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# Infections of Head and Neck Soft Tissues – A Statistical Study over a 10-year Period

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## Abstract

*Aim:* A statistical analysis of the epidemiology of head and neck soft tissues conditions was carried out. *Material and Method:* The patients with head and neck infections who received treatment at Ist Oral and Maxillofacial Surgery Clinics of Cluj-Napoca between January 2000 and December 2009 inclusively were included in this study. *Results:* 1008 patients accomplished the inclusion criteria. The starting point of the head and neck inflammatory conditions was represented mainly by dental-periodontal lesions (79.66%). Most of the infections were localized at the level of a single cavity (81.85%); when more than one cavity was affected the patients were had also systemic conditions. When septic metastases spread the most affected side was the mediastinal structures. All patients included in this study received surgical treatment, most frequently two surgical interventions being necessary (50.20%). The post-surgical evolution was favorable for 1005 patients with an average of hospitalization period of 6.11 days, the hospitalization stay being also influenced by the presence or absence of the systemic immunodepression. *Conclusion:* The present research identified that the inflammatory conditions of the head and neck have as major starting point the dental-periodontal inflammatory conditions. The surgical treatment is the best choice for curing these affections.

**Keywords:** Unspecified infections; Septic metastases; Systemic immunodepresion conditions.

## Introduction

The inflammatory conditions localized at the head and neck level represent health conditions frequently met in the current practice of oral and maxillofacial surgery specialists [1]. Most of these infections are caused by an unspecified bacterial flora, localized at the level of the soft tissues [2]. The most frequent cause of these conditions is represented by the inflammatory-periodontal conditions [3]. From the periodontal level the bacterial flora erodes the bones cortical and permeates at the level of the cavities around the maxillary bones and infection occurred. Pharyngeal conditions and lymphatic tissues inflammations, well-represented at this level, are other starting point of head and neck infections [4].

The evolution of head and neck infections depends on the type of the bacterial flora involved in the condition emergence and by the defense capacity of the affected body. On the average, at the level of the head of and neck unspecified inflammations, a number of 4.5 bacterial stems are

 

isolated, but not the number of the bacterial is as important as it is the level bacteria aggressiveness [5]. On the other hand, the affected body may have a series of systemic conditions which may considerably diminish the defense capacity. Among these, the most incriminated one is the decompensated diabetes, haematological conditions or existence of neoplasm [4]. The combination of these two factors leads to the appearance of some infections with serious evolution, expanded both topically and at distance, which may arouse serious problems regarding the treatment and have a reserved prognosis [6].

The aim of the present research was to perform a statistical analysis of the epidemiology of the head and neck soft tissues infections.

## Material and Method

The target population was represented by the patients with unspecified infections localized at the level of head ad neck soft tissues. The available population was represented by the patients hospitalized in the I$^{st}$ Oral and Maxillofacial Surgery Clinics of Cluj-Napoca, between January 2000 and December 2009 inclusively. A longitudinal retrospective study has been conducted based on the observation files, bulletins of imagistic and laboratory analyses (bacteriological exam and antibiogram, hemoleucogram, glycemia test, inflammatory tests).

Patients with acute infections of head and neck soft tissues were included in the study, being hospitalized. The patients with inflammations localized strictly at the periostal level, those with specific infections, those treated in ambulatory, and the patients with chronic evolution suppurations were excluded from the study.

The following variables were collected for each patient: the age (years), the gender (M/F); data about the unspecified infections of the head and neck soft tissues (the number of cavities affected (1, 2, 3 or more cavities), the starting point (dental-periodontal, postextractional, pharyngeal tonsils, posttraumatic, inflammatory, tumoral), the predominant anatomic-pathological form under which the suppuration occurred (serous, purulent, alterative), the presence of bacteriological exam (present/absent) the type of implied bacterial flora (anaerobe bacteria, aerobe bacteria and conditioned aero-anaerobe bacteria), systemic septic metastases (present/absent); data concerning the systemic conditions the patients were having and their influence upon infection spreading, treatment and evolution; data connected to the way in which the inflammations were treated: the number of surgical interventions (number), the number of the hospitalization days (days). A Microsoft Excel database was used for data collection.

The continuous variables were summarized using centrality parameters. The qualitative variables were summarized using percentages. The difference between two means was tested using the Student t-test whenever the data proved to be normally distributed. The independence in r×c (where r = number of rows in the table, and c = number of columns in the table) contingency tables was tested using the Chi-Squared test at a significance level of 5%, whenever the tests conditions were accomplished. The Cramer's V contingency coefficient was used to quantify the relationship in r×c contingency tables for nominal data. The data were analyzed using SPSS 16.0 at a significance level of 5%.

