

A Patient with Pediatric Septic Arthritis of the Hip Complicated with Osteomyelitis Responds to Clindamycin

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A 5-year-old girl was referred to our institution with complaints of right hip pain and fever (39.0°C); blood tests and magnetic resonance imaging (MRI) were performed. Blood biochemical results revealed a high inflammatory reaction. MRI results revealed inflammation in the hip joint. She was diagnosed with pediatric septic arthritis of the hip, which required arthrotomy and lavage drainage. Treatment with intravenous vancomycin was initiated on the assumption that the causative bacterial species was *Staphylococcus aureus*. However, Group A *Streptococcus pyogenes* (GAS) was subsequently isolated from an intraoperative sample, and the antimicrobial agent was switched to aminobenzylpenicillin (ABPC). Clindamycin (CLDM) was added to the treatment regimen 14 days after surgery as MRI indicated the development and spread of osteomyelitis. Three months post-surgery, MRI findings indicated that the osteomyelitis had resolved and antimicrobial therapy was discontinued. To prevent the spread of osteomyelitis, a combination of CLDM and ABPC should be considered at an early stage, particularly in pediatric patients with GAS-induced septic arthritis.

Key words: pediatric septic arthritis of the hip, Group A *Streptococcus pyogenes*, osteomyelitis, clindamycin

INTRODUCTION

Pediatric septic arthritis of the hip often leads to serious complications in the absence of early diagnosis and incisional drainage [1-4]. In addition, the rapid identification of the causative pathogen and selection of appropriate antimicrobial agents is crucial [5, 6]. Here we report the case of a patient with Group A *Streptococcus pyogenes* (GAS)-induced pediatric septic arthritis in the hip complicated with osteomyelitis, who was successfully treated with a combination of clindamycin (CLDM) and aminobenzylpenicillin (ABPC).

CASE REPORT

A 5-year-old girl with no relevant medical or family history was referred to a local medical institution with complaints of fever and right hip pain. Despite the administration of analgesics the symptoms worsened, and the patient was referred to our institution four days after the onset of symptoms.

At initial examination in our institution, the patient had fever (39.0°C), with pain and swelling resulting in the complete immobilization of the right hip and severe tenderness in the Scarpa triangle. Results of blood biochemical tests revealed high inflammation (white blood cell count, 15,600/ μ l; C-reactive protein (CRP), 19.2 mg/dl; and erythrocyte sedimentation rate, 111 mm/h).

Conventional X-ray images revealed no joint space enlargement or deformities in the bone head (Fig. 1). However, magnetic resonance imaging (MRI) results showed fluid accumulation in the right hip joint and signs of short-TI inversion recovery (STIR) hyperinten-

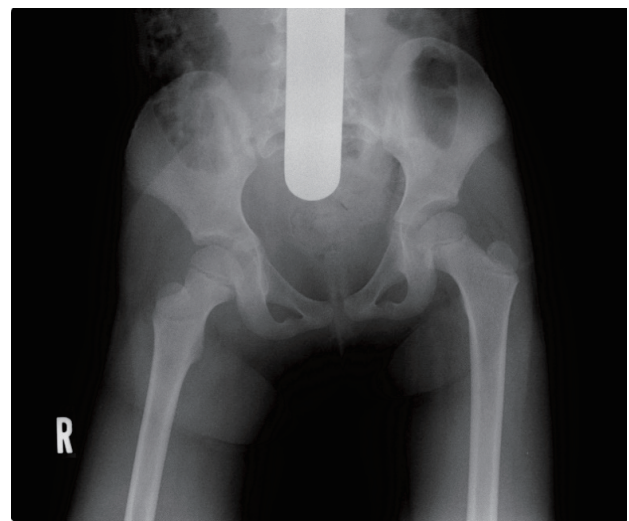


Fig. 1 Conventional X-ray image of both hips at initial examination
Joint space enlargement or changes to the bone head were not evident.

