

## Descriptive Study on Influence of Systemic Conditions on Head and Neck Infections

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### Abstract

*Aim:* The aim of the present research was to conduct a descriptive study about the role of systemic conditions, other than diabetes, in the occurrence and evolution of neck and head suppurations. *Material and Method:* For this purpose, we selected the sick people hospitalized in the I<sup>st</sup> Oral and Maxillofacial Surgery Clinics of Cluj-Napoca who presented suppurations of the head and neck and chronic systemic conditions. *Results:* One hundred and thirteen patients accomplished the inclusion criteria. The most frequent systemic conditions identified at patients with head and neck suppurations were the cardio-vascular diseases (48%), followed by hepatic diseases (19%). Head and neck suppurations proved to affect only one cavity in 75.22% of cases. The septic metastasis process was present in case of 3 patients, the mediastine being the most frequently affected organ by the presence of the septic process. The post-surgical evolution was favorable in case of 112 patients, the only death being noticed in the case of a woman suffering from decompensated leukemia. The mean of hospitalization days proved to be statistically significant higher when patients presented more than one affected cavity compared to patients with one affected cavity ( $p = 0.0030$ ). *Conclusion:* Immuno-depressing systemic conditions may influence in an unfavourable way the evolution of head and neck suppurations. The surgical treatment has been proved to be efficient in curing the suppurations of the patients suffering from diverse chronic systemic conditions.

**Keywords:** Suppurations of head and neck; Immuno-depression.

### Introduction

The role played by various systemic conditions in the occurrence of head and neck infections represents a subject of great interest for doctors, whatever specialization they may have. The systemic conditions may be influenced (or even worsened) by the occurrence of head and neck infections, but, on their turn, these conditions might also influence the occurrence manner and, especially, the evolution of cephalic extremities infections. The fact is that the infections around the

maxillary bones are caused by the presence of the inflammatory focus in this region that constitute the germs reservoirs which, once entered in the soft tissues, lead to the occurrence of infections variously manifested. The easiness with which the germs penetrate at the level of soft tissues, as well as the modality of evolution of the occurred infection might be influenced by the presence of some systemic conditions [1,2].

The metabolic pathology, especially the diabetes, represents an important category of conditions which associate with the occurrence of the head and neck infections. The role that diabetes plays on the modality of emergence and evolution of various perimaxillary infections has been widely considered in various specialty studies [3,4]. Due to these reasons, the purpose of the present study was to analyze the role that the systemic conditions, other than diabetes, have upon the way in which the head and neck infections occur and develop.

## **Material and Method**

Patients with infections localized at the level of superficial and deep cavities of the head and neck, which were hospitalized and treated at the 1<sup>st</sup> Oral and Maxillofacial Surgery Clinic of Cluj-Napoca between January 2000 and December 2009 inclusively were included in the study.

The inclusion criteria were: the presence of suppuration at the level of head and neck cavities, the presence of associated systemic conditions other than diabetes, hospitalized patient. The exclusion criteria were: infections with strictly per-bone evolution who did not affect the head and neck cavities, the presence of diabetes as associated pathology, treatment in ambulatory system.

A descriptive retrospective study was carried out in order to accomplish the aim of the study.

Data on each patient were obtained by studying the clinical observation sheets, bulletins of the laboratory and interpretation bulletins. Also data on systemic diseases that patients have presented in the study were obtained and medical letters issued by the practitioner, doctor.

The following variables were analyzed:

- General data: age (years), living environment (urban, rural), sex (male, female).
- Data regarding the head and neck cavities infection: number of affected cavities, predominant anatomic-pathological form under which the suppuration occurred (purulence, necrosis, purulence and necrosis and fetid brown secretion), and systemic septic disseminations (present/absent). Moreover, the presence or absence of cardiovascular, hepatic, hematological, malignancy and/or systemic infections were investigated for each patient.
- Data related to the manner in which the infections were cured in the case of patients having associated systemic pathology, other than diabetes: the number of surgical interventions (number), localization of incisions (exo-oral/endo-oral/mixed), the length of hospitalization period (days), the type of dosed antibacterial medication (according to the antibiogram/with wide spectrum), and survival (yes/no).

Quantitative variables were summarized using mean  $\pm$  standard deviation, minimum and maximum value, 95% confidence interval for means. Qualitative variable were summarized using percentage and associated 95% confidence interval calculated using a binomial distribution approach [5,6]. Whenever the data proved to be normal distributed, the difference between means were tested using t-test; otherwise a non-parametric test was used. The Z test was used to test the difference between two proportions. A significance level of 5 % was used in testing statistical hypotheses. The data were analyzed using SPSS 16.0, while the Microsoft Excel was used to graphically represent the results.

