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Management of infectious complications in diabetes mellitus mellitus patients

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Abstract: *Diabetes mellitus is a serious condition, causing multiple health problems due to the disease itself, but also to the complications that these patients are predisposed to. Being a current health problem, many patients tend to disregard the doctor's recommendations concerning the necessary measures to maintain adequate and continuous control of the glycaemia levels. This, in turn, may cause complications, which include neuropathy, microangiopathy and a predisposition to infections due to weak local defence mechanisms.*

In otorhinolaryngology, the infectious pathology is one of the most often causes for presentation to the physician. Ranging from common otitis, acute pharyngitis or laryngitis and sinusitis, these different entities will cause significant discomfort for the patient, prompting the need for medical care. In patients with diabetes, the natural course of the disease is altered, with more severe symptoms, a more extended period of recovery and the predisposition for aggravated cases with the tendency to complications. Such complications may be life-threatening if we take into account the complications associated with acute sinusitis for example, which include orbital or cerebral abscesses.

Our paper aims to present the authors experience on the complete approach of patients with infectious pathology concerning the sinuses associating diabetes mellitus.

Always, we must keep in mind that patients with diabetes represent a particular class of patients that require a personalized approach. They are predisposed to a vicious circle, in which the infection causes diabetes imbalance, which in turn decreases the defense mechanism and predisposes to complications. The correct management must always include a proper control of diabetes, a complete evaluation that will determine if complications are already present and aggressive management of the infection, with regular check-ups to determine the evolution of the patient.

Keywords*: infections, diabetes mellitus, local complications*

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INTRODUCTION

Due to the high prevalence of diabetes mellitus in the general population, this group of patients has always benefited from practical guides concerning the proper management of the disease and the therapy protocol in case of imbalances or complications of the disease. The same principle applies for the complete approach of any secondary problems, such as electrolites imbalances in the normal body functions or associated infections [1, 2].

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It is accepted that patients with diabetes are predisposed to infectious complications due to the depressed local defense mechanisms, the body's incapacity to limit the infection and the high risk of unbalanced glycaemia levels [3-5]. However, studies that show the specific cellular dysfunctions that cause this problem are still limited. Some even stated that the link between diabetes and infections is difficult to establish [6], while other studies reinforce this concept [7]. However, the number of patients included remains limited and the conclusions scarce.

One fact remains unanimously accepted, and that is that the management of a patient with diabetes that associates an active infection is different and must be more thorough than that of a non-diabetic patient with the same illness. The guides clearly state that the infection must be limited, while the diabetes is kept under control with normal glycaemia levels, even if the use of insulin becomes necessary. In this manner we can avoid further complications that can prove to be life-threatening.

The mechanisms by which diabetes mellitus affects the normal immune capacity of the body are still unclear. Studies so far have demonstrated an association between the presence of diabetes mellitus and a decreased function of polymorphonuclear cells and macrophages [8, 9]. These cells involved in the natural processes of chemotaxis and phagocytosis present with a decreased response, thus lowering the host's capacity of self-defence. This was demonstrated when comparing the function of these cells in patients with diabetes compared to non-diabetic subjects [10].

Another mechanism that was described in order to explain the predisposition to infectious complications of diabetic patients is represented by disturbances in the humoral immunity, such as a low response of cytokines following stimulation or low levels of complement factor 4 [11].

In order to provide accurate and efficient management of these patients, it is essential to establish which mechanisms play the most significant role. Studies so far suggest that humoral adaptative immunity remains efficient also in patients with diabetes mellitus, as proven by their capacity to respond well to vaccines [12, 13]. As far as the cellular immunity is concerned, dysfunctions at this level have already been demonstrated, although at a lower level than in cases of HIV infections or other immunosuppressant conditions. Of this, one of the most important aspects is represented by lymphocytes dysfunctions in diabetes patients and delayed hypersensitivity reactions [14].

Diabetes mellitus may influence the onset and evolution of infectious diseases by other means as well. High levels of blood glucose create an environment in which a microorganism is more virulent and presents an increased adherence to the cells. This is especially true in patients with long-term unbalanced diabetes that present constant high levels of blood glucose.

Another problem that may occur in patients with diabetes and infections is the risk of diabetic ketoacidosis [3]. This complication may prove to be fatal in a large number of patients when it occurs, and it requires intensive care and aggressive management [15].

Due to all these factors, the management of the diabetic patient with an infection must be a multidisciplinary one. The team must include diabetes and nutrition specialist, an infectious diseases specialist, an intensive care unit doctor if the condition of the patients requires it, and specialist that treats the affected organ. Only with such a complex approach can these patients be balanced and healed in safe conditions.

