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Incidence of Radiation Caries in Patients Undergoing Radiation Therapy in the Head and Neck Region

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Abstract

Objective: To determine the incidence of radiation induced caries in conventionally treated patients with head and neck cancer in Bosnian population.

Method: A number of 30 patients with malignant diseases were included into this study, from the Clinic for Maxillofacial Surgery and Clinic for Otorhinolaryngology. All the patients were treated with radiotherapy in the region of head and neck, at the Institute for Oncology, Clinical Centre of University in Sarajevo. All thirty patients were examined in four time periods: before the radiation, 3 weeks after commencing the radiation, three months after commencing the radiation and six months after commencing the radiation.

Results: Before starting radiation the DMFT-index (Decay Missing Filling Tooth-index) in our patients was 19,4. After 3 weeks commencing the radiation, the DMFT-index was also 19,4. Three months after commencing the radiation DMFT-index was 19,8. After six months commencing the radiation therapy the DMFT-index in our patients was 23,9.

Conclusion: Radiation caries is late effect of radiation therapy and like all other complications have a tremendous impact on patient’s quality of life during and after radiotherapy. Therefore, it would be necessary for a dental following of the patient during and after the radiation therapy, so dentist should be part of the oncology tim which is now not the practice in Bosnia and Herzegovina.
Radiotherapy plays an important role in the treatment of head and neck carcinoma, but it may result in severe dento-oral adverse effects of the radiation\(^1\). The radiation-related changes occur in all orofacial tissues, the oral mucosa, salivary glands, taste, dentition, periodontium, bone, muscles, and joints\(^1\).

These adverse effects of radiation can be divided into early (mucosa, taste, salivary glands), intermediate (taste, salivary glands), and late (salivary glands, dentition, periodontium, bone, muscles, joints) effects\(^2\).

Radiation caries is a rapidly progressing and highly destructive type of dental caries, and is one of the most common post-radiation, late complications in patients with head and neck cancer\(^2\)-\(^6\).

Clinically, there are four types of radiation caries\(^2\)-\(^6\). The first type is a characteristic caries-like lesion usually completely encircling the neck of the tooth. Amputations of the crowns may and do occur due to this type of lesions (Figures 1 and 2).

Pulpal tissue also have reaction to the radiation, decreased vascularity and atrophy, so these patients have decreased pain response and often do not seek treatment on time\(^7\) It has always been a matter of debate whether radiation caries is due to a direct or indirect effect of irradiation on teeth, or to both. Several investigators have reported that the development of radiation caries was not dependent on the presence of teeth in the field of irradiation, but that the determining factor was whether the main salivary glands were within the radiation field, resulting in hyposalivation\(^8\)-\(^15\). Some other in vitro and in situ studies proved that dentin of the irradiated teeth has decreased hardness, there are also several papers claiming about morphological changes on the enamel dentin junction\(^16\). Some authors noticed significant reduction of stability in the enamel dentine junction area, after radiation, pander with clinical symptoms of enamel loss\(^17\).

The intention of this research was to determine the incidence of radiation induced caries in conventionally treated patients with head and neck cancer in Bosnian population.

**MATERIALS AND METHODS**

A number of 30 patients with malignant diseases of head and neck were included into this study, from the Clinic for Maxillofacial Surgery and Clinic for Pesq Bras Odontoped Clin Integr, João Pessoa, 10(3):489-492, set./dez. 2010
Patients who were on chemotherapy in combination with radiation were excluded from this study, because of possible dento-oral side effects of chemotherapy that can give different results.

Patient received a dose between 50 and 70 Gy given over a five-week period, once a day, five days a week, 2 Gy per fraction. All thirty patients were examined in four time periods: before the radiation, 3 weeks after commencing the radiation, three months after commencing the radiation and six months after commencing the radiation and each time the DMFT-index (Decay Missing Filling Tooth-index) was determined.

