Influence of Environmental Factors on Rhinosinusal Tumours

RAZVAN HAINAROSIE1, EUGENIA MARIA DOMUTA2*, MIHAIL TUSALIU2*, MARIUS GABRIEL DABIJA3*, FLORIN ANGHELINA4*, DOINEL RADEANU4*, OCTAVIAN DRAGOS PALADE6#

1Carol Davila University of Medicine and Pharmacy, 8th Eroii Sanitari Blvd., 050474, Bucharest, Romania
2University of Medicine and Pharmacy, Otorhinolaryngology Discipline, Oradea, Romania
3Grigore T. Popa University of Medicine and Pharmacy, Neurosurgery Discipline, 16 Universitatii Str., 700115, Iasi, Romania
4University of Medicine and Pharmacy, Otorhinolaryngology Discipline, 2 Petru Rares Str., Craiova, Romania
5Iuliu Hataganu University of Medicine and Pharmacy, Otorhinolaryngology Department, Cluj-Napoca, Romania
6Grigore T. Popa University of Medicine and Pharmacy, Otorhinolaryngology Discipline, Second Surgery Department, 16 Universitatii Str., 700115, Iasi, Romania

Cancer of the nasal cavity and paranasal sinuses is a rare malignancy. The tumours of the nasal cavity are thus associated with the maxillary and ethmoidal sinuses. Those that start from the nasal vestibule and nasal septum raise particular problems and, although rare, form a particular group of cases among the rhinosinusal tumours. Radiation exposure, viral infections and constitutional factors were associated with the occurrence of rhinosinusal neoplasia also, but the evidence is inconclusive and indicates that only a small proportion of all squamous carcinomas can be attributed. The purpose of this study is the complex retrospective analysis of the cases of rhinosinusal malignancies diagnosed and treated in the Otolaryngology Clinic of the St. Spiridon Emergency Clinical Hospital in Iasi. We evaluated the characteristics of the patient group using a statistically significant analysis of the age, gender, background, and factors of affiliation. Specific tests and indicators have been used. It is not to be neglected the effects of the poor economic conditions and the lack of education of the population, by postponing the moment of presentation to the physician, influencing the therapeutic decision, postoperative evolution. These patients often present different degrees of malnutrition, immunodepression, etc. Statistical processing showed that these patients have a twofold risk of developing rhinosinusal tumours.

Keywords: environmental risks factors, rhinosinusal cancers, nasal cavity.

Cancer of the nasal cavity and paranasal sinuses is quite rare. For example, in the UK the incidence is 8:1,000,000, while in the United States, where it represents 1% of all neoplasia, it has an incidence of 5:1,000,000. In both countries, the incidence rate for men:women is approximately equal, with the most common occurrence being in the second decade of life [1].

Although many studies give the maxillary sinus topography more frequent than the ethmoid sinus, it is hard to tell how such a conclusion has been reached as long as the clinical signs occurs only when the tumour reaches beyond the sinus. 80-100% of patients have radiologic signs of bone destruction.

The tumours of the nasal cavity are thus associated with the maxillary and ethmoidal sinuses. Those that start from the nasal vestibule and nasal septum raise particular problems and, although rare, form a particular group of cases among the rhinosinusal tumours. Cancers that invade only the inferior part of the jaw are better classified as cancers of the upper extension of buccal cavity [2-5].

Given that rhinosinusal neoplasia is not very common, it is difficult to identify favoring or determining factors. For example, smoking, the first favorable cause of other cancers of the respiratory tract, is not associated with rhinosinusal neoplasia [6-8].

Perhaps the best proven factor in the UK and France is working in the wood and coal industry. This was found by epidemiological studies with laboratory confirmation. People working in the wood industry have the same risk of developing an ethnoid adenocarcinoma as smokers to develop a broncho-pulmonary neoplasia. It seems to be a long latency associated with this factor (28-43 years)[9-13].

Radiation exposure, viral infections and constitutional factors were associated with the occurrence of rhinosinusal neoplasia also, but the evidence is inconclusive and indicates that only a small proportion of all squamous carcinomas can be attributed[14-18]. Nickel workers are at a risk of 870 times higher rhinosinusal tumours, most of them appearing after 10 years of exposure, but with improved working conditions, the incidence has fallen rapidly. The average latency period in these cases was 24 years. Patients who have worked in the chromium industry have a 21-fold higher risk of latency of 23 years[19, 20].

