



Pesquisa Brasileira em Odontopediatria e
Clínica Integrada

ISSN: 1519-0501

apesb@terra.com.br

Universidade Federal da Paraíba
Brasil

KONJHODZIC-PRCIC, A; KEROS, J; AJANOVIC, M; SMAJKIC, N; HASIC-BRANKOVIC, L
Incidence of Radiation Caries in Patients Undergoing Radiation Therapy in the Head and Neck Region
Pesquisa Brasileira em Odontopediatria e Clínica Integrada, vol. 10, núm. 3, septiembre-diciembre,
2010, pp. 489-492
Universidade Federal da Paraíba
Paraíba, Brasil

Available in: <http://www.redalyc.org/articulo.oa?id=63717313024>

- How to cite
- Complete issue
- More information about this article
- Journal's homepage in redalyc.org

redalyc.org

Scientific Information System
Network of Scientific Journals from Latin America, the Caribbean, Spain and Portugal
Non-profit academic project, developed under the open access initiative

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

Incidência de Cárie de Radiação em Pacientes Submetidos a Radioterapia na Região de Cabeça e Pescoço

A KONJHODŽIĆ-PRCIĆ¹, J KEROS², M AJANOVIĆ³, N SMAJKIĆ¹, L HASIĆ-BRANKOVIĆ¹

¹Department of Dental Pathology and Endodontics, Faculty of Dental Medicine University of Sarajevo, Bosnia and Hercegovina.

²Department of Dental Anthropology, School of Dental Medicine, University of Zagreb, Croatia.

³Department of Prosthodontics, Faculty of Dental Medicine University of Sarajevo, Bosnia and Hercegovina.

RESUMO

Objetivo: Determinar a incidência de cárie de radiação em pacientes com câncer de cabeça e pescoço na população Bósnia.

Método: Trinta pacientes com diagnóstico de patologia maligna pertencentes a uma Clínica de Cirurgia Bucomaxilofacial e de Otorrinolaringologia. Todos os pacientes foram tratados com radioterapia na região de cabeça e pescoço, no Instituto de Oncologia da Universidade de Sarajevo. Todos foram examinados em quatro diferentes períodos: antes do início do tratamento, 3 semanas após o início do tratamento, 3 meses e 6 meses após o início da radioterapia.

Results: Previamente ao início da radioterapia o CPO-D médio foi de 19,4. Após 3 semanas, o CPO-D permaneceu em 19,4. Três meses após, o CPO-D foi de 19, 8, enquanto que 6 meses após, o CPO-D foi de 23,9.

Conclusão: A cárie de radiação é um efeito tardio da radioterapia e como todas as demais complicações tem um elevado impacto na qualidade de vida do paciente durante e após o tratamento. Portanto, é necessário o acompanhamento do pacientes durante e após o tratamento, de modo que o cirurgião-dentista seja parte integrante da equipe oncológica, condição esta que não é vista na Bosnia e Herzegovina.

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.

DESCRIPTORES

Radioterapia; Neoplasias de cabeça e pescoço; Efeitos de radiação; Cárie dentária.

KEYWORDS

Radiotherapy; Head and neck neoplasms; Radiation effects; Dental caries.

INTRODUCTION

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 radiation¹. The radiation-related changes occur in all orofacial tissues, the oral mucosa, salivary glands, taste, dentition, periodontium, bone, muscles, and joints¹.

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) effects².

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 cancer²⁻⁶.

Clinically, there are four types of radiation caries²⁻⁶. 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).



Figure 1. Radiation caries type I.



Figure 2. Radiation caries type I with crown amputations.

The second type of lesion begins with brown to black discoloration of the crown. The occlusion surface of

posterior teeth and incisal edges of anterior teeth wear away. The third type of lesion begins as a spot depression which spreads from incisal or occlusal edges on labial or buccal and lingual surfaces. In time the enamel shell is destroyed and coronal dentine becomes partially disintegrated leaving the crown reduced to an irregular discolored stump projecting over the gingiva (Figure 3).



Figure 3. Radiation caries type III.

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 time⁷. 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 hyposalivation⁸⁻¹⁵. 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 junction¹⁶. Some authors noticed significant reduction of stability in the enamel dentine junction area, after radiation, pander with clinical symptoms of enamel loss¹⁷.

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

Otorhinolaryngology of Clinical Centre University of Sarajevo. 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.

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).

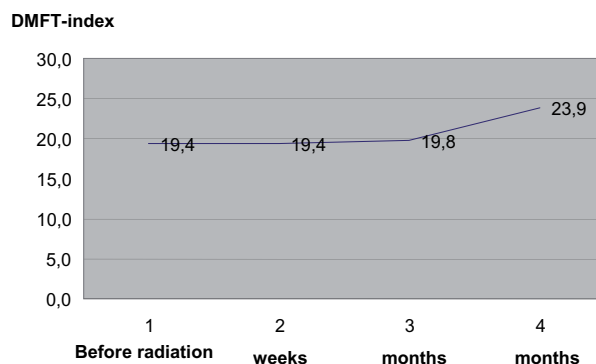


Figure 4. DMFT-index before and after radiation.