**RESULTS**

Before starting radiation the DMFT-index (Decay Missing Filling Tooth-index) in our patients was 19,4. After 3 weeks commencing the radiation the DMFT-index was also 19, 4. Three months after commencing the radiation DMFT-index was 19, 8. After six months commencing the radiation therapy the DMFT-index in our patients was 23, 9 (Figure 4 and Table 1).

![Figure 4. DMFT-index before and after radiation.](image)

<table>
<thead>
<tr>
<th>Time</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
<th>Mod.</th>
<th>t-test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before radiation</td>
<td>19,4</td>
<td>5,456</td>
<td>8</td>
<td>29</td>
<td>24</td>
<td>-2,26</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>After 3 weeks</td>
<td>19,4</td>
<td>5,456</td>
<td>8</td>
<td>28</td>
<td>24</td>
<td>-5,9</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>After three months</td>
<td>19,8</td>
<td>5,294</td>
<td>8</td>
<td>28</td>
<td>28</td>
<td>-2,8</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>After six months</td>
<td>23,9</td>
<td>3,754</td>
<td>15</td>
<td>28</td>
<td>28</td>
<td>-2,8</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

Patients with head and neck cancer have to cope not only with a life-threatening disease but also with the prospect of adverse effects of cancer therapies, frequently affecting the mouth and jaws. The choice of head and neck cancer treatment depends on the anatomic site and extent of the tumor, and on histological factors. Final treatment decisions are taken by the multidisciplinary cancer team and it is usually combination of surgical treatment, chemotherapy and radiotherapy. Radiotherapy, as a part of cancer therapy, plays very important role in the management of patients with head and neck cancer, but it is also associated with several undesired reactions.

Radiation caries is special form of dental caries, which is highly destructive with a rapid onset and progression and non specific localization. Also, patients with radiation caries have a decreased pain response, even with severe forms with large destruction and pulp exposure, due to decreased vascularity with fibrosis and atrophy of the pulpal tissues.

In generally the score of DMFT in Bosnian population is, unfortunately, very high. Our patients entering into cancer therapy were with already bad dental status, the DMFT-index before radiation is 19,4. This is one of the reasons that DMFT-index in this study after radiation is extremely high, 23,9 according to other studies. Furthermore, radiation caries in our patients developed extremely rapidly, in six months, and in very severe form were patient was losing whole crown of the tooth.

The development and progression of radiation caries multifactorial. Hiposalivation is one of the earliest side effects of radiation therapy. Radiation has a rapid effect on the salivary glands. In addition to quantitative alterations, the saliva also develops qualitative changes. Changes of saliva composition include in its antibacterial properties and ionic concentration, with consequent reductions of buffering capacity and the pH. The average post-irradiation pH falls from about 7.0 to 5.0, which is definitely cariogenic.

Studies also proved changes in the organic components of dentin and morphological changes on the enamel dentin junction of the irradiated teeth which decreased hardness of dentin, reduction of stability in the enamel dentine junction pander with clinical symptoms of enamel loss. In addition, early side effects of radiotherapy, such as mucositis and candidiasis also causes changes in the patients diet, that include sticky, soft, carbohydrate-rich foods which is highly cariogenic and contribute to development of radiation caries.
Regarding all of this, radiation caries is very complicated and serious condition in cancer patients.

In Bosnia and Herzegovina dentist is not a part of an oncology tim and patients begins their cancer therapy without any dental preparation, on the other hand they often deals with dento-oral complications without any professional help. In many cases this complications have a tremendous impact on their quality of life during and after radiotherapy and very often they are reason of interruption of therapy.

**CONCLUSION**

Radiation caries is late effect of radiation therapy and like all other complications have a tremendous impact on patient’s quality of life during and after radiotherapy. Therefore, it would be necessary for a dental following of the patient during and after the radiation therapy, so dentist should be part of the oncology tim which is now not the practice in Bosnia and Herzegovina.

**REFERENCES**


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