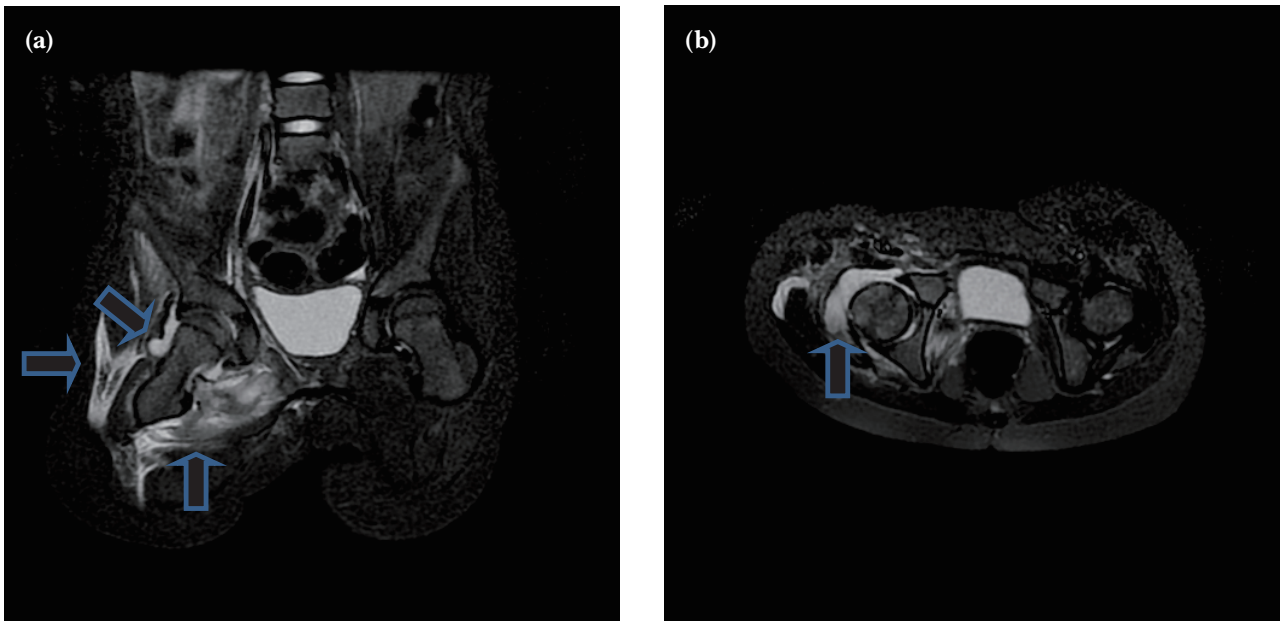


Fig. 2 MRI image at initial examination
(a): T2-weighted STIR - Coronal view
(b): T2-weighted STIR - Axial view
Fluid accumulation in the hip joint and a lesion with STIR hyperintensity extensively spreading to the surrounding tissues were observed.