Infections in diabetic patients can appear at any level and can involve primarily any organ. Starting from common cutaneous infections and up to severe ones, such as meningitis or myocarditis, these infections can appear alone or as part of a more severe condition and can lead to sepsis. The source of the primarly infection must be identified, and proper care measures must be ensured as soon as possible. These include broad-spectrum antibiotics as a first measure, followed by an antibiotic treatment according to an antibiogram after samples have been sent for testing. Other measures include anti-inflammatory drugs and the surgical drainage of any collection

MATERIALS AND METHODS

This paper aims to describe the proper management protocol used in our clinic for diabetic patients presenting with infections in the ENT field, more precisely the management of rhinosinusitis in diabetic patients.

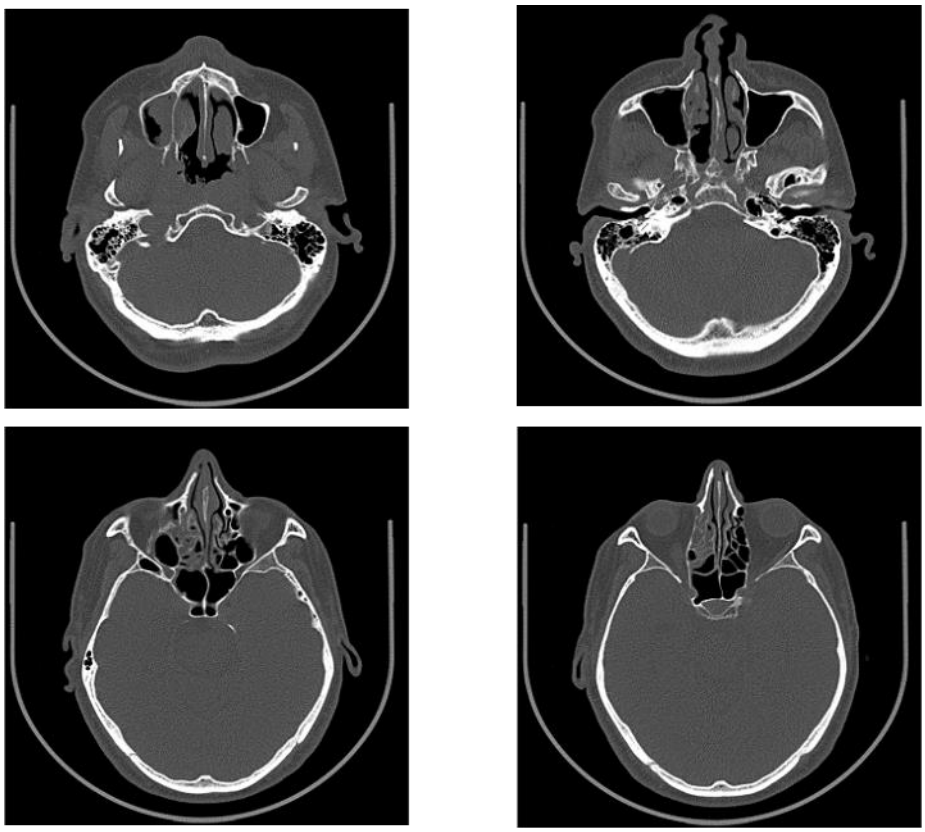
Taking into account the septic state of ENT cavities, we must keep in mind that patients with diabetes are more predisposed than the general population to develop infectious conditions. These may include otic infections, laryngeal of pharyngeal problems, but one of the most common conditions is represented by sinusitis.

Patients diagnosed with sinusitis usually associate one or more of the following complaints: purulent nasal discharge, headache, cranio-facial pressure and vertigo. In acute cases, high fever may occur. The causes of sinusitis are divided into nasal and odontogenic. The last one may represent a severe complication in patients with diabetes due to their predisposition for dental problems.

In such patients, the primary protocol is similar to that of non-diabetic patients. Antibiotic treatment associated with anti-inflammatory drugs, antihistaminics and proper hydration are the most common measures and must always associate nasal decongestants.

Complete blood work must be performed in order to asses the toll this episode inflicts on the organism. Efficient monitoring of the patient is mandatory, especially in diabetic patients, due to the risk of rapid-onset complications.

Figure 1: CT images of a patient with diabetes and sinonasal mucormycosis.



The complete diagnosis of these patients should include a computed tomography, which reveals the specific extension of any sinusitis. This is not routinely performed in the acute period, except for the cases that raise the suspicion of complications, such as an orbital abscess or meningitis. If the patients associate a positive response to therapy, the imagistic

examination should be performed at a period of time following the acute infectious episode.

Taking into account the agent that causes the infection, sinusitis can be either bacterial or fungal. Each can occur at diabetic patients, but they are at risk of developing a more significant number of fungal infections than the general population. This may be caused by both low local defense mechanisms, but also to the high incidence of dental problems in these patients.

Figure 2: Mucormycosis lesion of the mucosa of the rhinopharynx in a diabetic patient – intraoperative view.

