of admission revealed an area of hypo-density around the greater tuberosity of the humerus, and results of ultrasonography and those of magnetic resonance imaging (MRI) corroborated each other's findings of osteomyelitis at the greater tuberosity and of a subdeltoid abscess and a subscapular abscess (Fig. 1). On the basis of these physical, clinical, and radiological findings, we made a diagnosis of septic arthritis with concomitant osteomyelitis of the proximal humerus. And the patient was given emergency treatment comprising arthroscopic irrigation and drainage and multiple drilling on the day of admission.

To perform the arthroscopy, as we would in an adult we inserted two arthroscopic portals, anterior and posterior, in the patient who was under general anesthesia and in a lateral decubitus position. The posterior portal was made immediately inferior to the posterolateral edge of the acromion, forming a portal that accommodates a 24 mm arthroscope. By examining the

intra-articular environment through this portal, we found that the supraspinatus muscle and the biceps were in fair condition. The anterior portal was made on the lateral coracoid process. By passing a reamer through the anterior portal, we removed any inflammatory granulation tissue around the joint and sufficiently irrigated the intra-articular space with saline solution (Fig. 2). In addition, the posterior portal was used to insert the arthroscope into the subacromial space so that the osteomyelitis at the greater tuberosity and inflammatory tissue could be viewed. Then, we performed multiple drilling at the greater tuberosity with a lumbar puncture needle, sufficiently irrigated the intra-articular space with saline solution, and inserted a drainage tube (Fig. 3).

Although postoperative cultures failed to define a causative agent, we nevertheless administered the patient from the day of surgery with dual antibiotic therapy comprising 0.4 mg of vancomycin (Samjin Pharmacy, Seoul, Korea) and 1.16 mg of cefotaxime (Chong Kun Dang Pharmaceutical Corp., Seoul, Korea).

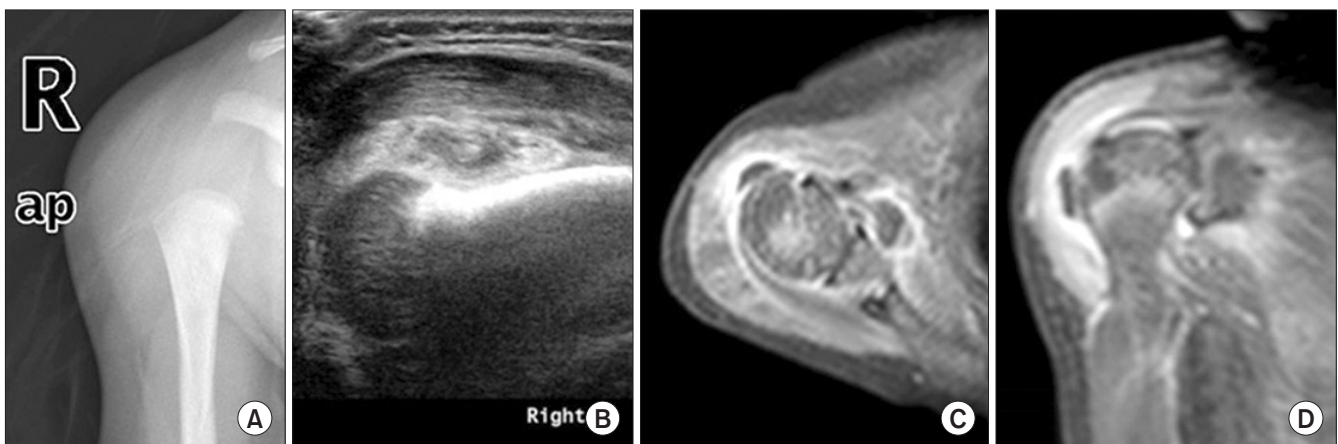


Fig. 1. Preoperative imaging work up. (A) Radiolucency in the greater tuberosity of the humerus and soft tissue swelling. (B) Irregular-shaped hypoechoic lesion at the subdeltoid and the subscapularis regions. (C, D) Intraosseous abscess at the greater tuberosity and subdeltoid and subscapularis abscesses.

