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Case Report

The Importance of Early Diagnosis of Septic Arthritis of the Ankle Joint in a Diabetic Patient: A Case Report

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Abstract

Septic arthritis of the ankle joint is very rare and presents an orthopaedic emergency that can in some cases lead to disability or even death. Here we present a case of a 65-year-old Caucasian male with diabetes mellitus type II, arterial hypertension, peripheral artery disease, hyperlipemia and stage II. chronic kidney disease who developed systemic signs of infection with fever and chills. Magnetic resonance imaging showed a septic tenosynovitis of both flexor hallucis longus and flexor digitorum longus with acquired complications of septic arthritis of the ankle joint and an abscess of the medial malleolus region. The patient was primarily treated with antibiotics, without improvements. Due to a delayed diagnosis and developed complications he later required treatment with multiple invasive surgical procedures. The outcome of the treatment was a successfully eradicated infection and a return of walking ability. Considering the scarcity of reports on management of septic arthritis of the ankle in diabetic patients, this case presents a valuable contribution, highlighting the importance of vigilance in early diagnosis and treatment of such infections for improving patient outcomes.

Keywords: Diabetes-related Foot Infection; Septic Flexor Tenosynovitis; Septic Arthritis of the Ankle Joint

Abbreviations

FHL: Flexor Hallucis Longus; FDL: Flexor Digitorum Longus; TP: Tibialis Posterior; CRP: C-Reactive Protein; US: Ultrasound; MRI: Magnetic Resonance Imaging; VAC: Vacuum Assisted Closure; ATA: Anterior Tibial Artery

Introduction

Foot infections are one of the most important chronic complications of diabetes. They often require long hospitalisation and can lead to limb amputation or even death [1]. Due to a large incidence of diabetes-related foot infections this represents a substantial social and financial burden for patient and the entire society [2].

Patients with diabetes often have comorbidities, resulting in patients poor healing capacity that requires frequent visits to a healthcare provider. Presence of peripheral neuropathy, peripheral artery disease or immune disfunction may disguise the signs and symptoms of infection, often leading to a delayed diagnosis [3]. Development of systemic symptoms e.g., fever of chills accompanied by leukocytosis and metabolic abnormalities indicates a more severe, limb or life-threatening infection [4]. Most commonly isolated pathogen is a bacteria *Staphylococcus aureus*, but it is important to consider the increased susceptibility of infection with uncommon pathogens in diabetic patients [5].

Despite most infections of the foot in diabetic patients initially presenting as relatively superficial, microorganisms can spread through subcutaneous tissue, fascia, tendons, muscles, joints and bones. The infection typically progresses in a proximal direction, as a consequence of the anatomical division into separate but intercommunicating compartments [6]. If the rise of compartmental pressure on the account of the inflammation response is too increased, ischaemic tissue necrosis can appear and the infection can easily progress to adjacent compartments [7]. As a result of the pathogens spreading though soft tissue, septic tenosynovitis can develop. It is defined as an infection of a closed synovial sheath of a tendon and in most cases the tendon itself [8]. The underlying cause of the infection most commonly involves an ulceration as a result of peripheral neuropathy and/or vascular compromise, trauma from a puncture, laceration or a bite followed by a local spread of pathogens. Hematogenous transmission was also reported [9].

Literature depicts that in 15 % of the population the flexor hallucis longus (FHL) tendon communicates with the subtalar space

[10]. A delayed diagnosis and treatment in these instances may pose a threat for developing septic arthritis. Such cases are considered an orthopaedic emergency with high disability and mortality rates [5]. Septic arthritis most often affects the knee joint, followed by hip, shoulder and elbow [11]. Due to the rarity of ankle joint infections very few reports were published describing the best management options. Delayed treatment often leads to irreversible damage, causing cartilage erosion, chronic pain or potential osteomyelitis [12].

