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Evolution assessment of head and neck infections in diabetic patients – A case control study

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ABSTRACT

This research aimed to assess the occurrence and progression of head and neck infections in diabetic compared to non-diabetic patients.

A retrospective study was carried out over a period of 10 years in 899 patients with head and neck infections. The patients who met the inclusion criteria were divided into cases and controls according to the presence/absence of diabetes.

Seventy-three patients (8%, 95% CI [6.45%–10.12%]) were included in the case group and 826 (92%, 95% CI [89.87%–93.55%]) were assigned to the control group. The extension of the infection proved to be significantly ($p < 0.001$) higher in diabetic patients compared to non-diabetic patients. The difference between the two groups was statistically significant (Mann–Whitney U statistics = 18205.500, $p < 1.56 \cdot 10^{-8}$). A more than 10 year history of diabetes was statistically related to a wider extent of head and neck infections ($p < 0.001$).

Diabetes proved to be associated with large necrotic areas and the spread of head and neck infections to more than two cavities.

1. Introduction

Head and neck tissues commonly represent the site of several non-specific infections with various degrees of severity. This localization is favored by the presence of the oral cavity and of pharyngeal structures, which, because of the exposure to a high level of bacterial flora, are frequently the starting point of these conditions (Fragiskos, 2007). The local and systemic expansion of such infections is limited in patients with normal reactivity (William et al., 1983). However, a series of systemic conditions lead to a decreased immune response and implicitly modify the reactions of a body affected by various septic processes (Guido et al., 2011; Tzermpos et al., 2013). Many conditions that lead to immunosuppression have been identified, the most common being metabolic conditions (e.g. diabetes) (Fauci et al., 2008). The clinical studies performed so far have emphasized a frequent association between diabetes and the occurrence of severe head and neck infections such as cervical necrotizing fasciitis (Uluibau et al., 2005; Flynn et al., 2006; Suehara et al., 2008). This kind of systemic pathology is of major importance for practitioners given the exponential increase of diabetes cases in industrialized countries (American Diabetes Association, 2008). The present research aimed to assess the occurrence and progression of head and neck infections in diabetic and non-diabetic patients.

2. Material and method

Patients with superficial and deep infections of the head and neck treated at the Oral and Maxillofacial Surgery Clinic, Cluj-Napoca, Romania during a 10-year interval (January 2000–December 2009) were available for the study.

Data were gathered from patients' charts, laboratory and imaging reports as well as letters of referral. The patient inclusion criteria were as follows: odontogenic origin, diagnosed as non-specific head and neck infections, diabetes mellitus as associated pathology or no associated pathology and in-patient treatment. The patient exclusion criteria were: non-odontogenic origin, specific infections, out-patient treatment, patients who failed to provide all documents required for the present study.

The patients were divided into two groups. The case group included patients with head and neck suppurations associated with

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diabetes mellitus while the control group consisted of patients with head and neck infections without associated systemic pathology.

General data: age (years), gender (M/F).

The data concerning the non-specific infection included: time from onset to first hospital visit (days), previous treatment (type), infection spread (local and systemic) and type of tissue present at the infection site. As far as local spread was concerned, the patients were divided according to the number of spaces affected by the septic process.

The studied groups included patients with suppurations located in one, two, three or several spaces. The systemic spread of head and neck infections was evaluated using imaging techniques (CT and MRI).

The data regarding diabetes mellitus included the duration of the disease, the degree of compensation, the type of glycemic control treatment and the response to treatment. In order to evaluate the degree of compensation of diabetes mellitus, the average HbA1c value from the time of diabetes diagnosis until surgery were calculated. This time interval differed in each patient according to the duration of diabetes mellitus. Individual patient data were collected from medical records and letters of referral from the diabetes specialists. Patients with HbA1c value between 7.5 and 9 were considered suboptimal level and above 9 were considered to have decompensated diabetes mellitus. Were also evaluated fasting glucose levels by venepuncture and an average value greater than 140 mg/dl was considered uncompensated diabetes mellitus.

The data regarding treatment covered the number of surgical interventions required, antibiotic treatment, the number of hospitalizations days and survival.

