Pediatr Pol 2022; 97 (1): 57-60
DOI: https://doi.org/10.5114/polp.2022.114714
Submitted: 14.12.2021, Accepted: 04.02.2022, Published: 26.03.2022

PEDIATRIA Polska
Polish Journal of PAEDIATRICS

CASE REPORT

Atypical aetiology of an abscess in the calcaneal region in an immunocompetent child: *Salmonella* spp. infection

Patrycja Sosnowska-Sienkiewicz[1], Aleksandra Tomczak[2], Agata Kukfisz[2], Przemysław Mańkowski[2]

[1]Department of Paediatric Surgery, Traumatology and Urology, Poznan University of Medical Sciences, Poznan, Poland
[2]Student Research Group of Paediatric Surgery, Poznan University of Medical Sciences, Poznan, Poland

ABSTRACT

Non-typhoidal *Salmonella* spp. infections are causative factor of acute gastroenteritis, bacteraemia, subsequent focal infection and the asymptomatic carrier state. Non-typhoidal *Salmonella* spp. causes clinical symptoms, especially in neonates, infants, aged and immunocompromised patients. We report a case of an 8-year-old immunocompetent male patient admitted to our hospital with an abscess in the left calcaneal region. Swelling and pain in the foot made walking difficult. The patient did not experience injury or any infection, including gastroenteritis. The abscess was surgically drained and the intravenous antibiotic therapy was introduced. *Salmonella* spp. growth was yielded in the drainage material and the negative-pressure wound therapy with nanocrystalline silver layer was applied. A gradual improvement in the clinical condition was observed. The cause of the abscess remains unknown. It is often difficult to assess the cause of unusual lesions in a patient. Multidisciplinary care is necessary to enhance the effect of the therapy.

KEY WORDS:

infection, abscess, surgical treatment, child, *Salmonella*.

INTRODUCTION

Non-typhoidal *Salmonella* spp. infections present predominantly with gastrointestinal symptoms with a self-limiting course of the disease. Specific, multi-drug-resistant strains of the bacteria can cause invasive disease in immunocompetent hosts [1]. Extraintestinal manifestations rarely include focal infection; some of them follow recovery from gastroenteritis and traveling to regions of endemic salmonellosis [2-5]. Non-typhoidal *Salmonella* abscesses have been described in patients with sickle-cell anaemia and coexisting immunocompromising disorders, like diabetes mellitus, HIV, or immunosuppression [3, 4, 6-9]. A focal infection of this aetiology is a rare complication of invasive surgical procedures and injuries, especially in the case of direct contact of the wound with animals [10-12]. Common animal reservoirs for *Salmonella* spp. infection include reptiles, amphibians, and poultry [3]. However, in some patients the source of infection remains unknown [13, 14]. Children seem to be less prone to extraintestinal manifestations of salmonellosis than adults [15]. The diagnosis of subcutaneous abscesses relies on clinical examination, imaging, and inflammatory markers [16]. There are no specific laboratory tests in widespread clinical use. Non-specific serum inflammation markers such as white blood cell count (WBC), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), interleukin 6, and D-dimer may be useful to evaluate the infection and monitor the response to therapy during the acute hospitalization phase [2]. ESR and CRP have demonstrated sensitivities for osteomyelitis of 94% and 95%, respectively [16]. Computed tomography (CT), ultrasonography (USG), and MR imaging can be used in the imaging of abscesses [17]. CT is preferred due to its improved sensi-

ADDRESS FOR CORRESPONDENCE:

Patrycja Sosnowska-Sienkiewicz, Department of Paediatric Surgery, Traumatology and Urology, Poznan University of Medical Sciences, 27/33 Szpitalna St., 60-572 Poznan, Poland, e-mail: patrycja.sosnowska@outlook.com

FIGURE 1. Intraoperative images of the initial debridement

tivity over ultrasonography; however, USG is appropriate for guiding catheter insertion [18]. Magnetic resonance imaging is suitable for soft tissue characterization at high resolution and identifying marrow inflammation [2]. The management of *Salmonella* abscesses requires a combination of radical surgery and intravenous antibiotic therapy [19]. The antibiotics of choice for *Salmonella* spp. infection are fluoroquinolones, third-generation cephalosporins, and penicillin antibiotics. The surgical procedures include incision and drainage of the abscess [18]. After the evacuation of the pus, extensive cavity debridement is necessary to prevent relapse and chronic osteomyelitis [20]. Moreover, negative pressure wound therapy has been shown to be effective in treating deep wounds caused by local infections [21].