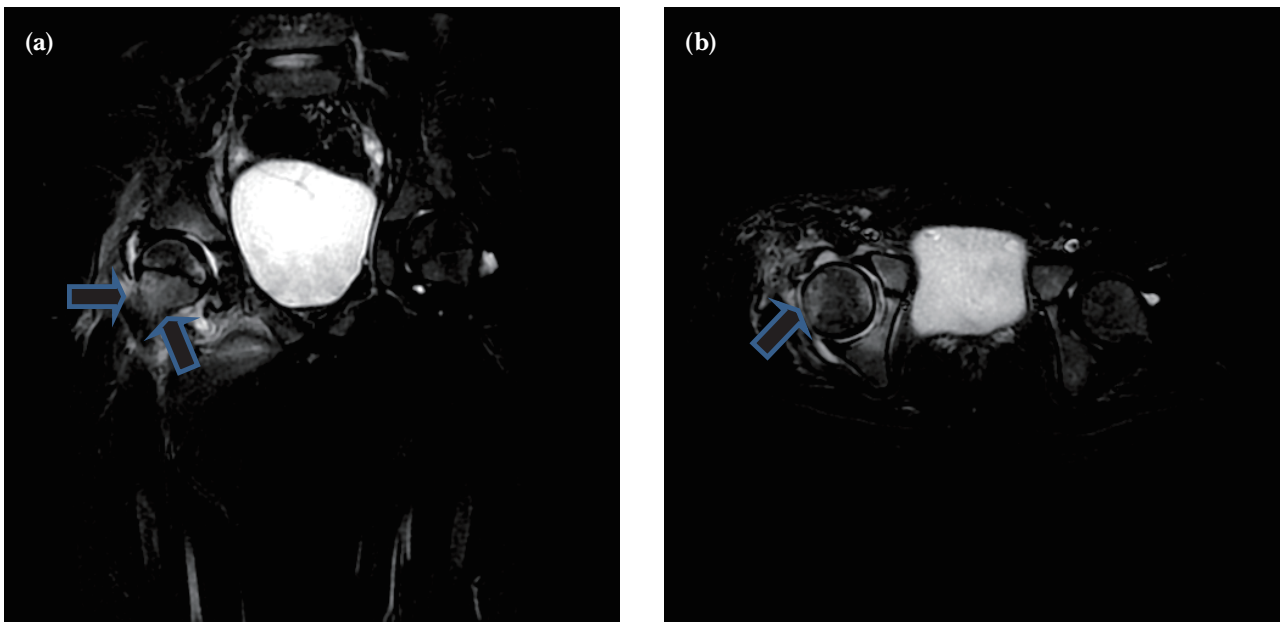


Fig. 3 MRI image 14 days after surgery
(a): T2-weighted STIR - Coronal view
(b): T2-weighted STIR - Axial view
A new lesion with STIR hyperintensity was identified, which spanned from the femoral metaphysis to the bone head.

sity extensively spreading to the surrounding tissues (Figs. 2a and 2b). Accordingly, emergency surgery was performed on the day that septic arthritis of the hip was diagnosed.

The intraoperative findings were as follow: When the muscle layer was imaged with the patient in the supine position using the Smith–Peterson approach under general anesthesia, a large amount of drainage was observed in the deeper section. The fluid collected was sent for culturing and gram staining to identify the causative bacterial species. The inside of the joint

was irrigated with approximately 10,000 ml of normal saline and the drain was left in position after the surgery was completed. The drain was removed after 4 days as only a small amount of fluid had been collected. As the bacteria were identified as gram-positive cocci, treatment with vancomycin (VCM) 40 mg/kg/day was initiated based on the assumption that *Staphylococcus aureus* was present. However, GAS was isolated from three intraoperative samples, and treatment was switched to ABPC (200 mg/kg/day) based on the results of antibiotic sensitivity test. On day 2

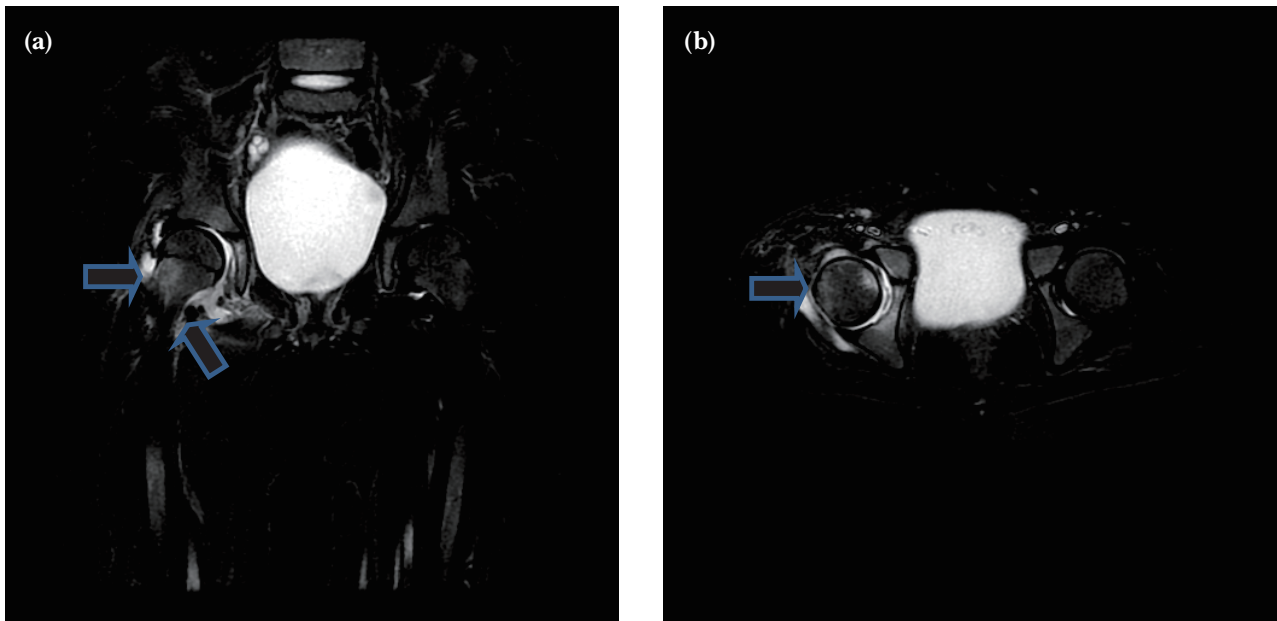


Fig. 4 MRI image 38 days after surgery
 (a): T2-weighted STIR - Coronal view
 (b): T2-weighted STIR - Axial view
 A reduction in fluid retention in the joint was observed, and the intramedullary lesion with STIR hyperintensity had diminished.

post-surgery, the patient's fever was resolved, and the pain in the right hip had decreased. On day 14, the white blood cell count was within the normal ranges based on hematology tests, although the erythrocyte concentration remained high (94 mm/h).