## Results

One thousand and eight patients fulfilled the inclusion criteria. Their ages varied between 1 and 88 years, with a maximal incidence in the third and second decades of life, and an average of 29.91±17.73 (95%CI [28.82-36.01]) years. The percentage of the male included in the study was slightly higher (56.15%) compared to the percentage of female. The mean of age for female patient proved not to be statistically different by the mean of age for male patients ($t = -0.186$ $df = 1006$, $p = 0.852$, where t = student statistics, df = degree of freedom, p = significance of t-value).

The dental - periodontal inflammatory conditions led to the occurrence of head and neck infections at 79.66% from the total number of patients suffering from the suppurations, followed

by the dental extraction (9.92% of the patients) and by the pharyngeal-tonsils conditions (5.06%). Other conditions were identified in 5.36% of the patients.

In most of the cases (81.85%) a single cavity was affected; two cavities were affected in 13.00%, while the suppurations localized at the level of three or more cavities affected were seen in 5.16% of the patients.

Chronic systemic conditions were observed at 18.06% of the patients; among them 79.23% presented one systemic condition, 18.03% presented two systemic conditions and 2.73% presented three systemic conditions. The relationship between presence of systemic conditions expressed as associated pathology and the extension of the suppurations expressed as number of affected cavities is presented in Table 1.

**Table 1.** The level of extension vs. associated pathology

| | | Associated Pathology | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| No. of cavities | 1 | 717 | 108 | 825 |
| | 2 | 106 | 26 | 132 |
| | 3 | 3 | 48 | 51 |
| Total | | 826 | 182 | 1008 |

$\chi^2 = 231.407$, df = 2, $p = 4.56 \cdot 10^{-47}$

Cramer's V contingency coefficient = 0.460, $p = 4.56 \cdot 10^{-47}$

In 97.42% of the cases the anatomic-pathological purulent form predominated, while at 2.73% were only areas of septic necrosis were identified at anatomic-pathological examination. The presence of serous-type inflammatory exudates revealed to be presented in all cases.

The bacteriological exam was performing for almost 21% of the cases. Staphylococcus Aureus was the most frequent bacteria identified (42.47% of the cases), followed by the Pyogenes Streptococcus (9.59% of the cases) and by the Escherichia Coli (8.22% of the cases). In 39.73% of the patients other bacteria were identified.

The septic metastases at the level of other organs were identified at 1.19% of the patients included in the study. The mediastin was affected at all patients with septic metastases. 41.67% of the patients proved to have septic metastasis just at the level of mediastin; 16.67% proved to have septic metastases at the level of mediastin and liver while 41.66% proved to present multiorganic septic determinations.

Surgical interventions were needed and perform to all the patients with head and neck infections. The number of needed surgical interventions varied between 1 and 9, with an average of almost 2 interventions.

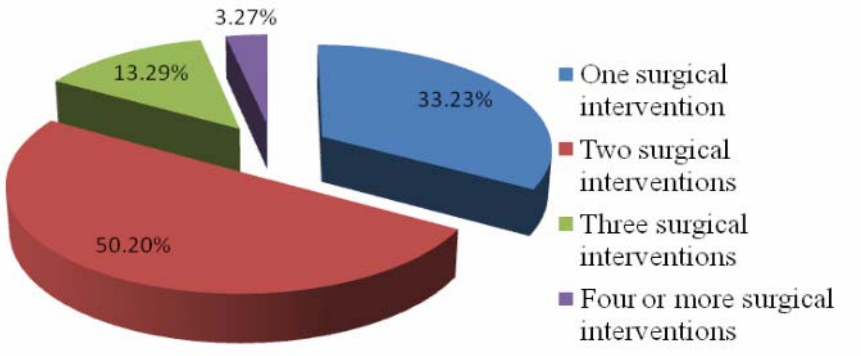


**Figure 1.** The distribution of the patients according to the number of surgical interventions

The number of surgical interventions was established by the post-surgical evolution of the patients, evolution influenced by the associated systemic pathologies (Table 2).

