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# Late-Onset Group B Streptococcal Septic Arthritis of the Shoulder and Proximal Humeral Osteomyelitis Presenting With Reduced Spontaneous Arm Movement in an Afebrile Infant

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## Abstract

We report a case of a one-month-old girl with late-onset group B *Streptococcus* (GBS) septic arthritis of the shoulder and proximal humeral osteomyelitis who presented with persistent reduction in spontaneous movement of the right upper extremity without fever, swelling, erythema, or warmth. Initial radiography showed no fracture, dislocation, or bone destruction. Because the reduced arm movement persisted, magnetic resonance imaging (MRI) performed approximately three weeks after symptom onset revealed findings suggestive of right shoulder septic arthritis and proximal humeral osteomyelitis. Blood and joint fluid cultures yielded *Streptococcus agalactiae*, identified as serotype III, confirming GBS bacteremia and septic arthritis, whereas proximal humeral osteomyelitis was diagnosed based on MRI findings. She underwent surgical irrigation and debridement followed by six weeks of antimicrobial therapy. Her right upper-limb function gradually improved, and no functional asymmetry was observed at two years and one month of age, although delayed development of the proximal humeral epiphyseal ossification center had been noted. This case emphasizes that late-onset GBS osteoarticular infection should be considered in young infants when unilateral reduction in limb movement persists for several weeks, even in the absence of fever or overt local inflammatory signs.

**Categories:** Pediatrics, Infectious Disease
**Keywords:** group b streptococcus (gbs), late-onset gbs disease, osteomyelitis, reduced spontaneous movement, shoulder septic arthritis

## Introduction

Group B *Streptococcus* (GBS) is a leading cause of invasive infection in neonates and young infants, and bacteremia and meningitis are the most common manifestations of late-onset GBS disease [1]. Osteoarticular infections, including osteomyelitis and septic arthritis, are uncommon manifestations of late-onset GBS disease overall; however, GBS remains an important pathogen in osteoarticular infections among infants younger than three months [2,3]. In young infants, osteoarticular infection may occur without fever or overt local inflammatory findings, and reduced spontaneous movement of the affected limb may be mistaken for brachial plexus palsy or birth trauma [4].

When reduced limb movement occurs in isolation and persists for several weeks, the absence of fever or overt local inflammatory signs may contribute to delayed recognition of osteoarticular infection. Delayed recognition is clinically important because bone and joint infections in early infancy may result in subsequent growth-plate injury, limb-length discrepancy, deformity, or functional impairment [5,6]. We report a case of late-onset GBS septic arthritis of the shoulder with proximal humeral osteomyelitis in an afebrile infant whose predominant clinical manifestation was a three-week history of persistent reduction in spontaneous movement of the right upper extremity without overt local inflammatory signs.

## Case Presentation

A one-month-old girl was born at 39 weeks and 5 days of gestation with a birth weight of 3,094 g. She was delivered vaginally without shoulder dystocia or other birth trauma. Her Apgar scores were 8 and 9 at 1 and 5 minutes, respectively, and her neonatal course was unremarkable. She had no relevant medical history or known allergies.

Four days before her routine one-month health examination, her family noticed reduced spontaneous movement of her right upper extremity. At the examination, she was afebrile, feeding well, and gaining weight appropriately. The asymmetry was confirmed on examination, whereas finger movement and grasping were preserved. No erythema, swelling, or warmth was evident over the right shoulder. Plain radiographs showed no fracture, dislocation, or bone destruction, and she was initially followed up as an outpatient (Figure *1A*).