The main goal of treatment is the eradication of the infection. Typical antibiotics of choice are flucloxacillin and vancomycin. Optimal antibiotic treatment is then determined based on the antibiogram results after obtaining appropriate specimens for microbiological analysis [13]. Selecting the most efficient treatment method depends on the type of infection and the anatomical structures involved in the pathogenesis. Most infections require surgical interventions ranging from minor debridement to major resection, amputation or revascularisation procedures. In case of septic tenosynovitis, along with antibiotic treatment early surgical intervention is recommended in all cases. In cases of a delayed clinical presentation often noted in diabetic patients, immediate operative exploration is indicated [14]. Development of septic arthritis needs to be considered while selecting the optimal surgical procedure. Arthroscopic synovectomy, irrigation and debridement are typically performed, with a similar succession rate to open surgery, carrying fewer complications [15].

The reports on such cases are very rare. The main value of our report is that it demonstrates the impact early diagnosis has on preventing complications, avoiding invasive surgical procedures and improving patients' recovery.

Case Report

A 63-year-old Caucasian male with diabetes mellitus type II, arterial hypertension, peripheral artery disease, hyperlipemia and stage II. chronic kidney disease presented in the emergency room with complaints of fever and general weakness for the past 2 weeks. Hours before the examination he fell and sustained blunt trauma to his right ankle. The patient was not a smoker or alcohol consumer. No relevant family history was reported.

A month prior to the examination in the emergency room the patient was treated by a general surgeon, who described a necrotising ulceration on the hallux of the left foot and an ulceration on the 4th toe of the right foot with signs of reactive cellulitis. Wound debridement was performed on the left foot and the patient started receiving antibiotic treatment with amoxicillin/clavulanate. Due to the presence of chronic wounds, the patient was examined by an angiologist two weeks later. Initial disturbances of arterial blood circulation on the level of the shin bilaterally were reported. While conservative treatment was recommended, the angiologist suggested femoral angiography to be performed in case the wounds were unable to successfully heal. At the control examination with a general surgeon 3 weeks after the initial treatment the wound on the left hallux presented without signs of inflammation with surrounding hyperkeratosis on the borders. The antibiotic treatment was then concluded and the patient was discharged home. Nine days after completing antibiotic treatment, the symptoms of high fever and general tiredness persisted. The patient then consulted his primary clinician who performed laboratory tests that showed an increase in biomarkers of inflammation, with abnormal values of C- reactive protein (CRP) (220 mg/L) and leukocytes (17,9 · 10^9/L). Laboratory findings also showed pathological values with multiple leukocytes and bacteria present in urine. Due to the pathological urine analysis, the patient received empiric treatment for a urinary tract infection with amoxicillin/clavulanate and was then referred to the Emergency Department.

On examination, the patient was subfebrile with a body temperature of 37,3°C. Minimal swelling and redness of the medial malleolus region of the right foot was described, tender to palpation. The wound on the left hallux was examined by a general surgeon and like previously it showed no signs of inflammation. The surgeon characterised the wounds as consistent with manifestations of diabetic neuropathy and denied the likelihood of them being the etiological factor for sepsis. To reveal potential sources of infection, X-ray imaging of the chest and ultrasound (US) examination of the abdomen were performed, which showed no abnormalities. After consulting infectologists a switch of antibiotic therapy to flucloxacillin and ceftriaxone was indicated. Due to the patient's recent blunt trauma to the right foot preceding the examination, traumatologist was consulted to exclude potential injuries. The patient had no history of previous injuries to the right foot. X-ray imaging of the right ankle and calcaneus showed no signs of recent fractures.

