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## CASE REPORT

### Part - B

## Salmonella Septic Arthritis of the Shoulder in an Infant after COVID-19 Infection

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### ABSTRACT

We report a case of Salmonella septic arthritis of the shoulder in an immunocompetent infant one month after COVID-19 infection. An eight-month-old infant presented with intermittent fever for two weeks. She had features of septic arthritis of the left shoulder. She was treated with arthrotomy of the shoulder. The Gram staining and culture were consistent with Salmonella. Ceftriaxone was given parenterally followed by an oral route. She recovered fully without any recurrence. Salmonella septic arthritis is a rare entity. This is the first case of Salmonella septic arthritis reported in an immunocompetent infant after COVID-19 infection.

**Keywords:** Salmonella osteomyelitis; Salmonella septic arthritis; COVID 19; septic arthritis of infancy; septic arthritis of the shoulder

**Case report**

An eight-month-old girl presented to us following intermittent fever for two weeks in January 2021. She had a SARS Cov-2 infection one month before the onset of fever. She was a healthy child and was taking a mixed diet. She was an immunized child for her age. Her developmental milestone was normal. There was no history of cough, dyspnea, vomiting, diarrhea, or trauma. There was no history of hemoglobinopathies in the family.

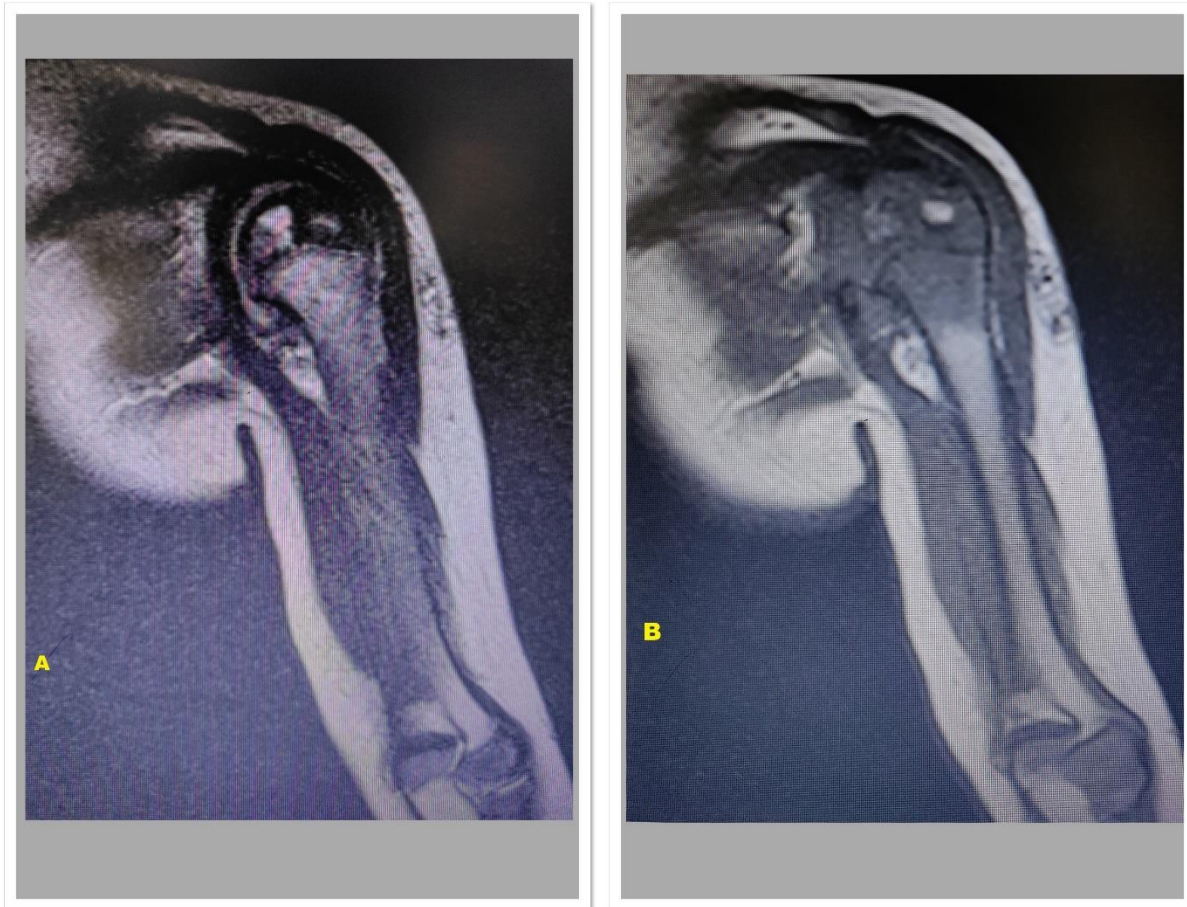
At the time of the presentation, she was active and playful. Her temperature was 100 degrees Fahrenheit. The respiratory rate was 24 per minute. There was no generalized lymphadenopathy or organomegaly. Cardiovascular, respiratory, and other system examinations were normal. There was minimal swelling over the left shoulder. There was a local rise in temperature with tenderness over the left shoulder. Active and passive movements were painful.