On repeat MRI, a new lesion with STIR hyperintensity was identified, which spanned from the metaphyseal region of the femur to the bone head (Figs. 3a and 3b). Therefore, we suspected the development of osteomyelitis; in addition to ABPC, CLDM 40 mg/kg/day was administered, for which the minimum inhibitory concentration was 0.06 $\mu\text{g}/\text{ml}$ and sensitivity was good. The erythrocyte sedimentation rate was observed to steadily decrease after the addition of CLDM, and 28 days after surgery, the CRP level was normal. By day 38, the erythrocyte sedimentation rate had decreased to 28 mm/h. MRI confirmed that the lesion had reduced in size (Figs. 4a and 4b) and the antibiotics were replaced with amoxicillin hydrate/potassium clavulanate (AMPC/CVA).

The patient was discharged after confirming that she could walk with the use of an ischial weight-bearing orthosis. Three months after the operation, the erythrocyte sedimentation rate was 17 mm/h, and the lesions with STIR hyperintensity were not noted on MRI (Figs. 5a and 5b, and 7). Oral administration of antimicrobials was therefore stopped, and the ischial weight-bearing orthosis removed from the patient who was asked to start walking with full weight-bearing. Sequelae or deformities in the hip joints were not present at six months postoperatively based on conventional X-ray images (Figs. 6a and 6b). The patient was found to be asymptomatic, showing good progress and able to walk independently. The patient was informed regarding the publication of images and data; the patient provided consent for publication.

DISCUSSION

Hematogenous infections are the primary cause of septic arthritis in children [7]. Children are commonly found to be positive for bacteremia at diagnosis, partly due to the metaphysis of long bones in which blood flow is rich and blood vessels develop anatomically in a jumble. Under these conditions, invasive bacterial cells in the blood may be temporarily trapped, resulting in the development of osteomyelitis [7]. Septic arthritis of the hip joints is reported to have a particularly poor prognosis [2, 8]. In contrast to other joints, hips contain the epiphyseal line within the joint, an anatomical feature which is associated with a higher risk of osteomyelitis. This serious complication may then lead to permanent dysfunction related to bone deformities and growth disorders [1-4]. The frequency of osteomyelitis complications in children with septic arthritis is 21%-42% [9]. The common occurrence and serious nature of osteomyelitis highlight the need for early drainage of the accumulated fluid, identification of the causative pathogen, and appropriate selection of antimicrobial agents [5, 6].

The correct choice of postoperative antimicrobial agents is essential, as an increasing number of septic arthritis cases are due to methicillin-resistant *Staphylococcus aureus* (MRSA). As such, antimicrobial agents (such as VCM) that are effective against MRSA have been recommended as the first-line agent [10]. Arnold *et al.* reported that methicillin-susceptible *Staphylococcus aureus* and MRSA are the causative agent of 70% and 10% of cases, respectively [11]. GAS is the next most common causative bacterial species, accounting for 12% of the total number of cases [11, 7]. The frequency of GAS is not rare; however, when it fulminates, difficulty in treatment is reported [12] For non-fulminant GAS, Seki and Obara *et al.* have reported that there was no resistance to β -lactam; there