Due to abnormal blood glucose values the patient was then admitted at the Department of Endocrinology and Diabetes for further treatment of an infection of unknown origin. After admission, he was afebrile with body temperature 36,5°C, redness and swelling of the medial malleolus of the right foot was noted. Laboratory values showed increased levels of CRP (399 mg/L), procalcitonin (2.74 μg/L) and leukocytes (15.4 · 10^9/L). Samples for haemoculture, urinoculture and nasopharyngeal swab were obtained and sent to microbiology for analysis. The results revealed no origin of infection. Throughout the course of hospitalisation there was observed progression in cutaneous alterations above the right ankle. Trauma surgeon was consulted again, who described a bullous oedema of the medial malleolus region of the right foot (Figure 1).

Figure 1: Cellulitis with the abscess of the medial malleolus region.

Department of Surgical Infections was consulted. To further examine the affected area, US analysis of the right ankle was performed which showed signs of cellulitis of the medial perimalleolar region and posteromedial part of the distal third of the right shank with a forming abscess of the perimalleolar and retromalleolar region. US examination also exposed signs of septic tenosynovitis of the tibialis posterior (TP) tendon and suspective signs of septic arthritis of the ankle joint with a large effusion in the posterior subtalar area and the anterior talocalcaneal joint. Magnetic resonance imaging (MRI) was indicated for further evaluation of the extent of the condition and optimal treatment planning. It revealed cellulitis with a forming abscess of the perimalleolar region. Signs of septic tenosynovitis of the posteromedial compartment were visible, accompanied with a large effusion surrounding the distal parts of FHL, FDL and TP tendons. Imaging also exposed a large effusion in the posterior subtalar region. Signs of bone inflammation were not present.

Operative procedure was indicated and the patient was transferred to the Department of Surgical Infections. After performing the necessary diagnostic procedures, the patient underwent surgery under general anaesthesia. Anterior and posterior arthroscopic synovectomy of the right ankle joint and tenosynovectomy of FHL, FDL and TP tendons were performed, followed by excisional drainage of the abscess of the medial malleolar region and debridement of soft tissue (Figure 2).

Figure 2: Intraoperative status of the wound.

Intraoperatively, tissue samples were obtained and sent to microbiology for analysis. The results showed soft tissue infection with bacteria *Staphylococcus aureus*. After consulting the infectologists, antibiotic therapy was continued, but only with flucloxacillin. Following the procedure, the wound was regularly dressed. Laboratory findings revealed a decrease in biomarkers of inflammation.

Due to inadequate wound healing and purulent discharge the patient underwent a revision surgery 8 days after the initial procedure (Figure 3). It involved debridement of soft tissue and tenosynovectomy.

Five days after the revision, debridement of soft tissue and placement of vacuum assisted closure (VAC) device was performed

Figure 3: Postoperative status of the wound after the initial procedure.

(Figure 4). Due to the complications in the wound healing process, the patient was referred to an angiologist for the evaluation of the arterial blood circulation. Transcutaneous oximetry measurements were performed, revealing the tissue partial oxygen pressure values of 43 mmHg in the right shin, 12 mmHg in the right instep and 53 mmHg in the right hallux. Based on the abnormal transcutaneous oximetry values, femoral angiography and percutaneous revascularisation were indicated and the following day the patient underwent percutaneous transluminal angioplasty of the anterior tibial artery (ATA). Infectologists recommended a switch of antibiotic therapy with flucloxacillin after 35 days to doxycycline for another 8 days. After the revascularisation procedure, debridement and the change of VAC device was performed on three separate occasions.

Final procedure was performed a month after the revascularisation procedure which included final debridement and placement of Integra dermal regeneration template and Thiersch skin graft (Figure 5,6). Six days after the procedure, VAC device was removed and the patient was discharged home the following day, with exact instructions on wound care and crutches to decrease foot load. Prior to being discharged, laboratory tests were performed again, revealing a decrease in biomarkers of inflammation. No additional diagnostic imaging was indicated.