Microsoft Excel was used for the data collection. The continuous quantitative variables were expressed as mean with standard deviation and the minimum and maximum value while the discrete quantitative variables were summarized using the mean, the module and the minimum and maximum value. Qualitative data were summarized as percentages and associated 95% confidence interval (95%CI) computed using an optimized method based on binomial distribution (Jäntschi and Bolboacă, 2010). The Z test for two proportions was used to compare two frequencies. Mean continuous quantitative variables were compared using parametric tests if the assumption of normality was met; otherwise, non-parametric tests were applied. Student's t test and the chi-square test were used for the statistical validation of the results. The data were processed using SPSS 16 at a significance level of 5%.

3. Results

During the time interval studied, 11,653 patients were admitted for treatment at the Oral and Maxillofacial Surgery Clinic, Cluj-Napoca, Romania. Out of these, 1008 (8.65%) patients presented various head and neck infections. The patient inclusion criteria were met by 899 patients, out of whom 73 (8%, 95% CI [6; 10]) were included in the case group and 826 (92%, 95% CI [90; 94]) were assigned to the control group.

The age of diabetes mellitus patients diagnosed with non-specific perimaxillary infections ranged from the 2nd to the 8th decade of life with an average of 44.09 years. The control group patients the infections occurred from the 1st to the 8th decade of life with an average of 26.5 years. Male patients were more frequently affected by infections in both groups.

An average time interval of 8.18 (3.44) days (95% CI [7.38–8.98]) from infection onset until the first hospital visit was recorded in the case group, while this interval was of 6.45 (2.2744) days (95% CI [6.29–6.60]) in the control group. Therefore, the time interval from infection onset until the first hospital visit was significantly higher in the case group patients compared with controls ($p < 0.0001$). During this interval, all case group patients underwent oral antibacterial chemotherapy. The antibiotic treatment was prescribed by the family doctor, the dentist or the patients self-medicated. The following antibiotics were administered orally: augmentin (amoxicilin 875 mg + clavulanic acid 125 mg), oxacillin, ampicillin and clindamycin. Despite antibiotic treatment, all case group patients reported worsening of symptoms and septic spread.

The progression of non-specific head and neck infections led to the formation of pus in 73.97% (95% CI [63%–84%]) of the patients included in the case group while in the other patients the infections caused septic necrosis due to septic vascular thrombosis. Comparatively, septic necrosis occurred in only one patient without diabetes mellitus. A strong association between the presence of diabetes mellitus and the occurrence of necrotic areas was discovered, the result being statistically relevant ($p < 0.0001$)(Table 1).

Head and neck infections affected only one space in 34% of the case group patients and 86.8% of the control group patients (Table 2). There was a strong correlation between the presence of diabetes mellitus and infection spread to three or more spaces (~51% of cases) with relevant "p" and "Phi" ($Phi = 0.661$; $p = 3.82 \cdot 10^{-86}$).

Systemic septic complications originating in the cervical infection were recorded in 12.33% of the case group patients while such complications were absent in the control group. All the patients with systemic spread presented acute descending mediastinitis. Imaging investigations revealed the presence of pus collection in the mediastinum and thoracic organs (Fig. 1) or gas inclusions (Fig. 2) secondary to bacterial fermentation. Micro liver abscesses were identified by imaging in 3 patients. Several organs and their function (mediastinum, lungs, liver, kidneys) were affected in 4 patients.

In the case group, 57.53% of patients were diagnosed with diabetes mellitus less than 10 years before the occurrence of the non-specific infection. However, the long duration of diabetes mellitus proved to favor the spread of the infection to 3 or more spaces ($p < 0.0001$).

Compensated diabetes mellitus was present in 61.97% (95% CI [49%–73%]) of all the patients included in the case group, whose average HbA1c value was 9.812.

Although the local spread of the infections was higher in patients with decompensated diabetes mellitus (Fig. 3), a statistically significant difference was not found ($p > 0.05$).

Table 1
Distribution of patients in the two groups according to the manifestation of non-specific infections.

		Tissue type			Total
		Purulent	Septic necrosis	Mixed	
Group	Case	54	12	7	73
	Control	825	1	0	826
$P_{\text{case vs. control}}$		< 0.0001	< 0.0001	< 0.0001	
Total		879	13	7	899

Table 2
Distribution of patients in the two groups according to the number of head and neck spaces affected by non-specific infections.

		No. of cavities			Total
		1	2	3	
Group	Case	25	11	37	73
	Control	717	105	4	826
$P_{\text{case vs. control}}$		< 0.0001	0.6282	< 0.0001	
Total		742	116	41	899
Contingency coefficient = 0.661; $p = 3.82 \cdot 10^{-86}$					