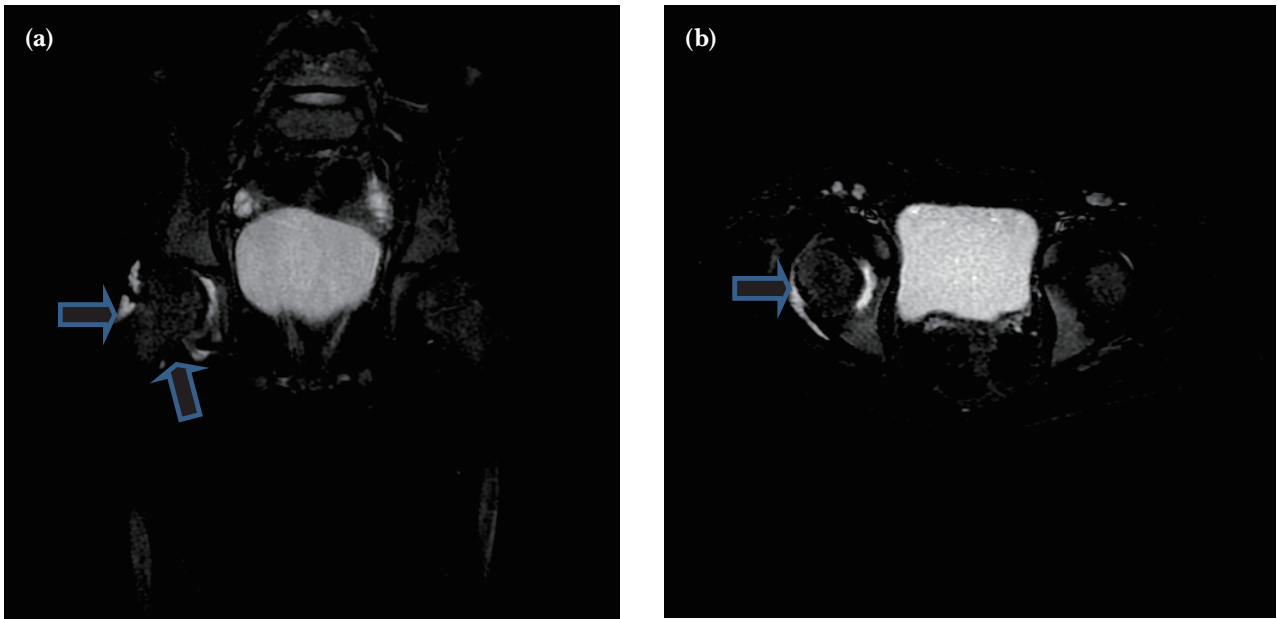


Fig. 5 MRI image 3 months after surgery
(a): T2-weighted STIR - Coronal view
(b): T2-weighted STIR - Axial view
The intramedullary lesion with STIR hyperintensity had disappeared.

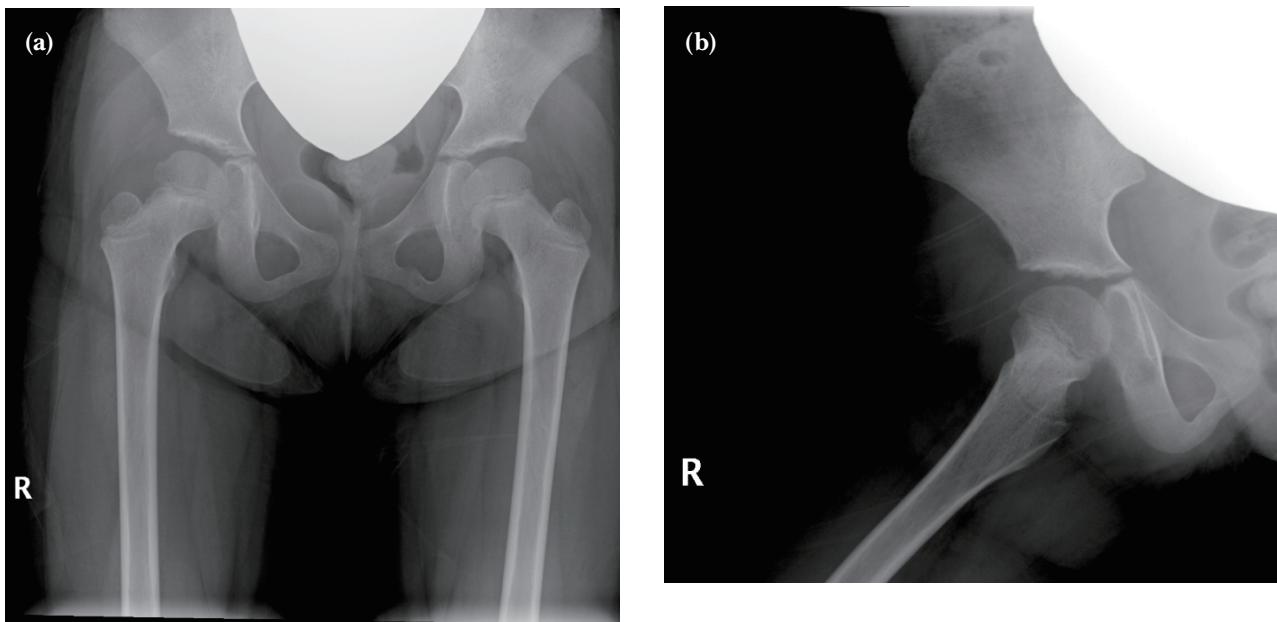


Fig. 6 Frontal view of both hips on conventional X-ray image at 6 months after surgery
(a): Frontal view
(b): Lateral view
There were no residual deformities in the femoral head.

