Brazilian Dental Science
Ciência Odontológica Brasileira
unesp
UNIVERSIDADE ESTADUAL PAULISTA "JÚLIO DE MESQUITA FILHO"
Instituto de Ciência e Tecnologia
Campus de São José dos Campos

CASE REPORT

doi: 10.14295/bds.2017.v20i1.1284

Multiple tooth extractions in radiotherapy patients: indications, osteoradionecrosis risk and possible oral rehabilitation: case report

Exodontias múltiplas em paciente radioterápico: indicações, risco de osteorradionecrose e possível reabilitação oral: relato de caso

Andressa Bolognesi BACHESK[1], Marcello PIACENTINI[1], Ana Luiza de Moura LIBÓRIO[1], Gustavo Jacobucci FARAH[1], Neli PIERALISI[1], Ângelo José PAVAN[1]

1 – State University of Maringa – Maringa – PR – Brazil

ABSTRACT

Osteoradionecrosis (ORN) is one of the most severe oral complications after the head and neck cancer treatment. Tooth extraction, through its traumatic stimulation, is identified as an important predisposing factor. Indications and preventive methods for carrying out these procedures in irradiated patients are questioned, thus, knowledge of appropriate protocols is essential. This article reports a case of multiple tooth extractions in a cancer patient in terminal stage whose preventive measures were taken without the occurrence of complications. Based on a literature review, this paper accounts the possible indications of this procedure, the risk of developing osteoradionecrosis, and the prevention possibilities for this sequela. In addition, this report addresses a viable oral rehabilitation alternative after this kind of surgery by using overdenture on the lower jaw teeth.

KEYWORDS

Extraction; Osteoradionecrosis; Radiotherapy; Rehabilitation.

RESUMO

A osteorradionecrose (ORN) é uma das complicações bucais mais graves pós-tratamento de câncer de cabeça e pescoço, sendo a extração dentária, por meio de sua estimulação traumática, apontada como um importante fator predisponente. As indicações e métodos preventivos para a realização destes procedimentos em pacientes irradiados são questionados, se tornando fundamental o conhecimento de protocolos adequados. O presente artigo relata um caso de exodontias múltiplas em um paciente oncológico em fase terminal, cujas medidas preventivas foram realizadas, não ocorrendo desenvolvimento de complicações. Por meio de revisão de literatura, explana as possíveis indicações deste procedimento, o risco de desenvolvimento de osteorradionecrose e as possibilidades de prevenção para esta sequela. Além disso, aborda uma alternativa de reabilitação oral viável após este tipo de cirurgia, por meio de overdenture sobre dentes em mandíbula.

PALAVRAS-CHAVE

Extração; Osteoradionecrose; Radioterapia; Reabilitação.

INTRODUCTION

Combined radiotherapy surgery has been one of the main therapeutic methods for solving the head and neck cancer cases, either as a primary therapy or together with chemotherapy. Although this association makes the cure and survival rates higher than the single treatment, the patient is more prone to side effects and orofacial complications arising from both, surgery and radiotherapy [1,2].

Among the most frequent changes resulting from radiation, there is xerostomia, mucositis, taste changes, trismus, radiation decay, and osteoradionecrosis (ORN), which is considered the most severe oral complication [1,3]. This sequela is characterized by the loss of either the lining mucosa or the mouth skin tissue with the consequent exposure of the necrotic bone tissue [4]. Clinically, they range from small asymptomatic bone exposures to aggressive acute processes that can progress to pathological fractures of the affected bone [1,4].

From the second to the fifth year after the end of radiotherapy, the most common factors that may cause ORN [1,5] are from oral dental origin, among which, the traumatic stimulation through tooth extractions is the most relevant [3,6,7]. Its exact incidence after tooth extractions in patients undergoing radiotherapy is unknown, however, some authors say that 7% is the most accurate estimate [4,8], and the risk is enhanced if chemotherapy is combined with treatment [9,10]. Such an incidence is due to the inappropriate way without defined protocols according to which tooth extractions are traditionally carried out in irradiated patients [1,5].

Therefore, it is essential to establish protocols for indicating tooth extractions and preventing osteoradionecrosis, in case they are necessary [1,4,5,11]. The aim of this study is, thus, to report a successful clinical case in which multiple tooth extractions have been planned and carried out in a cancer patient after combined radiotherapy and chemotherapy in order to prevent ORN. And by literature review, explain the possible indications for these procedures which should be performed taking into considerations various factors, not just the condition of the tooth. In addition, it shows a viable oral rehabilitation alternative through overdenture on teeth.

A CASE REPORT

A 58-year-old male patient attended the dental clinic of the State University of Maringá with dental pain complaints. He reported being a cigarette smoker for 40 years and an alcoholic person for 25 years, whose consumption he had stopped for 7 and 3 years, respectively. Diagnosed with poorly differentiated Mucoepidermoid Carcinoma in submandibular gland, this subject reported having undergone a surgical treatment with the radical neck dissection on the right region, associated with 40 radiotherapy sessions in a telecobaltotherapy unit (total of 7,200 cGy on the right and left cervicofacial areas - including maxilla and mandible, and 5000 cGy in lymphatic drainages), in addition to 4 chemotherapy sessions.