## **Results**

The criteria of including in the study were met by 113 patients, 65 (58%, 95% CI [47.80 - 66.36]) female and 48 (42%, 95% CI [33.64 – 52.21]) male. The age of the patients included into the study varied between 1 and 87 years, with an average of  $47.14 \pm 20.99$  years (95% CI [43.23-51.06]). The mean age of female patients proved not to be statistically different by the mean age of male

(Student parameter = 1.61, df (degree of freedom) = 111,  $p = 0.1094$ ). 58% of patients included into the study were from urbanized areas.

The histogram of the age on decades is presented in Figure 1.

The most common systemic condition that patients having head and neck suppurations presented was the cardio-vascular diseases (48%, 95% CI [39.24 – 57.69]). Other pathologies identified in the study group were as follow: hepatic diseases (19%, 95%CI [13.08-26.92]), systemic infections (14%, 95%CI [8.47 – 20.76]), malign conditions (13%, 95%CI [7.70 – 19.99]), and the hematological conditions (5%, 95% CI [2.31 – 10.76]). The prevalence of cardiovascular diseases proved to be statistically higher compared to all other conditions in the investigated group (Z test for comparing proportions,  $p < 0.05$ ).

The distribution of diseases by sex is presented in Table 1.

The female and male distribution according to the decade is presented in Figure 2.

The absolute frequencies of associated diseases on decades are presented in Table 2.

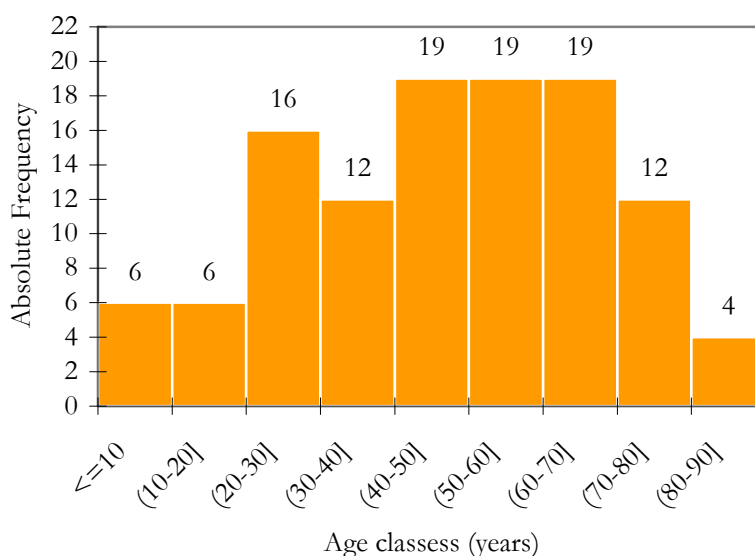


Figure 1. Distribution of age on decades

Table 1. Associated diseases by sex distribution

Diseases	Female (%) - n=65	Male (%) - n=48	pz (F%-M%)	Total
Cardio-vascular	40 (62)	23 (48)	0.1132	63
Hepatic	9 (14)	16 (33)	0.0110	25
Hematological	3 (5)	4 (8)	0.4866	7
Metastasis	11 (17)	6 (13)	0.5301	17
Other Systemic Diseases	10 (15)	8 (17)	0.7574	18

The top three most frequent associated diseases were as follow (reported to the number of persons in the decade):

- Cardio-vascular diseases: 6<sup>th</sup> decade (79%) – 9<sup>th</sup> decade (75%) – 8<sup>th</sup> decade (67%)
- Hepatic diseases: 2<sup>nd</sup> decade (83%) – 4<sup>th</sup> decade (33%) – 5<sup>th</sup> decade (32%)
- Hematological diseases: 3<sup>rd</sup> decade (25%) – 2<sup>nd</sup> decade (17%) – 6<sup>th</sup> & 7<sup>th</sup> decades (5%)
- Metastasis: 7<sup>th</sup> decade (26%) – 9<sup>th</sup> decade (25%) – 8<sup>th</sup> (17%)
- Systemic conditions: 1<sup>st</sup> decade (33%) – 3<sup>rd</sup> decade (31%) – 8<sup>th</sup> decade (25%).

The cardio-vascular conditions were the oldest associated conditions the patients having suffered from, covering a minimum period of 2 years and a maximum of 35 years. On the second place there are the hematological conditions with a maximum period of 18 years and a minimum of 4 years (this being the biggest minimum). The hepatic conditions are on the next place and have a

maximum period of 14 years and a minimum of 1 year. The most recent conditions associated to infections suffered by patients were malign conditions with a minimum period of 0.5 years and a maximum of 5 years.