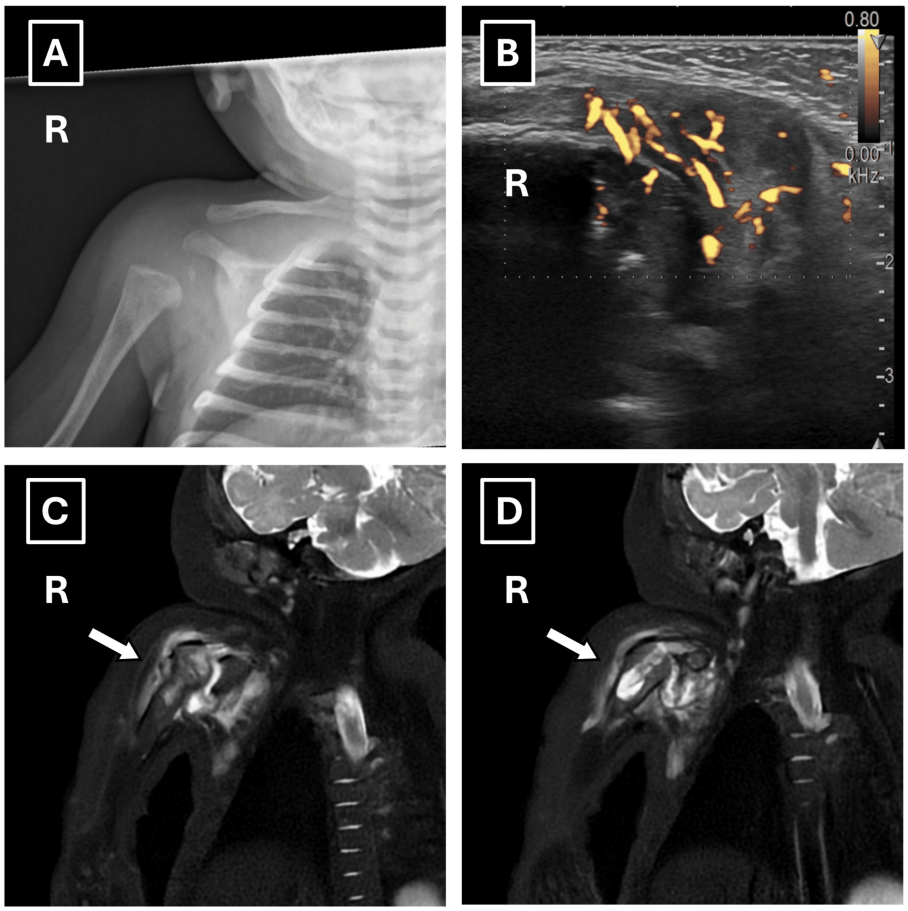



**FIGURE 1: Imaging findings at initial evaluation and diagnosis**

(A) Initial plain radiograph showing no fracture, dislocation, or bone destruction. (B) Longitudinal power Doppler ultrasonographic image of the right shoulder obtained at diagnosis, showing increased periarticular vascularity. (C, D) Coronal fat-suppressed T2-weighted magnetic resonance images obtained at diagnosis, showing right shoulder joint effusion, periarticular inflammatory changes, and abnormal high signal intensity in the proximal right humerus (arrows).

Because the asymmetry persisted, MRI was performed 17 days after the initial assessment, approximately three weeks after symptom onset. MRI abnormalities around the right shoulder prompted admission for further evaluation and treatment.

On admission, her temperature was 37.4°C, and her vital signs were stable. Although tenderness of the right shoulder could not be clearly elicited, she cried intensely when the right upper extremity was elevated, and spontaneous movement at the shoulder was markedly reduced. Laboratory evaluation showed a white blood cell count of 15,900/μL, C-reactive protein level of 5.43 mg/dL, platelet count of 753 × $10^3$/μL, and procalcitonin level of 0.1 ng/mL.

Ultrasonography demonstrated synovial thickening, periarticular fluid collection, and increased vascularity on power Doppler imaging (Figure *1B*). MRI revealed right shoulder joint effusion, inflammatory changes in the surrounding soft tissues, and high signal intensity in the proximal right humerus on fat-suppressed T2-weighted images (Figures *1C*, *1D*). These findings suggested right shoulder septic arthritis and proximal humeral osteomyelitis.

She underwent surgical irrigation and debridement of the right shoulder on the day of admission. Blood and joint fluid cultures grew *Streptococcus agalactiae*, which was identified as serotype III. Intravenous ampicillin (200 mg/kg/day) and cefotaxime (150 mg/kg/day) were initiated. Cefotaxime was discontinued on hospital day 5 after culture and antimicrobial susceptibility results became available, and ampicillin monotherapy was continued. The drain was removed on postoperative day 2. Blood and joint fluid cultures confirmed GBS bacteremia and septic arthritis, whereas proximal humeral osteomyelitis was diagnosed based on the MRI findings.

Antigravity movement of the right upper extremity was observed by hospital day 3 and improved further by

hospital day 5. Pain during passive movement subsequently resolved, although spontaneous shoulder movement remained reduced for approximately three weeks. MRI on treatment day 27 and serial ultrasonography showed marked improvement in the joint effusion and surrounding inflammatory changes. She was transitioned from intravenous ampicillin to oral amoxicillin before discharge and completed a total of six weeks of antimicrobial therapy at three months of age. Cultures of breast milk and maternal urine and stool were negative, and the source of infection remained unidentified. The acute diagnostic and therapeutic course is summarized in Figure 2.