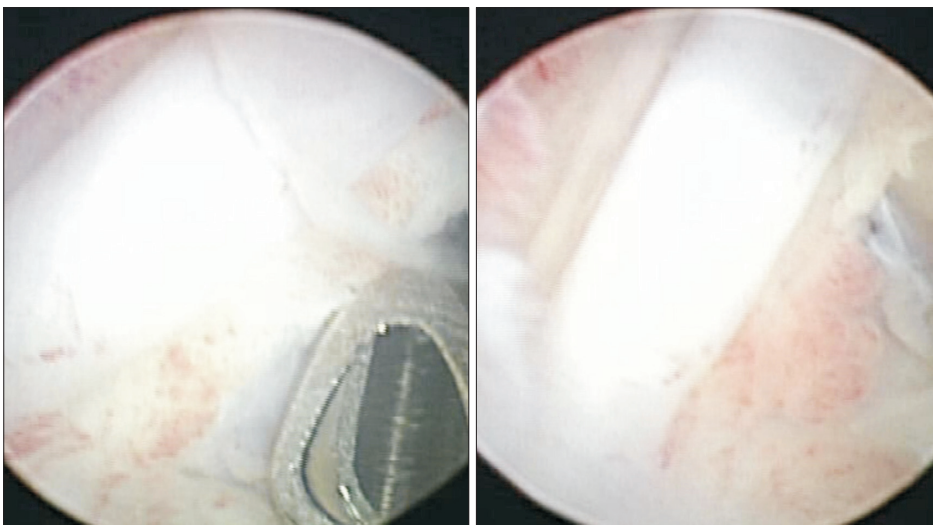


Fig. 2. Initial arthroscopic findings show inflammatory granulation tissue.

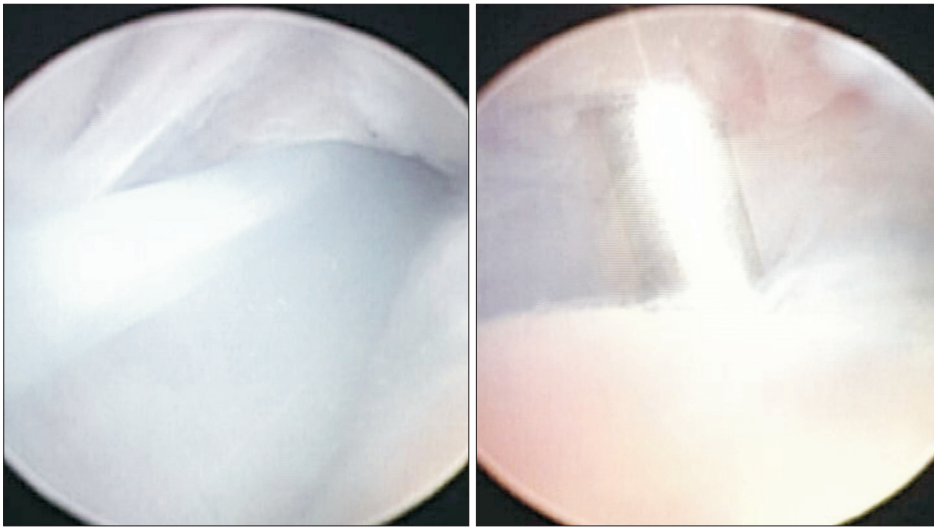


Fig. 3. Intraoperative findings of multiple drilling and drain insertion.

