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Diabetic foot infection – the need of optimal treatment to avoid amputation. A case report

Infekcja stopy cukrzycowej – potrzeba optymalnego leczenia w celu uniknięcia amputacji. Opis przypadku

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<p>Wstęp:</p> <p>Słowa kluczowe:</p>	<p>Streszczenie</p> <p>Stopa cukrzycowa powikłana zakażeniem owrzodzenia stanowi jeden z najczęstszych problemów powiązanych z cukrzycą. Objawy kliniczne towarzyszące infekcji są przeważnie ubogie, prowadząc do opóźnienia prawidłowej diagnozy. W wyniku tego, niestety nadal często dochodzi u chorych do amputacji kończyny.</p> <p>Przedstawiony przypadek kliniczny, 73-letniego pacjenta z wieloma chorobami towarzyszącymi, stanowi przykład jak poprzez odpowiednie leczenie zakażenia, w pierw ocenionego jako wskazanie do amputacji, można było tego uniknąć.</p> <p>Zastosowanie odpowiedniej antybiotykoterapii opartej na ocenie klinicznej rany, wynikach wymazów, stanie ogólnym pacjenta wraz z systematycznym oczyszczaniem rany stanowiło podstawę sukcesu terapeutycznego.</p> <p>W wyborze oraz ocenie przebiegu leczenia pomocne było wykonanie szeregu badań diagnostycznych, takich jak badania obrazowe stopy (RTG), stanu naczyń (ocena tętna, ultrasonografia dopplerowska), laboratoryjne (m.in. posiewy z głębokich warstw rany, wskaźniki stanu zapalnego). Z racji tego, że problem ten dotyczy wielu dziedzin medycznych, ważna jest współpraca pomiędzy specjalistami przy diagnostyce oraz leczeniu tego schorzenia.</p> <p>stopa cukrzycowa, owrzodzenie stopy, powikłania cukrzycy</p>
<p>Background:</p> <p>key words:</p>	<p>Abstract</p> <p>Diabetic foot infection is one of the most frequent complications of diabetes. Clinical signs, connected with infection, are often scarce, leading to a delay of a correct diagnosis. As a result, in many cases it is still associated with amputation.</p> <p>A case report of a 73-year-old patient with many related comorbidities, constitutes an example of how the appropriate treatment of infection avoided unnecessary amputation.</p> <p>The proper choice of antibiotic therapy, founded on clinical assessment of the wound, results of the swabs, the patient's state together with the systematic debridement of the wound made the base of the therapeutic success.</p> <p>A range of clinical investigations, encompassing foot imaging (X-Ray), assessment of the vascular conditions (by pulse evaluation, ECHO-doppler), laboratory tests (i.e. swabs from the deep layers of the wound, indicators of inflammation) was helpful to choose the best therapy.</p> <p>The cooperation between specialists during the diagnostic procedures and treatment was also very important due to the fact that the problem is connected with many medical branches.</p> <p>diabetic foot, foot ulcer, diabetes complications</p>
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Introduction

Diabetes is becoming a severe problem among society. It brings about many complications and the diabetic foot syndrome is one of the most serious and frequent [1]. The term „diabetic foot” includes a group of pathologies, such as neuro–osteoarthropathy, peripheral vascular disease, foot ulceration, osteomyelitis [2, 3]. Amputation in these patients is twelve times more frequent in comparison with non–diabetic patients and infection is the most powerful risk factor [3]. This treatment results from the rapid course of disease, but it is also favored by improper therapy and poor patient’s and medical staff’s awareness [4].

As foot infections are common complications of diabetes (diabetic foot infections, DFI) and require specialists’ expertise from several medical disciplines, it is necessary to improve the clinical approach, which should be based on the multidisciplinary cooperation [5]. Moreover, it is important to emphasize the contribution of a proper use of antibiotics. Therefore, an infectious disease specialist or a medical microbiologist are important members of the foot–care team [5]. The following case report shows how effort, experience, and good cooperation avoided amputation, which at the beginning was considered to be the only solution.

Case Report

A 73–year–old man, with a 27–year history of type 2 diabetes mellitus, related comorbidities and metabolic syndrome (BMI 33), was admitted due to a phlegmon of the left midfoot with chronic neuropathy.

The past medical history revealed mild chronic renal failure (CKD; for 4 years) with microalbuminuria, bilateral diabetic retinopathy treated with laser photocoagulation, moderate peripheral polyneuropathy of the lower limbs, hypertensive–ischemic cardiomyopathy, former sigmoid cancer surgically treated, well–controlled arterial hypertension and multifactorial anemia.

The patient complained of recurrent foot infections. One year before admission he was affected by osteomyelitis (confirmed by probe to bone test (PTB–test) and X–Ray) of the second phalanx of the right foot (positive to MRSA), firstly treated with ciprofloxacin plus rifampicin and finally with amputation.

On physical examination the left foot was tender, warm, indurated and presented hyposphythmic pulse, reduced sensitivity with stocking–glove pattern. According to clinical manifestation of infection, the wound was classified into PEDIS 3 (tendon’s involvement). Hammer toes were present. After swabbing the tendon, an empiric antibiotic therapy with linezolid and piperacillin/tazobactam was started. Home therapy was shifted from oral antidiabetic drugs to subcutaneous insulin in order to improve the glycemic

control. The foot X–Ray did not show osteomyelitis. No other radiological tests were performed.

The swab results were positive for *Serratia marcescens* and *Staphylococcus aureus* (MRSA). The antibiotic therapy was, therefore, changed to levofloxacin and meropenem on the seventh day. The next swab was collected with evidence of *S. aureus* (MRSA).