**Figure 1:** An ultrasound scan of the left shoulder showing thick particulate collection tracking along the biceps tendon communicating with the joint space and to the subscapularis muscle suggestive of abscess formation.

The hemogram showed a hemoglobin level of 10.5 g/dl and a total leukocyte count of  $16.35 \times 10^3$  with 60% neutrophils. The erythrocyte sedimentation rate was 44 mm/hr, and the C-reactive protein was 3.78 mg/dl. A radiograph of the shoulder showed loss of soft tissue planes without any bony abnormalities. Ultrasonography of the left shoulder showed thick particulate collection tracking along the biceps tendon measuring 13x12x30 mm communicating with the

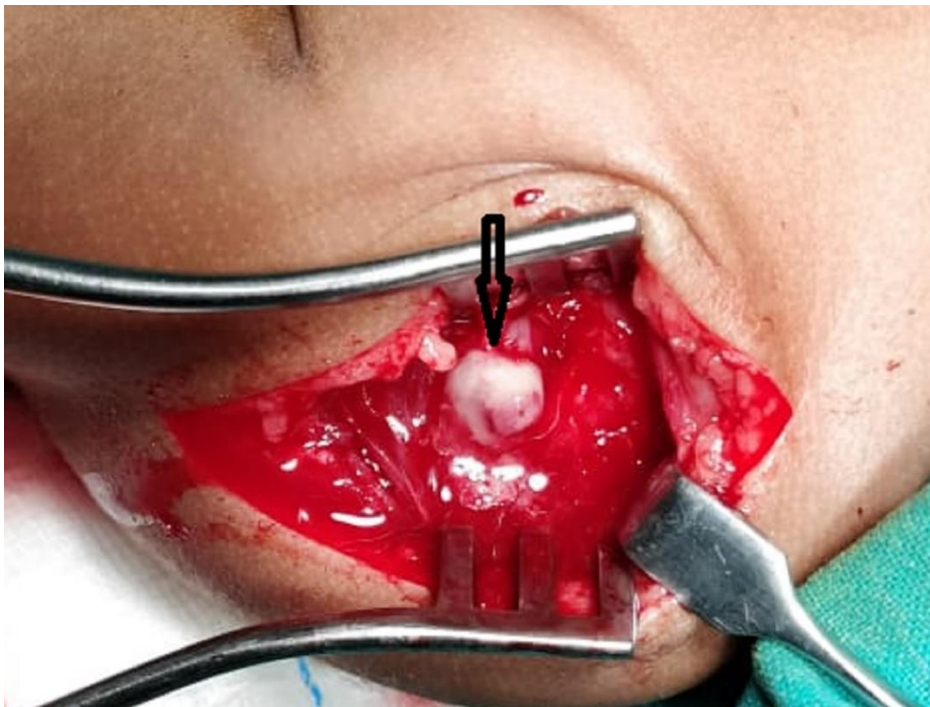
joint space and to the subscapularis muscle, which measured 18x23 mm and was suggestive of abscess formation (Fig 1). A T1-weighted magnetic resonance imaging (MRI) scan showed hypointense lesions in the proximal metaphysis of the left humerus, and a STIR image showed hyperintensity in the metaphysis with effusion (Fig 2). The features were suggestive of osteomyelitis of the proximal humerus with septic arthritis of the left shoulder.



**Figure 2:** MRI scan. (A) T1-weighted image showing hypointense lesions in the proximal metaphysis of the left humerus and (B) STIR image showing hyperintensity in the metaphysis with effusion.