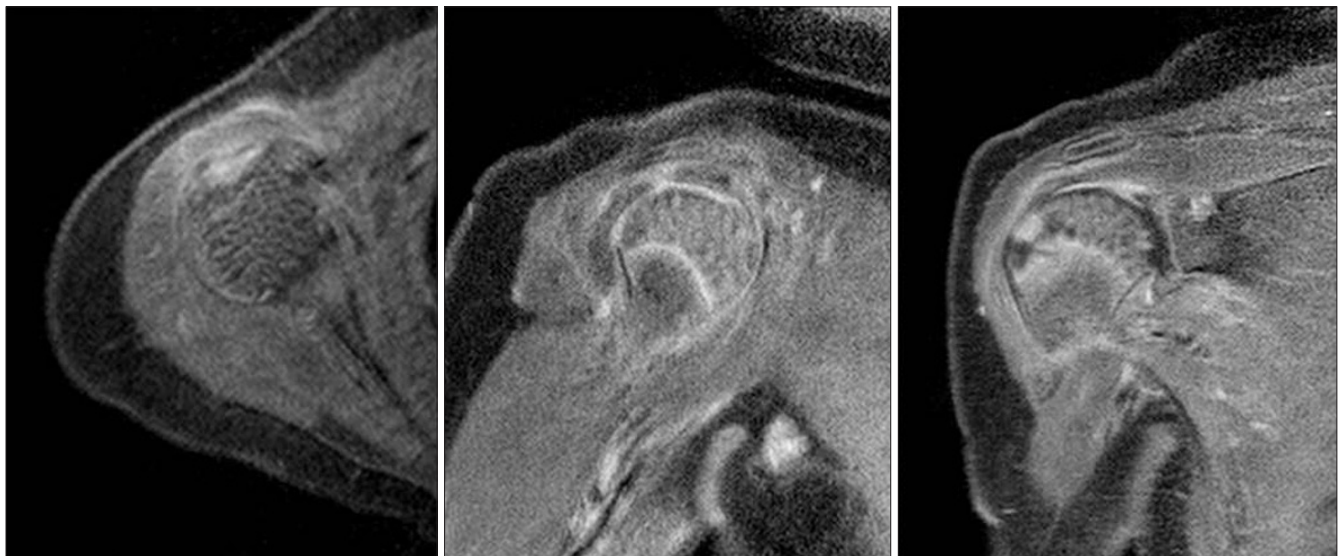


Fig. 4. Magnetic resonance imaging scans taken at the 6th postoperative week show regression of the osteomyelitis of the humeral head and of the adjacent soft tissue infection.

Cefotaxime administration was terminated on the 10th postoperative day, and vancomycin administration was continued until the day of discharge on the 3rd postoperative week. Results of MRI taken on the 2nd postoperative week showed that the abscess size and osteomyelitis were substantially decreased. Clinical observations showed that the WBC level decreased to  $8,600/\mu\text{l}$  and the CRP level decreased to  $0.09 \text{ mm/dl}$ . By the 6th postoperative week, MRI findings revealed an absence of abscesses or of osteomyelitis save for trivial edema of the muscles or the bone marrow (Fig. 4). Plain radiography taken on the 18th postoperative month showed that the ossification centers of the greater tuberosity and of the humeral head of the affected arm compared to the unaffected contralateral arm did not show a statistically significant difference. We found neither restrictions

in joint ROM nor joint subluxation (Fig. 5).

## Discussion

The first case of septic arthritis in neonates was recorded in 1874 by Smith. Although it was regarded as an extremely fatal condition at the time, fatality rates have now decreased to around 1% with developments in antibiotics.<sup>3)</sup> Even though antibiotic use has considerably reduced the mortality of neonates and infants affected by this disease, a delayed diagnosis, which often occurs because history taking and physical examination are difficult to take in these patients, leads to a delayed treatment and permanent defects, such as injury or deformity of the ossification center, joint subluxation, and etc. Hence, a prompt



Fig. 5. X-ray scans taken on the 18th post-operative month does not reveal significant bony abnormality.

diagnosis and a timely treatment are critical.<sup>2)</sup> A clinician can suspect septic arthritis if the following clinical features are observed: fever, acute ROM restriction, muscle stiffness, focal swelling, an increased blood WBC level, an increased blood CRP level, a faster erythrocyte sedimentation rate, and etc. The size of the increase may not be as prominent in neonates as it is in adults.