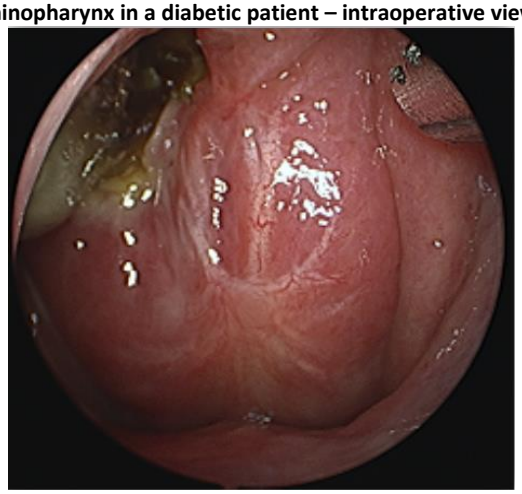


Figure 3: Intraoperative view of the same patient following an extensive debridation up to healthy tissue.

A significant aspect of the management of patients with sinusitis is the necessity to drain any purulent collection that prevents complete healing. The principle must be applied for all patients, but in diabetic patients, it is extremely important. Oral medication is more often inadequate in completely controlling the course of the disease. The surgical drainage may prove to be one of the simplest gestures that can be performed, with low risks. This principle applies to all patients but can be the only viable option in particular cases, such as Mucormycosis infections. In such cases, the surgical debridation of the affected area up to healthy tissue may be the only way to control the spread of the fungi.

The need for a multidisciplinary team remains, especially in patients with unbalanced diabetes that may require an aggressive approach [16]. Without adequate control of glycaemia levels, the healing process will be longer and less efficient. Also, an acute infection associates the risk of fluctuant glycaemia levels, with secondary complications. These patients have a higher risk of sepsis due to the decreased power of the body to contain the infection.

The surgical approach must be thorough and ensure adequate drainage of the infected sinuses. The same principle applies to bacterial or fungal sinusitis. Only the complete removal of the infectious reservoir will allow for a complete recovery.

RESULTS AND DISCUSSIONS

Patients with diabetes, especially if poorly controlled, represent a surgical challenge. Although the intervention itself follows the same principles as in non-diabetic patients, the surgeon must be even more thorough during the intervention and ensure that all infected sinuses have been drained and, in cases of fungal sinusitis, all affected tissue has been removed. The weak local defense mechanisms are not reliable in such cases, and any infectious reservoir remaining can cause a relapse in the disease [17].

These patients represent a challenge from the point of view of the anesthetist as well [18, 19]. The glycaemia levels are more difficult to control during the infectious process, they associate a higher risk of complications, including sepsis, and the response to usual therapy may be altered.

In our experience, the surgical gesture of draining the infected sinuses can be salvatory. Antibiotic or antifungal treatment is mandatory, depending on the

type of sinusitis. However, therapy alone can be insufficient and unable to limit the infection. This is even truer in diabetes patients, due to their body's low defense mechanisms. In cases of sinusitis, after a complete diagnosis that must in some cases include an imagistic evaluation, the surgical intervention is advisable if the response to treatment in the first days is insufficient or if any complications appear. The imagistic examination of choice is represented by a CT scan, which can be completed with an MRI if complications, such as orbital or cerebral extension, are suspected.

The functional endoscopic sinus surgery is a minimally invasive one and ensures a good visualization of the affected area. It allows the surgeon to control the patency of every sinus and verify if all sources of infection have been removed.

The postoperative care is crucial, being a key element in the complete recovery of the patient. Especially in a diabetic patient, maintaining appropriate glycaemia levels in the postoperative period will increase the patient's chances of a full and uneventful recovery.

CONCLUSIONS

Diabetes remains a challenging disease, despite the advancements that are continuously made concerning the therapy. The diabetic patient remains a particular one, requiring a more thorough approach, especially when an infectious process is present. People with diabetes are at higher risk to develop complications and more susceptible to inadequate and incomplete healing. Another frequent problem is caused by the multiple problems caused by diabetes, even concerning the local defense mechanisms. In such patients, a vicious circle may occur, based on the relationship between infection and unbalanced diabetes, where diabetes favors the infection. This, in turn, causes difficulties in maintaining normal glycaemia levels, which paves the way for infectious complications.

The authors recommend a multidisciplinary approach of patients with ENT infections and diabetes. This applies even more for patients with sinusitis, which is a common disease but can develop even life-threatening complications if incompletely treated. If the disease does not respond well to medical therapy, it is advisable to ensure the surgical drainage of the affected sinuses and the ENT surgeon must do so before complications. For patients with diabetes, we must also bear in mind that the onset of complications may be more rapid and dramatic.

Once the infection has been drained, the healing process will have a normal course only if the patient is well balanced, with normal glycaemia levels. Insulin may be necessary, even in patients that did not require this prior to the event. Only the proper management of diabetes allows a normal recovery. Even so, these patients must be carefully observed to ensure no secondary complications or relapses occur, and if such cases occur, the necessary measures must be quickly taken, including revision surgery if needed.

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