Non-occupational agents such as thorium dioxide injected into the maxillary sinus, exposure to hydrocarbons and isopropyl alcohol also increase the risk of rhinosinusal tumours. All of these injuries appear to develop as a result of nasal fossil air currents that trap and deposit irritating particles either at the anterior portion of the nasal septum or at the middle cornet, resulting in squamous metaplasia and then carcinoma [21-25].

The purpose of this study is the complex retrospective analysis of the cases of rhinosinusal malignancies diagnosed and treated in the Otolaryngology Clinic of the St. Spiridon Emergency Clinical Hospital in Iasi between 1990 and 2004. We evaluated the characteristics of the patient group using a statistically significant analysis of the age, gender, background, and factors of affiliation. Specific tests and indicators have been used.

Experimental part

Materials and methods

We used a study group of 143 patients diagnosed with rhinosinusal malignant tumours in the oto-rhyno-
laryngology clinic of Sfantu Spiridon Hospital in Iasi. These patients were monitored clinically, radiologically, paraclinically and anamnestically, in the pre-surgical period.

As methods, we used statistical series of dynamic variation of periods and dynamic momentum variation. For the square test, the $x_1$ test is a nonparametric test used for statistical deductions in the case of two or more samples randomly drawn from a population and having a different frequency distribution between them.

This test compares two or more frequency distributions for two batches from the same population, so with a similar frequency distribution, but with a different feature. Absolute figures are taken into account, thus making it more laborious to compute the average, the dispersion, the moments.

Also, this test applies only to those situations where the expected events exclude each other, in the sense that only one of them is possible.

For $df = 1$ (degree of freedom) and a 95% confidence we have Chi - square $X^2 = 3.84$. If the calculated value is greater than this value means that there is association and the exposure has an influence on the studied disease.

Once the contingency table (or cross classification) is made, we calculated the odds ratio (CR) and the relative risk (RR) ratio.

**Results and discussions**

Chance report (CR) expresses the chances of those who are exposed to a certain feature are OR or higher than the odds of the unexplored ones.

The risk ratio (RR) expresses the risk of those exposed is RR or higher than those unexposed.

**Table 1**

<table>
<thead>
<tr>
<th>GENDER</th>
<th>NUMBER</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>40</td>
<td>27.97%</td>
</tr>
<tr>
<td>Male</td>
<td>103</td>
<td>72.03%</td>
</tr>
</tbody>
</table>

The incidence of females cases was 27.97%, small compared to the incidence of male cases.

**Table 2**

<table>
<thead>
<tr>
<th>DEMOGRAPHIC ORIGIN</th>
<th>NUMBER</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>97</td>
<td>67.83%</td>
</tr>
<tr>
<td>Urban</td>
<td>46</td>
<td>32.17%</td>
</tr>
</tbody>
</table>

Achieving the contingency table allowed the study of patient involvement in the presence of TMRS.

A control group of patients (60 cases) without TMRS, randomly selected from the ENT Clinic, was used.

The very high values of Chi-square ($X^2 = 20.45$) and the Spearman Rank correlation coefficient ($r = -0.74$) lead to the conclusion that rhinosinus malignant tumors are significantly present in rural areas ($p = 0.000003$, 0.05), which also results from the analysis of the regression line (table 4, fig. 3).

**Table 3**

<table>
<thead>
<tr>
<th>PATIENTS DISTRIBUTION BY DEMOGRAPHIC ORIGIN AND TMRs</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMRs</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Present</td>
</tr>
<tr>
<td>Absent</td>
</tr>
</tbody>
</table>

The slope of the regression line indicates the significant correlation between the patient’s background and the presence of TMRS.

**Table 4**

<table>
<thead>
<tr>
<th>Demographic origins vs TMRs</th>
<th>Chi-Square test</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.L. SQUARE - CHI Test</td>
<td>20.45789</td>
<td>1</td>
<td>0.00001</td>
</tr>
<tr>
<td>Contingency coefficient</td>
<td>-0.74772</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spearman Rank correlation coefficient</td>
<td>-0.74748</td>
<td>0.000003</td>
<td></td>
</tr>
</tbody>
</table>
The histogram of the age of patients with rhinosinus malignancies reveals the normal distribution of cases by age (Gaussian distribution).