The physical and radiographic examination showed a poor oral hygiene, dental caries, endodontic impairment, missing teeth and hyposalivation, which generated xerostomia. (Figure 1) An adaptation of the oral environment was carried out by using sanitation, neutral gel fluoride application, and provisional restorations with glass ionomer cement in the impaired elements. The patient refused to use artificial saliva, thus, he was advised to increase his daily water consumption. After three months, there was a progression of caries, particularly in the cervical anterior lower teeth (Figure 2), clinically characterized by a yellow-brownish and asymptomatic color. The diagnosis of radiation decay was obtained, and gingivectomies were planned to enable restorations and keep the teeth.

Figure 1 - Initial panoramic radiograph.

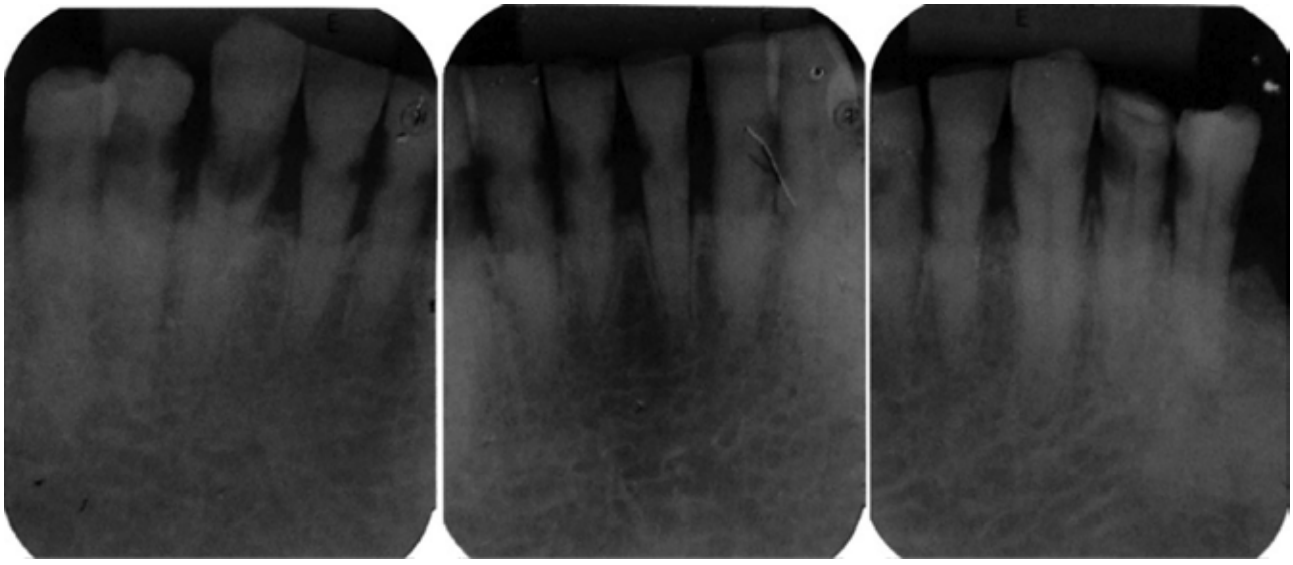

Figure 2 - Periapical radiographs showing radiation decay of the cervical anterior lower teeth.

However, in two months, the patient showed generalized dental pain and excessive worsening of the disease (Figure 3.1 and 3.2), in addition to the recurrence of cervical cancer and metastasis to lung, pancreas, spleen, oropharynx and heart. In view of such a poor cancer prognosis of a year of life, there was urgency in accomplishing the dental procedures to initiate

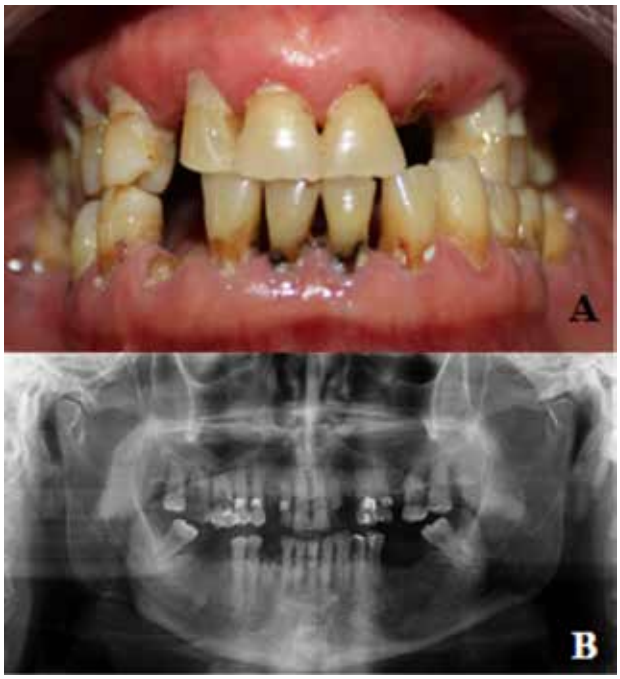

Figure 3 - a) Intra-oral image of the patient b) Panoramic radiograph showing dental patient's condition

the chemotherapy. Therefore, after showing the alternative therapies and their risks, by mutual agreement with the patient, family and dentists, multiple tooth extractions were carried out, with the exception of teeth 33 and 45, which remained relatively intact, only with initial decay. The procedure was performed under local anesthesia in an ambulatory care setting, with minimum trauma.