have been reports of penicillin being used as first-line therapy [12, 14]. However, the sole administration of penicillin may be ineffective against slow-growing GAS because of its mode of action against bacteria (inhibition of cell wall synthesis during cell division) [12, 13]. Several reports have recommended the inclusion of CLDM in the treatment of GAS infections as it inhibits the production of exotoxins and is associated with good bone marrow penetration [7, 12, 13]. However, caution should be exercised with regard to long-term administration of CLDM because of the possibility of the emergence of resistant bacteria [13]. Although on

an individual report level, Seki has reported penicillin as the first choice for treating GAS [14]. Conversely, Shishido reported that combination therapy with penicillin and CLDM is good for treating fulminant GAS, which is a serious complication [13]. However, whether combination therapy is required in all patients is still controversial, and we believe that it is a viably useful option at an early stage in pediatric cases of septic arthritis of the hip.

Although the use of intravenous antimicrobial agents for 6 weeks has been recommended, recent studies have reported a treatment success rate of 97%

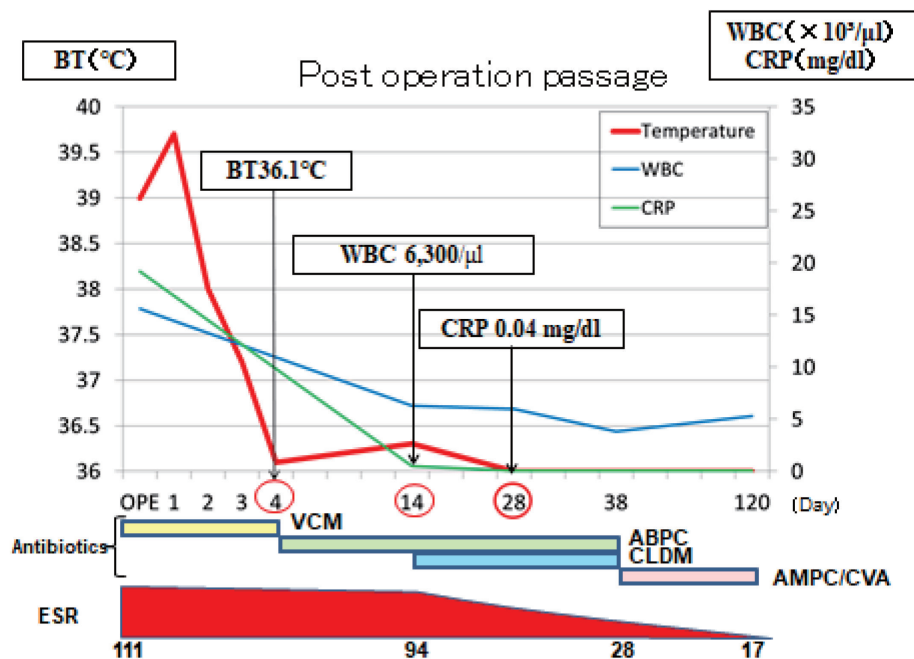


Fig. 7 Postoperative course

and similar therapeutic effect within 4 weeks of treatment [4, 15]. The alleviation of fever, improvement in local symptoms, and normalization of CRP levels may also be achieved by a transition to oral antimicrobials during the treatment period [15, 16]. However, the fact that many children refuse to ingest bitter-tasting medications must be considered. In our patient, the use of oral ABPC and CLDM was initially considered; however, owing to the resistance of the child to orally ingest the drugs, the attending physician decided to administer intravenous AMPC/CVA after consulting pediatric physicians specializing in infectious diseases.

We were able to perform early emergency surgery on this patient prior to the onset of septic arthritis and ABPC was started based on the results of the antibiotic sensitivity test. Despite this, the subsequent development and spread of osteomyelitis resulted in prolonged treatment. This case study confirms that single-agent treatment with ABPC may be ineffective for such cases. Therefore, we believe that concomitant use of CLDM is a treatment option from the early stage in pediatric patients with septic arthritis of the hip caused by GAS.

CONCLUSION

The efficacy of the combination of ABPC and CLDM therapy was suggested for pediatric patients with septic arthritis of the hip caused by GAS.

CONFLICTS OF INTEREST

There were no conflicts of interest.

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