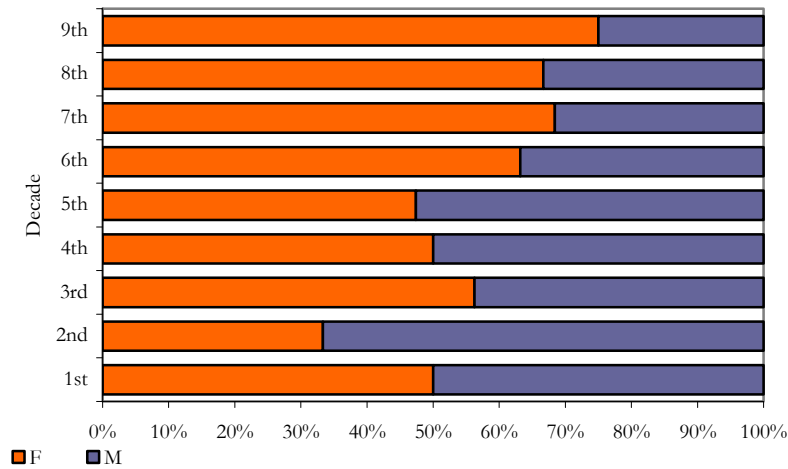


Figure 2. Distribution of gender on decades

Table 2. Absolute frequency of associated diseases by decades

Decade	Disease				
	Cardio-vascular	Hepatic	Hematological	Metastasis	Other Systemic Diseases
1 <sup>st</sup>	3	1	0	1	2
2 <sup>nd</sup>	0	5	1	0	0
3 <sup>rd</sup>	5	3	4	1	5
4 <sup>th</sup>	6	4	0	1	2
5 <sup>th</sup>	11	6	0	3	2
6 <sup>th</sup>	15	2	1	3	1
7 <sup>th</sup>	12	1	1	5	3
8 <sup>th</sup>	8	3	0	2	3
9 <sup>th</sup>	3	0	0	1	0
<b>Total</b>	<b>63</b>	<b>25</b>	<b>7</b>	<b>17</b>	<b>18</b>

The starting point of head and neck cavities infections was represented by dental - periodontal conditions (77.97%), pharyngeal-tonsils conditions (11.02%), dental extraction (10.17%) and traumatism (0.85%).

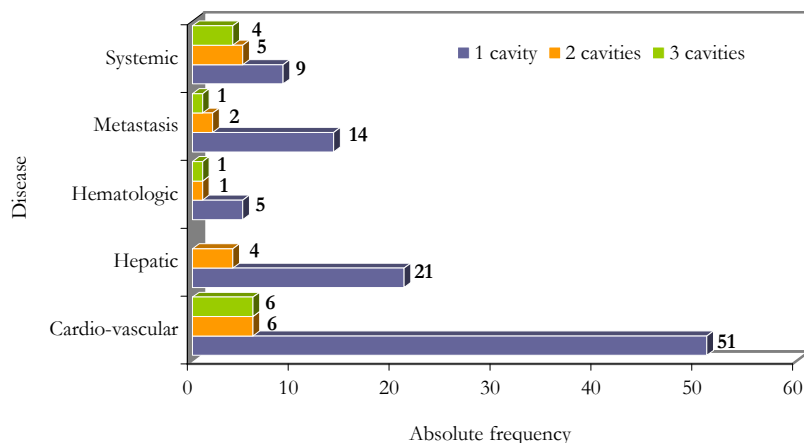
The suppurations were limited to a single cavity of head and neck for 75.22% of the patients, two cavities in case of 14.16% of the patients and three or more cavities in case of 10.62% of the patients. The distribution of the infections spreading degree and the association with a systemic pathology is illustrated in Figure 3.

The purulent secretions at the level of septic focus were noticed in 94.9% of the patients included in the study, in case of 3.54% of the patients only areas of septic necrosis were noticed and at 1.77% of the patients both purulent secretions and septic necrosis areas were observed. Among the patients with septic necrosis, 50% had associated malign conditions, and 33.33% suffered from cardio-vascular conditions, while 16.67% had hematological conditions.

Three of the patients included in the study had septic systemic metastases. A patient having cardio-vascular conditions had mediastinal septic determinations, another patient with malignant condition chemotherapeutically cured had mediastinal septic and hepatic determinations and another patient with decompensated haematological conditions had multi-organ septic metastases.

The surgical treatment of the patients suffering from head and neck suppurations and from systemic associated pathology assumed two surgical interventions in the case of 46.02% of the

patients, for 33.63% a single surgical intervention was assumed, for 16.81% three surgical interventions were assumed and in case of 3.54% several surgical interventions were performed. The exo-oral surgical approach was predominant (84.07%) followed by the endo-oral (12.39%) and mixed (3.54%) ones.



**Figure 3.** Classification of patients according to the amount of affected cavities and the type of condition

In all cases, antibacterial chemotherapy was dosed intravenously, and in 12.93% of cases the antibiotics were dosed according to the bacteriologic and antibiogram examination results.