At the follow up examination a day after being discharged home, the patient had no subjective complaints, wound presented without signs inflammatory response and the skin graft was vital. After

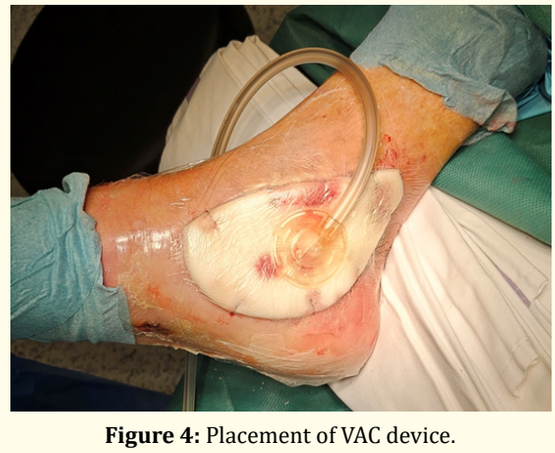

Figure 4: Placement of VAC device.

Figure 5: Placement of Integra dermal regeneration template.

Figure 6: Coverage of the wound with Thiersch skin graft.

reintegration of the skin graft, he was able of full load bearing and continued rehabilitation at physiotherapy.

Discussion

In our case report, we presented a 65-year-old Caucasian male admitted for the treatment of an infection of unknown origin. Due to a delayed diagnosis of a diabetes-related foot infection, the patient later underwent several invasive surgical procedures. The outcome of the treatment was a successful eradication of the infection, with a satisfactory restoration of functionality despite the late diagnosis.

This clinical case depicts the importance of consideration of an extensive foot infection in diabetic patients which can often present with non-specific symptoms. When treating a diabetic patient International Working Group on the Diabetic Foot guidelines always recommend screening for a presence of an infection and classification of its severity. It is important to note, that current clinical guidelines define diabetes-related foot infections based on the presence of inflammatory response in any part of the foot [16]. Too often, the focus of clinical examination is directed to ulcerations, which can in some cases lead to a missed diagnosis and results in a poor clinical outcome.

There are only a few available reports in the existing literature describing the management of septic arthritis of the ankle as a complication of a diabetes-related foot infection. However, due to the increasing incidence of diabetes in the modern society, a consequential increase in cases of such infections is to be expected. Understanding the underlying pathogenetical mechanisms is therefore crucial for making an early diagnosis and selecting the optimal treatment. A retrospective literature review by Lee., *et al*. presenting 29 patients with septic arthritis of the ankle joint showed that early diagnosis and treatment significantly affected the final outcomes, with a notable reduction in disability and mortality rates [17].

Another study by Lee., *et al*. involved 25 patients with septic arthritis of the ankle joint and investigated the simultaneous involvement of adjacent tissues seen on MRI when planning the sur-

gical procedure. Most patients with septic ankle arthritis showed frequent concurrent involvement of FHL, FDL, TP tendons and the subtalar joint [18]. The results of this study are consistent with the clinical presentation seen in our case report. Based on these findings, in case of septic tenosynovitis of the tendons of posteromedial compartment it is pivotal to consider a possible spread of infection to communicating joints.

A retrospective study of 41 patients with purulent flexor tenosynovitis conducted by Dailiana., *et al*. found that early diagnosis of the condition correlated with best functional outcomes. Poor clinical outcomes mostly resulted due to delayed treatment or infections with specific pathogens [19]. The main conclusion of this study correlated with the results of studies conducted on patients with septic arthritis, emphasizing the importance early detection and consideration of a potential spread of the infection.

Our case shows the importance of early diagnosis and treatment to prevent life threatening sepsis and possible amputation.

Conclusion

The clinical case that we presented highlights the importance of vigilance in diagnosing and treating foot infections in diabetic patients. Comprehensive screening for inflammatory signs beyond ulcerations and understanding pathogenetic mechanisms of the disease are critical for a successful intervention. Our case supported with the existing literature, emphasize the high impact time of the diagnosis and type of treatment have on clinical outcome. Swift diagnosis and the right treatment can notably reduce disability and mortality rate in patients.

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