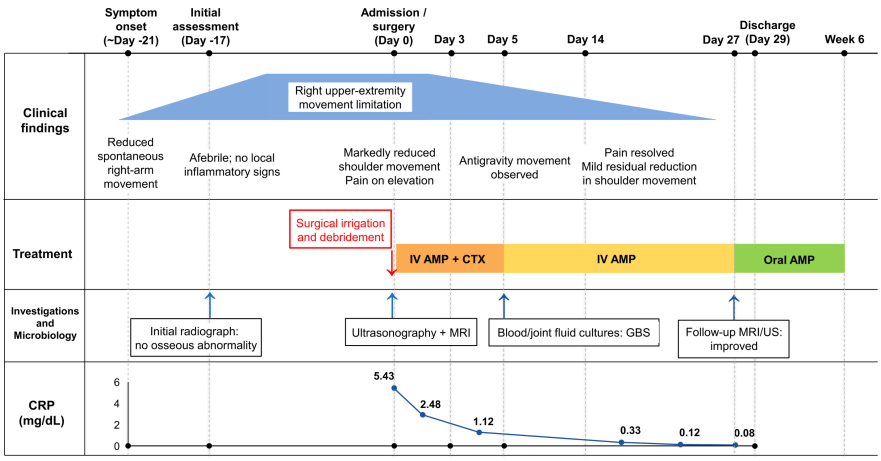



**FIGURE 2: Clinical course from symptom onset to completion of antimicrobial therapy**

AMP, ampicillin; AMX, amoxicillin; CTX, cefotaxime; CRP, C-reactive protein; GBS, group B *Streptococcus*; MRI, magnetic resonance imaging; US, ultrasonography

Reduced spontaneous movement of the right upper extremity persisted despite the absence of fever or local inflammatory signs at the initial assessment, and a diagnosis was established approximately three weeks after symptom onset. Upper-extremity movement and C-reactive protein levels improved after surgical irrigation and debridement and antimicrobial therapy. The shaded area schematically represents the course of right upper-extremity movement limitation.

The figure was created by the authors using Microsoft PowerPoint (Microsoft Corporation, Redmond, USA).

Follow-up radiographs obtained approximately six months after diagnosis showed underdevelopment of the right proximal humeral epiphyseal ossification center compared with the contralateral side. The ossification center gradually enlarged on serial radiographs, with interval development evident approximately two years after diagnosis. By one year of age, spontaneous movement of the right shoulder was comparable to that of the contralateral side. At two years and one month of age, no asymmetry in upper-extremity movement or clinically apparent upper-limb length discrepancy was evident. However, continued follow-up is warranted because later growth-related sequelae cannot yet be excluded.

## Discussion

Although osteoarticular infections are uncommon manifestations of late-onset GBS disease, GBS remains an important causative pathogen in infants younger than three months [1-3]. In the series reported by Branco et al., among 24 infants younger than three months with osteoarticular infections, a causative pathogen was identified in 21 cases, of which 5 (23.8%) were caused by GBS [3].

Osteoarticular infection in young infants may present as reduced use of the affected limb or pseudoparalysis, although local swelling and warmth are also commonly observed. In a multicenter study by Sun et al., localized swelling was reported in 88.7%-98.9% of neonates and infants with osteoarticular infections, reduced spontaneous movement in 79.8%-95.7%, and local warmth in 69.2%-85.1% [7]. In our patient, reduced spontaneous movement of the right upper extremity persisted for approximately three weeks without fever, swelling, erythema, or warmth before the diagnosis was established. The prolonged duration of this isolated and clinically subtle manifestation was the principal diagnostic challenge in this case.

Several previously reported cases of GBS osteoarticular infection in infants have also presented with reduced upper-extremity movement (Table 1) [4,8,9].

| Reference/case | Age/sex | Site | Main presentation | Fever and local signs | Time from symptom onset to diagnosis | Basis/notes |
|---|---|---|---|---|---|---|
| Present case | 1 month, female | Right shoulder septic arthritis; proximal humeral osteomyelitis | Reduced right-arm movement; distal movement preserved | Afebrile; no swelling, erythema, or warmth | Approx. 21 days | Normal initial radiograph; MRI/US suggested infection; blood and joint fluid cultures yielded GBS serotype III |
| Sadleir and Connolly [4], Case 1 | 3 days, male | Left humeral osteomyelitis | Acute left-arm monoplegia; pain with movement | Afebrile; shoulder warm and swollen | 12 days | Normal early radiograph; later lytic lesion; blood culture yielded GBS |
| Sadleir and Connolly [4], Case 2 | 15 days, male | Left proximal humeral osteomyelitis | Reduced left-arm movement; flaccid arm | Afebrile initially; fever 38.5°C after 10 h; local signs NR | Approx. 1 day | Normal radiograph and US; bone scan positive; repeat blood culture yielded GBS |
| Sadleir and Connolly [4], Case 3 | 21 days, female | Left proximal humeral osteomyelitis | Absent left-arm movement; pain with passive motion | Afebrile; mild shoulder swelling | Approx. 18 days | Repeat radiograph and bone scan positive; synovial fluid culture yielded GBS |
| Hasegawa et al. [8] | 31 days, female | Left shoulder septic arthritis; suspected proximal humeral osteomyelitis | Reduced use of the left arm | Afebrile; no swelling or erythema | 13–14 days | Imaging suggestive; surgery performed on day 14 |
| Lee et al. [9] | 5 weeks, NR | Right shoulder septic arthritis; proximal humeral osteomyelitis | Reduced right-arm movement | Afebrile; no swelling or erythema | 5 days | MRI suggestive; operative specimens confirmed infection |