The child was managed initially by general measures such as antipyretics, splinting the left shoulder in a cuff, and collar sling. She was given 150 mg/kg cefuroxime intravenously twice daily. An arthrotomy of the left shoulder was performed. Intraoperatively, there was approximately 30 ml of pus in the shoulder joint. There was no destruction of

the articular cartilage on the humeral head or glenoid (Fig 3). The joint cavity was thoroughly washed with normal saline. Few drill holes were placed in the proximal metaphysis of the humerus to decompress the intramedullary abscess. The pus and synovium were sent for Gram staining, culture and sensitivity, and biopsy.

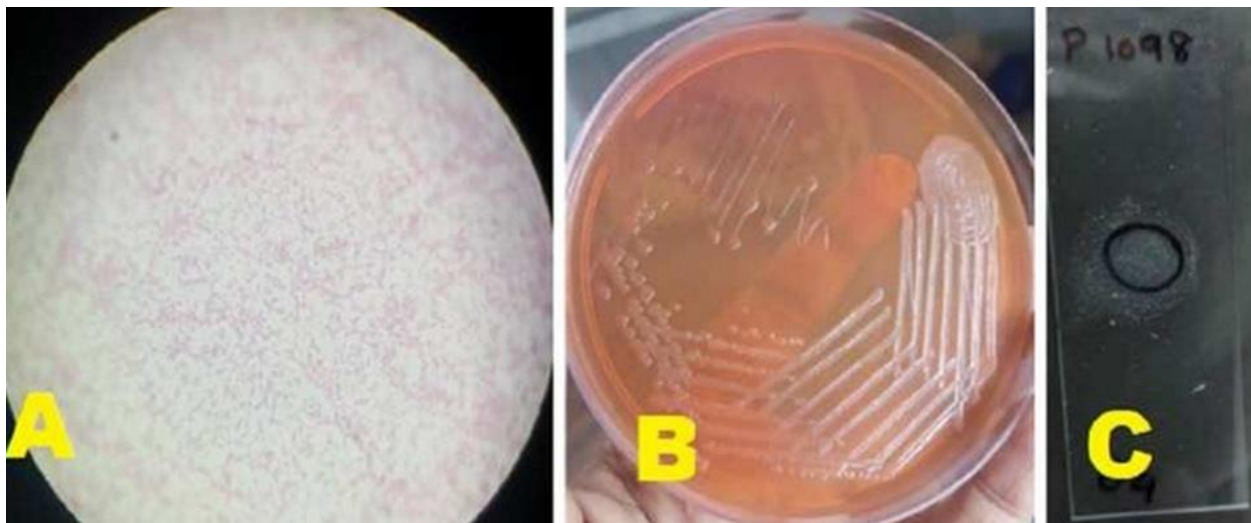


**Figure 3:** Intraoperative photograph showing the left shoulder joint without destruction of the epiphysis of the humerus and pus inside the joint (arrow).

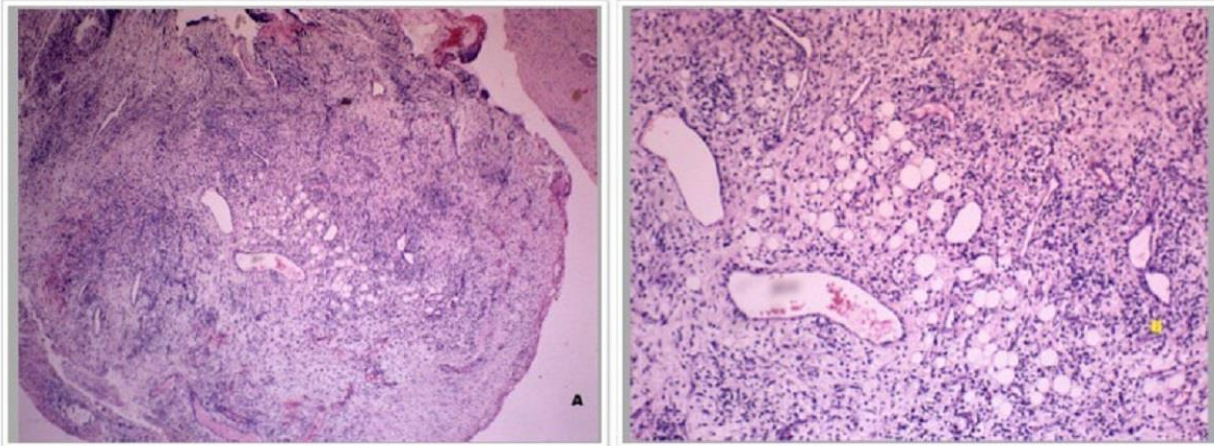
After arthrotomy, the temperature decreased. Gram staining showed gram-negative bacilli. There was the growth of *Salmonella* on nonlactose fermenting colonies in Macconkey agar, and there was agglutination with *Salmonella* O-antigen 4 (Fig 4). *Salmonella* was sensitive to ceftriaxone. The histology showed synovial tissue, adipose tissue, and fibro collagenous tissue with diffuse dense infiltration by neutrophils, lymphocytes, eosinophils, plasma cells, and histiocytes suggestive of acute infection (Fig 5).