The post-surgical evolution was favorable in case of 112 patients, these being discharged after a time period of minimum 1 day (4 cases) and maximum 44 days (1 case) with an average of  $6.62 \pm 5.62$  days (95%CI [5.57-7.67]) of hospitalization. One patient died in less than 24 hours since hospitalization due to multiple organic insufficiency and septic shock. The hospitalization days proved not to be related to type of associated disease. But, the mean of hospitalization days proved to be statistically smaller for patients with one cavity affected compared to the mean of hospitalization for patients with more than one cavity affected ( $m_{1-cavity} = 5.24$ ,  $m_{>1-cavity} = 10.82$ , Student statistics = -3.2452,  $df = 29$ ,  $p = 0.0030$ ).

## Discussion

Regarding the patients with systemic conditions, the suppurations have an increased incidence in elder persons, not in young adults. This difference is the result of the fact that chronic systemic conditions, especially the cardio-vascular ones, occur in patients with ages beyond 50 years [5]. But in case of other systemic conditions, a tendency of decreasing of the age when suppurations occur may be noticed.

From the point of view of the systemic condition age, it may be observed that cardiac pathology is the oldest in the case of these patients, and malign conditions are the most recent. This fact is not surprising taking into account the prognosis and the evolution specific to each type of pathology. On the other hand, it has to be mentioned that most of the field literature studies reveal the fact that cardiac conditions do not favor the occurrence of soft tissues suppurations but suppurations may complicate very much the evolution of cardiac conditions [2,7,8]. The presence of an increased number of patients suffering from heart disease in the study group was expected considering their widespread [2]. However, in our study was not observed a marked influence on the evolution of cardiovascular diseases of the head and neck abscesses and necrotizing. On the other hand the evolution of suppurating head and neck in patients with systemic diseases known to be much more seriously immunosuppressing is much worse with the possibility of developing septic remote releases.

It may be observed, from the percentage point of view, that suppurations evolving on a ground affected by haematological or malign conditions have the tendency to extend to a greater amount of cavities in comparison to those occurred in cardiac patients. The same observation can be done among patients enrolled in this study. Although patients with hematologic or malignant diseases are less, the number of cases with septic metastases is comparable to that present in the case of patients with cardiovascular disease. This can be explained by the fact that haematological and malign conditions are accompanied by a considerable immunological insufficiency [9]. Nevertheless, these infections evolved, in most of the cases, with the occurrence of purulent secretions. The occurrence of purulent secretions means the presence of phagocytes phenomena and, implicitly, of a competent immunological system. The presence of septic necrosis areas is associated with the presence of severe immune-depressing conditions such as malign or haematological conditions [10]. This hypothesis is supported by other specialized studies that have found a strong association between the presence of purulent secretions and good immune status of the patient

Most patients included in this study required two surgeries to ensure drainage of secretions from the inflammatory focus. The way most frequently used is the exooral approach. Using exooral incisions shows a disadvantage in terms of aesthetic, but they are more efficient than those endooral because it provides a wide and latch the secretions drainage tanks. The same type of approach has been used successfully by other authors. Achieving a higher number of surgeries required in those patients who have an alarming trend of abscesses and necrotizing pneumonia with extensive expansion both locally and systemically.

Regarding the extension at distance, it may be observed the predisposition of the septic metastases occurrence at the mediastinal level, this fact being favored by the presence of the fascial system of the head and neck [11].

The surgical treatment was successfully applied in most of the cases. The unfavourable post-surgical evolution manifested in a single case where the patient had significant alterations of defensive capacity successive to systemic conditions which were not compensated. This impaired immune status occurred secondary to decompensated chronic lymphocytic leukemia, which could not be compensated by the haematologist in time.

## **Conclusions**

The patients with head and neck diseases proved to have associated in most of the cases cardiovascular diseases. Cardiovascular diseases proved to be most frequent in the 6<sup>th</sup> decade, the metastasis in the 7<sup>th</sup> decades. Cardiovascular diseases were not found to be involved in local and systemic evolution of head and neck suppurations.

Opposite, the hepatic diseases proved to be more frequent in the 2<sup>nd</sup> decade, hematological diseases in the 3<sup>rd</sup> decade and other systemic conditions in the 1<sup>st</sup> decade. In patients who have hematological and malignant diseases is a tendency to abscesses and necrotizing extension increased both locally and systemic. Surgery has proved to be the treatment of choice regardless of the type of abscesses and necrotizing systemic pathology involved. However, immunocompromised diseases affects in a negative way the evolution of the head and neck abscesses, blood disorders are the most risky in this regard.

## **Conflict of Interest**

The corresponding author declares declare that there has no conflict of interest.

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