**TABLE 1: Selected reported cases of group B streptococcal osteoarticular infection in infants**

GBS, group B *Streptococcus*; MRI, magnetic resonance imaging; NR, not reported

Time to diagnosis was calculated from the onset of the presenting symptom, when reported.

Among these cases, the interval from symptom onset to diagnosis and the presence of fever or local inflammatory signs varied substantially. In the present patient, diagnosis was established approximately 21 days after symptom onset despite the continued absence of fever or overt local inflammatory findings. Sadleir and Connolly described one afebrile infant diagnosed after approximately 18 days, although mild shoulder swelling was present [4]. Hasegawa et al. reported a case of an afebrile infant presenting without swelling or erythema in whom diagnosis was established after 13-14 days [8], whereas the patient described by Lee et al. was diagnosed after five days [9]. These observations emphasize that persistent unilateral reduction in spontaneous arm movement should itself prompt consideration of osteoarticular infection, even when other clinical signs of infection are absent.

During infancy, transphyseal vessels connecting the metaphysis and epiphysis remain present, facilitating extension of infection across the physis into the epiphysis and adjacent joint [10]. The coexistence of proximal humeral osteomyelitis and shoulder septic arthritis in our patient is consistent with this anatomic characteristic.

Because the unilateral reduction in arm movement persisted, further evaluation ultimately included laboratory testing, ultrasonography, and MRI. MRI demonstrated findings suggestive of shoulder septic arthritis, proximal humeral osteomyelitis, and surrounding soft-tissue inflammation. In retrospect, persistence of the unilateral movement abnormality despite the absence of fever or overt local inflammatory signs could have prompted earlier laboratory evaluation and advanced imaging. Thus, the persistence of this symptom, rather than the result of any single initial imaging modality, should be recognized as an important trigger for further evaluation.

Early diagnosis is important not only for controlling infection but also for minimizing subsequent effects on bone growth and joint function. In our patient, surgery and antimicrobial therapy resulted in the resolution

of the infection and recovery of right upper-extremity function. Although no asymmetry in upper-extremity movement or clinically apparent upper-limb length discrepancy was evident at two years and one month of age, underdevelopment of the right proximal humeral epiphyseal ossification center had been observed during follow-up. In neonates and young infants, physeal injury after osteoarticular infection may become apparent only later despite satisfactory functional recovery [5,6]. Therefore, later growth-related sequelae cannot yet be excluded in our patient, and continued follow-up through skeletal maturity is warranted, with particular attention to humeral length discrepancy, osseous deformity, and limitation of shoulder range of motion.

## Conclusions

Herein, we described a case of an afebrile infant with late-onset GBS septic arthritis of the shoulder and proximal humeral osteomyelitis who presented with persistent reduction in spontaneous movement of the right upper extremity without overt local inflammatory signs. In infants younger than three months, unilateral reduction in limb movement that persists for several weeks should prompt consideration of osteoarticular infection, including late-onset GBS disease, even when fever and local inflammatory signs are absent. Recognition of this persistent but clinically subtle manifestation may facilitate earlier laboratory evaluation and advanced imaging. Because later growth-related sequelae cannot yet be excluded, long-term follow-up through skeletal maturity is warranted.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Ayaka Yamaoka, Soichiro Ishimaru, Taichi Kobayashi, Kentaro Suzuki, Shun Imamura

**Drafting of the manuscript:** Ayaka Yamaoka, Taichi Kobayashi, Shun Imamura

**Acquisition, analysis, or interpretation of data:** Soichiro Ishimaru, Kentaro Suzuki

**Critical review of the manuscript for important intellectual content:** Soichiro Ishimaru, Kentaro Suzuki

### Disclosures

**Human subjects:** Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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ChatGPT (OpenAI, San Francisco, USA) was used to assist with manuscript editing and organizing the clinical information presented in the clinical course figure. The final figure was independently created and verified by the authors using Microsoft PowerPoint, based on the underlying clinical data. All manuscript content was reviewed and approved by the authors.

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