After obtaining the antibiotic sensitivity report, she was given parenteral ceftriaxone 50 mg/kg once a day for two weeks thereafter orally for another three weeks. The response to treatment was monitored using total leukocyte count, ESR, and CRP. After two months, the child was asymptomatic, and she regained her full range of movements. There was no recurrence of symptoms for the last year.

We obtained consent from the parents for the publication of this report.



**Figure 4:** Photograph showing gram-negative bacilli (A), the growth of *Salmonella* on nonlactose-fermenting colonies in Macconkey Agar (B), agglutination with *Salmonella* O-antigen 4 (C).



**Figure 5:** The low power (4x) (A) and high power (10x) (B) show synovial tissue, adipose tissue, and fibro collagenous tissue with diffuse dense infiltration by neutrophils, lymphocytes, eosinophils, plasma cells, and histiocytes suggestive of acute infection

### Discussion

Bacterial coinfection and secondary infections are very rare in COVID-19 [1]. The most common musculoskeletal problems reported in COVID-19 infection are arthralgia and myalgia. There is evidence of viral myositis. Peripheral neuropathies and Guillen Barrie syndrome are reported following COVID-19 infection. There is also reactivation of rheumatological conditions. There is no literature evidence for increased musculoskeletal infections following COVID infections [2]. Approximately 17.6% of patients with COVID-19 have gastrointestinal symptoms. Diarrhea is the most common symptom. Its severity increases with the course of the disease. There are

no reports of hemorrhagic colitis or gastrointestinal bleeding. Due to the presence of ACE2 receptors in the digestive tract, there is plasmacytic and lymphocytic infiltration on microscopic examination [3]. However, we have no evidence for epithelial destruction of the intestine and entry of Salmonella into the bloodstream following COVID-19 infection.

There are very few cases of septic arthritis due to Salmonella in infants reported in the literature. There are reports of Salmonella septic arthritis in the elbow, knee, and shoulder. Most cases are presented late. There are reports of Salmonella arthritis after viral upper respiratory tract infection [4,5,6, 7] (Table 1).

**Table 1:** Previous cases of Salmonella septic arthritis in infants reported during the last 15 years with their clinical features and treatment.

Authors	Clinical features	Treatment
Al Nafeesah AS.	An 11-month-old girl with a week-old fever and swelling left elbow.	Arthrotomy and antibiotics
Lang BY, Varman M, Reindel R, Hasley BP	A 6-month-old girl developed pain and difficulty in moving her right lower limb due to septic arthritis of the right knee. The symptoms started after a viral upper respiratory tract infection. There was contact with the bearded dragon.	Arthrotomy debridement of right knee and antibiotics
Balakumar B, Gangadharan S, Ponmudi N, Kumar S, Prakash JJ, Palocaren T	A nine-month-old boy presented fever and decreased range of movements of the right upper limb for 10 days. He was diagnosed with a case of septic arthritis of the right shoulder.	Arthrotomy and antibiotics
Dr. Mohd Ashar EK, Dr. Mithun Shetty and Dr. Sudeep Shetty	A 12-month-old girl with a week of fever irritability and reduced movements of right shoulder	Arthrotomy and antibiotics

In our case, an eight-month-old girl who had no previous history of enteric fever or immunocompromise developed Salmonella septic arthritis of the left shoulder. She had a SARS CoV-2 infection with diarrhea one month before the onset of septic arthritis. She had no evidence of sickle cell anemia. We do not know whether intestinal infarction due to coagulopathy in COVID leads to the spread of Salmonella from the intestine. We suggest further investigations to determine whether there is an increased risk of dissemination

of intestinal commensals to the bloodstream following COVID-19 infection.

### **Conclusion**

Salmonella infections of the bone and joints are rare. Hemoglobinopathies and immunocompromised states are predisposing factors. We reported a rare case of Salmonella septic arthritis in an immunocompetent infant after a COVID-19 infection.

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