Modes of imaging for septic arthritis and osteomyelitis in neonates include plain radiography, ultrasonography, bone scans, MRI, and etc. In their study on 11 patients with septic arthritis, Kwon et al.<sup>4)</sup> singled out preoperative ultrasonography with clinical examination of parameters such as articular distension, capsular hypertrophy, subluxation, and intraarticular debris as the mode of diagnostic tool that provides the most conclusive indication for diagnosis and for surgery. Yet ultrasonography is limited in that its results may be influenced by the examiner's level of experience or expertise. Conversely, although the use of MRI for septic arthritis is costly and requires sedation of neonates, it has the most widespread use for its accuracy in imaging the lesion. In this case report we employed clinical examination, ultrasonography, and radiography to examine the patient. Though fever was not a coexisting symptom in our patient, an acute restriction in ROM and focal swelling were seen, and blood WBC level and blood CRP level were increased. The preoperative plain radiography showed signs of joint distension and areas of hypo-density around the greater tuberosity of the humerus. The results of ultrasonography confirmed the presence of articular distension and of articular debris, and shoulder MRI of the patient enabled us to locate the position and estimate the size of the lesion accurately.

Paterson<sup>5)</sup> reported that the causative pathogens of septic arthritis are *Staphylococcus aureus* and *Haemophilus influenzae*, the former being the more prevalent. Yet Al Saadi et al.<sup>6)</sup> reported that only 43% of abscess cultures are positive for a pathogen. In this case report, although the microbiological etiology could not be identified through cultures, the patient was administered empirical antibiotics for three weeks. Neither recurrence nor

postoperative complications occurred.

In three neonates aged eight months or older, Forward and Hunter<sup>7)</sup> observed satisfactory clinical outcomes without any postoperative complications or side-effects when they performed irrigation and drainage through wrist arthroscopy. In a 9-day-old neonate with septic arthritis, Yoon et al.<sup>8)</sup> observed favorable outcomes after arthroscopic irrigation and drainage. Likewise, our minimally invasive technique comprising intra-articular irrigation, drainage, and multiple drilling would have probably reduced the rate of postoperative complications in our patient that would have otherwise risen during an open joint surgery. The results of MRI from the 2-week and 6-week postoperative follow-ups showed a clear improvement in radiological features. By the 18th postoperative month, radiological examination did not reveal an ossification center injury, joint subluxation, or bone deformity in the affected arm compared to the unaffected contralateral arm. Also, the ROM of the affected side compared to the unaffected side was normal. Altogether, our findings suggest a satisfactory, short-term clinical outcome after arthroscopic irrigation and drainage and multiple drilling for septic arthritis and osteomyelitis in neonates.

## References

1. Gafur OA, Copley LA, Hollmig ST, Browne RH, Thornton LA, Crawford SE. The impact of the current epidemiology of pediatric musculoskeletal infection on evaluation and treatment guidelines. *J Pediatr Orthop*. 2008;28(7):777-85.
2. Saisu T, Kawashima A, Kamegaya M, Mikasa M, Moriishi J, Moriya H. Humeral shortening and inferior subluxation as sequelae of septic arthritis of the shoulder in neonates and infants. *J Bone Joint Surg Am*. 2007;89(8):1784-93.
3. Knudsen CJ, Hoffman EB. Neonatal osteomyelitis. *J Bone Joint Surg Br*. 1990;72(5):846-51.
4. Kwon JW, Sohn KT, Shin SH, Park JH. Diagnosis of bone and joint infection in neonates. *J Korean Orthop Assoc*. 1999;

- 34(5):979-84.
5. Paterson DC. Acute suppurative arthritis in infancy and childhood. *J Bone Joint Surg Br.* 1970;52(3):474-82.
  6. Al Saadi MM, Al Zamil FA, Bokhary NA, Al Shamsan LA, Al Alola SA, Al Eissa YS. Acute septic arthritis in children. *Pediatr Int.* 2009;51(3):377-80.
  7. Forward DP, Hunter JB. Arthroscopic washout of the shoulder for septic arthritis in infants. A new technique. *J Bone Joint Surg Br.* 2002;84(8):1173-5.
  8. Yoon HK, Kim MH, Lee BI. Arthroscopic treatment for septic arthritis of the shoulder in neonates. *J Korean Orthop Assoc.* 2010;45(4):321-5.