The aim of this case report was to present an 8-year-old immunocompetent boy admitted to our hospital with an abscess in the left calcaneal region, caused by bacteria atypical for this localisation.

CASE REPORT

An 8-year-old male patient was transferred from the Orthopaedic Clinic to the Department of Paediatric Surgery, presenting an abscess in the left calcaneal region. Prior to admission, he had been treated orthopaedically due to suspected necrosis of the left calcaneal tubercle. There was local swelling, redness, and increased heat in the heel area. The boy reported pain during palpation. The symptoms had started 2 weeks earlier and, during this time, no treatment was started because the child was suspected of having an injury that neither the child nor the parents could identify. The boy reported to the doctor because of increasing pain while walking. In the past the child was otherwise healthy. He did not experience a foot injury, wound healing problems, or any infections, including enteritis.

Imaging examinations initially included an ultrasound examination of soft tissues, which showed a non-specific image in the form of increased echogenicity of the tissues in the left heel area, approximately 2 × 3 cm (suggested inflammation). Antibiotic therapy was started. After 3 days of empirical therapy, a computed tomography was performed revealing an abscess approximately 1.5 × 2.0 cm in size. On the day of admission to the Department of Paediatric Surgery the abscess was lanced under general anaesthesia (Figure 1).

The drained material was sent for a bacteriological examination. Empirically, clindamycin was continued at 20 milligrams (mg) per kilogram (kg) of body weight per day, divided into 4 equal doses. Summing up, it was used for 7 days until the results of the bacteriological examination were available. On subsequent days the wound was irrigated with lavaseptics (0.1% polyhexamethylene biguanide hydrochloride, 0.1% undecylenamidopropyl betaine), and penetration of the wound to the calcaneal tuber was observed. On the second day of hospitalization an equinus deformity of the foot appeared and was corrected using a backslab. By the fourth day of hospitalization there was no considerable improvement. For this reason, the wound was re-deterged, and the surface of the calcaneal tuber appeared. A negative-pressure wound therapy with a nanocrystalline silver layer was applied (suction setting: –125 mmHg). On the fourth day the results of the bacteriological examination revealed *Salmonella* spp. growth. Isolates were found to be susceptible to ampicillin, ceftriaxone, and trimethoprim-sulfamethoxazole and resistant to cefuroxime and ciprofloxacin. Due to the atypical infection, the patient was consulted with a clinical microbiology specialist. The antibiotic therapy was changed to ceftriaxone at 60 mg/kg body weight per day as a single dose, applied for the next 10 days. Sickle cell anaemia was excluded. On the sixth day the vacuum-assisted wound closure system was removed. The abscess cavity was infilled with granulation tissue. Nanocrystalline silver dressing was administered and changed daily. On the seventh day a wound swab was taken, which revealed *Salmonella* spp. growth. On the 17th day a small amount of pus discharge was detected but bacteria culture was negative. The wound was irrigated with lavaseptics and hydrogel dressing and an external layer of nanocrystalline silver was applied. Then the patient was discharged with maintained backslab correction of the foot malposition. The follow-up appointments confirmed proper wound healing.

DISCUSSION

The complex method of a few wound treatment therapies – from mechanical clearing through targeted antibiotic therapy to locally acting active dressings – was efficient in our patient. Analysis of available references about *Salmonella* spp. abscesses revealed that most patients were

immunocompetent with no history of trauma, fever, or gastrointestinal infection.