The ECHO–color–Doppler examination did not indicate hemodynamically relevant obstruction of the vessels (50% maximum stenosis), even if worsening was noticed in comparison to the previous test.

The antibiotic treatment was continued with good clinical response. After a 20–day meropenem course, administration was abandoned. The patient continued with levofloxacin and metronidazole. The antibiotic therapy was stopped after 37 days.

Throughout the course of treatment, the wound was regularly debrided, washed with soap solution and then dressed with quarter–strength povidoneiodine. Blood transfusions had to be performed for anemia deterioration (Hb from 6.9 g/dL to 10.4 g/dL).

Before hospitalization, laboratory tests showed CRP 21.3 mg/dL, ESR 103 mm/h, WBC 13000/mmc, glycosylated haemoglobin 7.6%, creatinine 2.59 mg/dL. After treatment, inflammation markers decreased (CRP 0.7 mg/dL, ESR 46 mm/h, WBC 5030/mmc).

Discussion

The foot infection presented in the case in question was classified as moderate (grade 3) [5, 6]. The wound did not seem to be extensive (minor area of around 1 cm x 1 cm). However, the debridement of necrotic tissue revealed involvement of deep layers with more than 2 cm of inflammation, as well as the involvement of the tendon. Foul odor was present. There were no signs of systemic toxicity. This pattern, together with the chronic stage of the wound, aroused the suspicion of infection caused by multibacterial flora, with high probability of *S. aureus* (possibly MRSA), *Streptococcus spp.* (especially *S. agalactiae*, *S. pyogenes*), coliform bacteria, obligate anaerobes, *Pseudomonas aeruginosa* (even if its pathogenic role is doubtful) [7].

In accordance with IDSA Guidelines, the best choice of empirical antibiotic treatment should have contained a glycopeptide (to cover MRSA) plus B–lactam. Unfortunately there were contraindications due to the patient’s comorbidities (CKD, recent severe hearing impairment), which excluded glycopeptides.

The empiric intravenous therapy was started with linezolid to cover all the Gram positive strains mentioned above and piperacillin/tazobactam for the other suspected microorganisms. As parenteral antibiotics achieve faster and higher serum levels, this way of administration is suggested at the beginning [5, 3]. Such a widespread therapy, including MRSA

coverage, was necessary because of the previous infection (caused by this type of strain) and also the severity of infection.

A few days later there was a moderate improvement of CRP and stability of WBC count, as well as normalization of fever, but no amelioration of the foot ulcer. After receiving the swab results, which confirmed the suspicion of MRSA and also revealed *S. marcescens*, the therapy was simplified, but, even if the presence of anaerobes was not confirmed, it is recommended to cover also them in such severe kind of wounds [5, 7]. Linezolid was substituted with levofloxacin for worsening of creatinine clearance. Later on, serum creatinine was periodically tested and it remained stable.

During the first ten days of hospitalization the wound increased in size and there was a significant loss of substance. Orthopedic evaluation was performed because of this and amputation was suggested. Another look was searched and the vascular surgeon hinted a conservative approach. After a couple of weeks of antimicrobial therapy, the edges of the wound became well-marked and defined, pointing out that the progression of infection was stopped thanks to the medical treatment and that major surgical intervention was no more needed. Once the lesion showed an improvement, the antibiotic therapy was switched to oral agents, according to the literature [5, 6, 8, 2, 1, 3]. It is advisable that the duration of antibiotic treatment should not exceed 3 weeks to avoid potential drug-related events, the risk of development of resistant strains and also to contain costs [7]. In this case, the suggested time was remarkably prolonged (5 weeks), but this way of therapeutic management was supported by the progressive improvement and no evidence of side effects.

The investigation recommended in every DFI with an open wound, as the primary assessment of osteomyelitis, is PTB-test. While exploring the wound with a blunt metal probe, not only a palpable bone can be noticed, but also any foreign bodies, soft-tissues abscesses, communications with joint cavities or tendon sheaths, which can be helpful in further procedure [5, 1].

The ankle-brachial index (ABI), which is widely used in the classification of the peripheral arterial disease, could have been measured as an initial assessment of vascular changes, thanks to its non-invasive, bedside and reproducible feature, as well as easy execution. ABI is a more reliable indicator of vascular disease in comparison to palpation of the peripheral pulse, especially in diabetic patients [5, 6, 2].

As the patient suffered from neuro-osteoarthropathy, it was reasonable to initiate treatment for presumptive osteomyelitis. Unfortunately, this claim was not sufficiently supported by proper research. Due to delayed appearance of cortical changes (by up to a month), the sensitivity of plain films is limited. In order to exclude osteomyelitis, repeated radiograms should be performed at least a few weeks apart [5, 9]. That is why, it was more correct to carry out MRI

for the detection of bone infection. Furthermore, antimicrobial regimens should be decided on by taking into consideration also the economic reason involved in their usage. They should be changed to the most effective ones and less expensive as soon as the antibiograms are obtained.

The treatment of diabetic foot infection should include metabolic compensation of diabetes, antibiotic therapy, surgical debridement, off-loading the limb, and antiseptic dressings [3]. Other adjunctive procedures can also be helpful, for example, hyperbaric oxygen therapy, growth factors, maggots or topical negative pressure therapy – but they are not currently supported by IDSA Guidelines [5].

Conclusions

In conclusion, if possible, we should consider the introduction of antibiotic treatment well before deciding on the ultimate solution, which is the amputation. The parallel implementation and execution of surgical debridement and antibiotic therapy seems to be the most beneficial way of treatment. The average time of healing the diabetic foot ulcer in special medical centers is about two months [4]. Therefore, treatment requires a significant dose of patience from the medical staff, but especially from the patient.

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