### Table 5
**DISTRIBUTION OF CASES BY AGE OF PATIENTS**

<table>
<thead>
<tr>
<th>AGE</th>
<th>NO. OF CASES</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤10</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>10≤AGE≤20</td>
<td>6</td>
<td>4.2</td>
</tr>
<tr>
<td>20≤AGE≤30</td>
<td>12</td>
<td>8.39</td>
</tr>
<tr>
<td>30≤AGE≤40</td>
<td>18</td>
<td>12.59</td>
</tr>
<tr>
<td>40≤AGE≤50</td>
<td>28</td>
<td>18.18</td>
</tr>
<tr>
<td>50≤AGE≤60</td>
<td>30</td>
<td>20.98</td>
</tr>
</tbody>
</table>

Major incidences of cases with rhinosinus malignancies occur in patients aged 50-70 years (20.98%) (table 5, fig. 4).

By applying the specific Spjotvoll / Stoline test scores for the age of patients with rhinosinus malignant tumour by gender, it was found that there was no statistically significant difference between these mean values. This is explained by the value of the significance level \( p = 0.0776 \) which is much higher than the reference value of 0.05 corresponding to a confidence interval of 95%.

In the etiopathogenesis of rhinosinus malignant tumors a number of external factors are involved [26-34]. They were identified and analyzed in the patients of the study group as compared to their presence in the control group, thus demonstrating their involvement in the presence of rhinosinus malignant tumors (table 6, fig. 5).

The retrospective analysis of the involvement of certain risk factors in the occurrence of rhinosinus malignant tumours leads shows that in the studied group the risk of rhinosinus malignant tumors is 5.28 times higher in persons working in the wood industry, 4.15 times higher in those who work in other toxic environments (exposure to nickel, chromium). Also, chronic illnesses, alcohol consumption, smoking, poor economic conditions due to lack of hygiene, lack of adequate nutrition, neglect of health, and the chance for these people to develop rhinosinus malignancies are more than twice as high.

### Table 6
**THE INVOLVEMENT OF RISK FACTORS IN THE PRESENCE OF TUMORS**

<table>
<thead>
<tr>
<th>Predisposing factors involved in the etiopathogenesis of malignant rhinosinus tumours</th>
<th>CR</th>
<th>RR</th>
<th>( X^2 )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers in the wood and coal industry</td>
<td>2.28</td>
<td>2.47</td>
<td>10.07</td>
<td>0.0001763</td>
</tr>
<tr>
<td>Nickel, Chrome</td>
<td>4.15</td>
<td>2.26</td>
<td>11.13</td>
<td>0.00034379</td>
</tr>
<tr>
<td>Chronic diseases (liver, diabetes, cardiovascular)</td>
<td>3.21</td>
<td>2.02</td>
<td>7.28</td>
<td>0.0069844</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>2.71</td>
<td>1.86</td>
<td>5.28</td>
<td>0.021787</td>
</tr>
<tr>
<td>Poor economic conditions</td>
<td>2.49</td>
<td>1.78</td>
<td>4.37</td>
<td>0.036850</td>
</tr>
<tr>
<td>Smoking</td>
<td>2.37</td>
<td>1.68</td>
<td>4.12</td>
<td>0.0428729</td>
</tr>
</tbody>
</table>

Fig. 4. Distribution of cases by age of patients

Fig 5. The incidence of risk factors in the etiopathogenesis of malignant tumors of the hypopharynx
Conclusions

We can not specify the existence of a determinant or favoring factor of the occurrence of rhinosinusal tumours but the statistical analysis noticed an increased risk for patients working in the wood industry [5.28], which are exposed to chromium, nickel [4.21] as well as to the associated diseases (liver, cardiovascular, diabetes). It is not to be neglected the effects of the poor economic conditions and the lack of education of the population, by postponing the moment of presentation to physician, influencing the therapeutic decision, postoperative evolution. These patients often present different degrees of malnutrition, immunodepression, etc. Statistical processing showed that these patients present a twofold risk of developing rhinosinusal tumours.

References


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