Minohara *et al.* described a similar case of a healthy 6-year-old boy with a soft-tissue *Salmonella* spp. abscess on the sternum [22]. The child presented no past medical history of congenital or acquired immune deficiencies, immunosuppressive therapy, recurrent infections, or surgical procedures. This patient received a 10-day cefpirome intravenous therapy and drainage was performed with good effect and no complications. In this case the patient was positive for *Salmonella* spp. stool culture without any gastrointestinal symptoms. The authors suggest that the abscess may have been caused by *Salmonella* spp. that entered the bloodstream from the gastrointestinal tract. Sood described a case report of subcutaneous abscess of *Salmonella* spp. aetiology located in the breast [23]. The patient had not reported any injury or inflammation in this area. The authors believe that the patient might have had an episode of typhoid fever and the infection spread during the bacteraemic phase due to immune deficiency. Comparable to our case, repeated drainage was necessary due to the positive culture of the bacteria despite the targeted antibiotherapy with ceftriaxone. Limão *et al.* [2] presented a medical history of a 7-year-old healthy child with *Salmonella* spp. subcutaneous and metatarsal bone infection. In this case, the infection was following a small superficial injury. Three weeks before admission the patient had had acute tonsillitis, treated with intramuscular benzylpenicillin, and a week later, self-limited gastroenteritis. The authors believe that the bacteraemia may have been triggered by previous gastroenteritis and recent antibiotic therapy. The treatment with narrow-spectrum antibiotics and extensive debridement was also prolonged, and the child needed rehabilitation to regain functional recovery. McLeod *et al.* described a case of *Salmonella* spp. neck abscess in an 18-year-old patient with type I diabetes mellitus [3]. The extra-intestinal focal infection was revealed 4 weeks after gastrointestinal illness. One month prior he had had an episode of diabetic ketoacidosis. In addition, the patient had a history of routine exposure to reptiles. CT scan revealed a large left-sided lymph node along the sternocleidomastoid muscle containing fluid collection. The authors presumed that the patient acquired the infection by direct spread of the pathogen from the oropharyngeal space to the local lymph node or haematogenous spread to the node. The diabetic ketoacidosis episode may have been a result of gastrointestinal illness and hematogenous seeding of the lymph node. AlYousef *et al.* presented a case of rare thyroid abscess due to *Salmonella* spp. in a 55-year-old patient with type II diabetes mellitus [4]. The patient had a history of colloid right thyroid lobe nodule and non-specific diarrhoeal illness 17 days prior to her presentation. The authors indicate that *Salmonella* has a predilection for tissues with an abnormal morphology, such as cystic or mixed thyroid nodules. Akkoyunlu *et al.* reported a case of focal salmonellosis in the left arm lasting for 6 months before the initiation of medical treatment, with no signs of spread of the infection [24]. The patient presented a history of cervix cancer, and therefore she underwent radiotherapy and chemotherapy 3 years earlier. She was taking methotrexate, corticosteroids, and quinine for rheumatoid arthritis. On admission the fever and leukocytosis were absent. After the surgical drainage and 4 weeks of antibiotic therapy, no clinical, laboratory, or radiological pathology was detected. The authors hypothesized that the muscle abscess occurred as a result of the infection in the atherosclerotic plaque caused by transient bacteraemia. Brnčić *et al.* showed a case suggesting that the abscess was formed as a result of a 9-month focal infection of the breast [25]. The patient had no associated signs of the disease, such as fever or shivers. Contrary to our findings, the bacteraemia probably developed as a result of gastroenteritis. Probably in our patient focal *Salmonella* spp. infection was the reason for the initial problem and failure of orthopaedic treatment of suspected sterile calcaneal tuber necrosis. The gastrointestinal colonization was checked but not diagnosed. In addition to standard therapy with targeted antimicrobial treatment and drainage, our patient needed other wound healing methods, including negative pressure, irrigations with lavaseptics and nanocrystalline silver dressings, and backslab correction of the foot deformity, rendering the treatment more challenging. The literature review showed that there are multiple methods of treatment for the condition presented by our patient.

CONCLUSIONS

The lesion diagnosed in our patient is relatively rare. It should be considered a differential diagnosis of soft tissue and bone infection in an immunocompromised patient or in a patient with a prior history of gastrointestinal symptoms. It is often difficult to assess the cause of unusual lesions in a patient. Depending on the clinical condition each of the described treatment methods brings various benefits. Targeted treatment seems to be more appropriate than empirical therapy. Multidisciplinary care is necessary to enhance the effect of the therapy. Thorough control of the abscess of the calcaneal region is essential because the condition may lead to relapses and chronic osteomyelitis.

DISCLOSURE

The authors declare no conflict of interest.

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