Table 1. Statistics evaluation of results.

| | Before radiation | After 3 weeks | After three months | After six months |
|--------|------------------|---------------|--------------------|------------------|
| Mean | 19,4 | 19,4 | 19,8 | 23,9 |
| SD | 5,456 | 5,456 | 5,294 | 3,754 |
| Min. | 8 | 8 | 8 | 15 |
| Max. | 29 | 28 | 28 | 28 |
| Mod. | 24 | 24 | 28 | 28 |
| t-test | | | -2,26 | -5,9 |
| P | | | p<0.001 | p<0.001 |

DISCUSSION

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^{21,22}. 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^{2-4,5,18}. 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 tissues⁷.

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^{19,20}. 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 changes²³. 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 definitively cariogenic²³.

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 loss¹⁷. 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 team and patients begin their cancer therapy without any dental preparation, on the other hand they often deal with dento-oral complications without any professional help. In many cases these 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 dentist following of the patient during and after the radiation therapy, so dentist should be part of the oncology team which is now not the practice in Bosnia and Herzegovina.

REFERENCES

1. Mušanović M, Obralić N. Onkologija. Sarajevo: Bošnjački institut, Fondacija Adil Zulfikarpašić, 2001. pp. 429-33.
2. Vissink A, Jansma J, Spijkervet FK, Burlage FR, Coppes RP. Oral sequelae of head and neck radiotherapy. *Crit Rev Oral Biol Med* 2003; 14(3):199-212.
3. Del Regato JA. Dental lesions observed after roentgen therapy in cancer of the buccal cavity, pharynx and larynx. *Am J Roentgen* 1939; 42:404-10.
4. Frank RM, Herdly J, Philippe E. Acquired dental defects and salivary gland lesions after irradiation for carcinoma. *J Am Dent Assoc* 1965; 70:868-83.
5. Karmiol M, Walsh FR. Dental caries after radiotherapy of the oral regions. *J Am Dent Assoc* 1975; 91:838-45.
6. Cooper JS, Fu K, Marks J, Silverman S. Late effects of radiation therapy in the head and neck region. *Int J Radiat Oncol Biol Phys* 1995; 31(5):1141-64.
7. Andrews N, Griffiths C. Dental complications of head and neck radiotherapy: part 1 and 2. *Aust Dent J* 2001; 46(3):174-82.
8. Anneroth G, Holm LE, Karlsson G. The effect of radiation on teeth. A clinical, histological and microradiographic study. *Int J Oral Surg* 1985; 14:269-74.
9. Kielbassa AM, Schulte-Mönting J, Hellwig E. Correlation between microhardness transversal microradiography and in situ-induced demineralization in irradiated human dental enamel. *Arch Oral Biol* 1999; 44:243-51.
10. Kielbassa AM, Shohadai SP, Schulte-Mönting J. Effect of saliva substitutes on mineral content of demineralized and sound dental enamel. *Support Care Cancer* 2001; 9:40-7.
11. Kielbassa AM, Munz I, Bruggmoser G, Schulte-Mönting J. Effect of demineralization and remineralization on microhardness of irradiated dentin. *J Clin Dent* 2002; 13(3):104-11.
12. Amerongen AV, Veerman EC. Saliva - the defender of the oral cavity. *Oral Dis* 2002; 8(1):12-22.
13. Leslie MD, Dishe S. The early changes in salivary gland function during and after radiotherapy given for head and neck cancer. *Radiother Oncol* 1994; 30:26-32.
14. Anderson MW, Izutsu KT, Rice JC. Parotid gland pathophysiology after mixed gamma and neutron irradiation of cancer patients. *Oral Surg* 1981; 52(5):495-500.
15. Al-Nawas B, Grötz KA, Rose E, Duschner H, Kann P, Wagner W. Using ultrasound transmission velocity to analyse the mechanical properties of teeth after in vitro, in situ, and in vivo irradiation. *Clin Oral Invest* 2000; 4(3):168-72.
16. Jongebloed WL, 's-Gravenmade EJ, Retief DH. Radiation caries. A review and SEM study. *Am J Dent* 1988; 1(4):139-46.
17. Pioch T, Golfes D, Staehle HJ. An experimental study of the stability of irradiated teeth in the region of the dento-enamel junction. *Endod Dent Traumatol* 1992; 8(6):241-4.
18. Harrison JS, Dale RA, Haveman CW, Redding SW. Oral complications in radiation therapy. *Gen Dent* 2003; 51(6):552-60.
19. Papas A, Russell D, Singh M, Stack K, Kent R, Triol C, Winston A. Double blind clinical trial of remineralizing dentifrice in the prevention of caries in a radiation therapy population. *Gerodontology* 1999; 16(1):2-10.
20. Schwarz E, Chiu GKC, Leung WK. Oral health status of southern Chinese following head and neck irradiation therapy for nasopharyngeal carcinoma. *J Dent* 1999; 27(1):21-8.
21. Jansma J. Oral sequelae resulting from head and neck radiotherapy: course, prevention and management of radiation caries and other oral complications. [Thesis]. Groningen, The Netherlands: University of Groningen; 1991.
22. Dreizen S. Description and incidence of oral complications. *NCI Monogr* 1990; 9:11-5.
23. Aguiar GP, Jham BC, Magalhães CS, Sensi LG, Freire AR. A review of the biological and clinical aspects of radiation caries. *J Contemp Dent Pract* 2009; 10(4):83-9.

Recebido/Received: 12/05/10
Revisado/Reviewed: 19/07/10
Aprovado/Approved: 30/07/10

Correspondence:

M Ajanovic
University of Sarajevo
Department of Prosthodontics - Faculty of Dental Medicine
Bosnia and Herzegovina
E-mail: ajanovic@bih.net.ba