**Table 2.** The number of surgical interventions vs. associated pathology

| | | PatAsoc | | ***Total*** |
|---|---|---|---|---|
| | | No | Yes | |
| No. IC | 0 | 1 | 0 | ***1*** |
| | 1 | 273 | 61 | ***334*** |
| | 2 | 430 | 76 | ***506*** |
| | 3 | 102 | 32 | ***134*** |
| | 4 | 17 | 5 | ***22*** |
| | 5 | 1 | 6 | ***7*** |
| | 6 | 1 | 1 | ***2*** |
| | 7 | 1 | 0 | ***1*** |
| | 9 | 0 | 1 | ***1*** |
| ***Total*** | | ***826*** | ***182*** | ***1008*** |

IC = chirurgical treatment;
PatAsoc = systemic pathology;
$\chi^2 = 34.579$, df = 8, $p = 3.19 \cdot 10^{-5}$;
Cramer's V = 0.185, $p = 3.19 \cdot 10^{-5}$

The post-surgical evolution was favorable for 1005 patients who after a hospitalization between 1 to up to 52 days. The average of hospitalization was of 6.11±4.64 days. Most of the patients were hospitalized for 4 days (16.32%) followed by those who were hospitalized for 5 days (14.98%). The cases when the patients were hospitalized more than 10 days represent 10.42% of the total. Three patients included in this study presented the septic shock, at less than 24 hours from the surgical intervention, followed by the multiple organic insufficiency, cardio-respiratory arrest and death.

## Discussion

The present research revealed that the main cause of head and neck soft tissues infections is represented by the dental-periodontal conditions. This result is in accordance to the previously reported researches. Alexandre Babá Suehara et al. [7] identified in a study performed on 80 patients with infections of the profound areas of the neck that microorganisms penetrates at the head and neck level from the dental-periodontal lesions. Thomas R. Flynn et al. [8], in a prospective research on the aetiology of the infections of the head and neck soft tissues, also found that the starting point, in over 90% of cases, was represented by the existence of the dental-periodontal lesions. The difference from these studies consists in the role the dental extraction has in the appearance of head and neck infections. This difference is observable from that these authors categorised the diverse stomatological manoeuvres which led to the inclusion of the infections of head and neck soft tissues in the category of dental conditions.

The present study identified that most of the patients had infections localized at the level of one cavity of the facial mass, fact in accordance to other studies. This occurs due to the natural tendency of the human body to limit the infections spreading [9, 10]. The systemic immunosuppressant pathology presents a marked influence on spreading of these infections. Although only 18% of the cases had associated pathology, this study proved that the level of spreading out was dependent on the existence of associated pathology ($p < 0.05$). The association in the contingency table proved to be moderate (0.460) but statistically significant ($p < 0.05$).

The infections localized at the head and neck level proved to gave septic metastases at distance, mainly at the mediastinal level. This is because in most of the cases in which the infection diffuses at distance this spreads along the fascial system of the neck, and only in very serious forms the dissemination on the blood way with septic multiorganic damaging [9, 11].

All the infections of head and neck soft tissues had as main treatment the incision and the drainage of suppuration. The number of the surgical interventions depends on the extent in which the suppuration spreads, but also on the patients' postsurgical evolution [8, 11]. Thus, in the case of the patients having immunosuppressant systemic conditions the number of surgical interventions

proved to be dependent on the associated pathology ($p < 0.05$, Table 4), but the level of association was low (the contingency coefficient had the value of 0.185, but statistically significant $p < 0.05$).

Most of the head and neck infections manifested themselves by the occurrence of purulent inflammatory exudate. This occurs as a result of phagocytosis phenomenon, by which the immunity of the infection-affected body acts. The absence of purulent secretions and the evolution of infection only under alteration form constitute a negative prognosis factor as it signifies the lack of reaction of the patient's immunitary system. Taking these into account, it may be stated that the appearance of the purulent secretions is a positive aspect in infections evolution, especially in the case of the diffuse ones [12].

The post-surgical evolution of the patients suffering from head and neck infections was favorable in most of the cases. The reduced days of hospitalization, similar to those reported by other authors [9, 12], proved the efficiency of the surgical treatment. On the other hand, the immunosuppressant systemic conditions have a great impact on the number of hospitalization days which is dependent on the associated pathology but the contingency correlation proved to be low (less than 0.25) but statistically significant ($p < 0.05$).

## Conclusions

The dental-periodontal conditions represent the main cause of head and neck soft tissues infections occurrence. In most of the cases, these conditions present a locally limited evolution. Nevertheless, in case of the patients suffering from immunosuppressant systemic conditions, the infections may extend either regionally or at the level of other organs with serious consequences upon the patient's health.

The surgical intervention proved to be the main constituent of these infections treatment. Another important part is represented by the rebalancing of the homeostatic constants, especially at the patients with immunosuppressant conditions, where, in order to obtain a favourable evolution, it is necessary to compensate the prime disease.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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