A pre-surgical medication protocol was carried out to increase the local vascularization and reduce the possibility of infection and sequelae, such as the ORN. According to the protocols recommended in the literature [2,4,9,13] the week previous to the procedure, Clindamycin 300mg, Pentoxifylline 400 mg and Vitamin E 1000 IU were prescribed, which remained during the postsurgical period; there was only an exchange of the antibiotic to Amoxicillin 500 mg because of the gastrointestinal adverse effects experienced. On the third day after surgery, the endodontic therapy of the elements 33 and 45 was carried out, which would become abutments, and, then, the release to start the chemotherapy. During cancer treatment, under favorable systemic clinical conditions, the rehabilitative phase was initiated with maxillary complete dentures and mandibular overdenture on the remaining teeth by using the O-ring system, which ensured a greater stability to the prosthesis. (Figure 4) This technique consisted in the preparation of dental roots, molding and manufacturing of casting metallic nucleus with spherical retainers O-ring type, cementation of nucleus and capture of o'rings in the prosthesis. (Figure 5)

Figure 4 - a) Prepared prosthesis; b) Prosthesis in function.

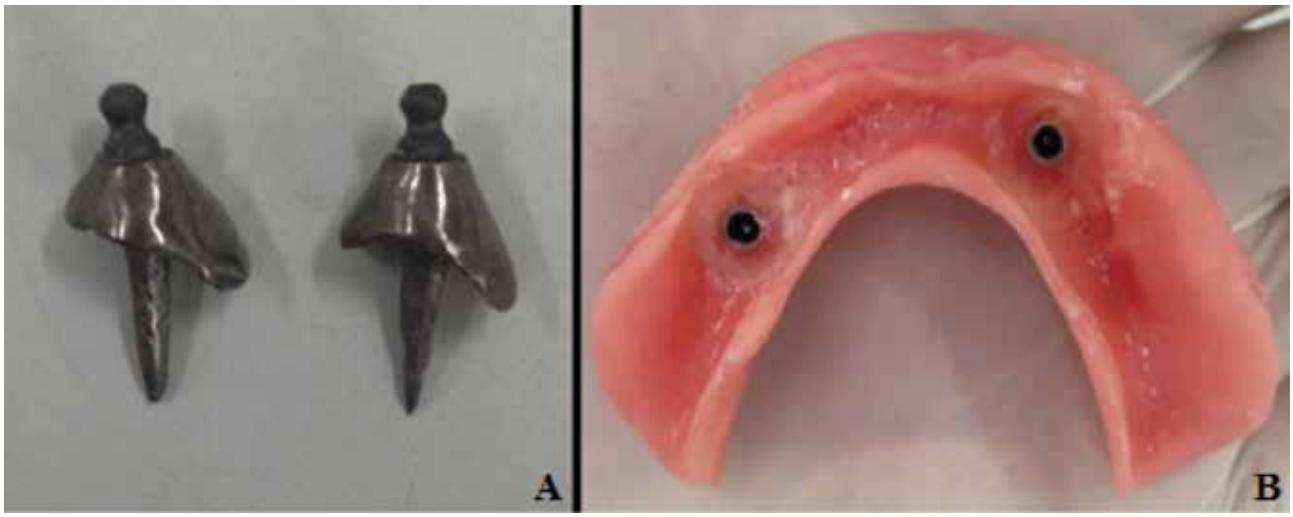

Figure 5 - a) Casting metallic nucleus; b) Capture of o'rings.

The patient remained in weekly dental monitoring for five months, and is still under observation, with monthly visits while performing weekly chemotherapy sessions. He has painful symptoms arising from cancer treatment, not of oral origin, without any severe sequelae, as the ORN.

DISCUSSION

ORN is one of the most severe oral complications after the head and neck cancer treatment [1,2,9]. The exposure of necrotic bone tissue is usually accompanied by other clinical signs and symptoms, such as oral and/or cutaneous fistulas, muscle trismus, purulent drainage, in addition to discomfort and masticatory difficulties [4,10]. The jaw is the most affected region in 2-22% of the cases, predominantly in the mandibular body [2,4,8,14]. This incidence is justified mainly by the scarce blood supply of this highly compact bone [4]. Another easier explanation is the frequency in which the jaw is included in the radiation field [4].

Such sequelae might occur spontaneously or may be trauma-induced. Its main predisposing factors are the presence of poor oral hygiene, periodontal disease, dentoalveolar abscess, extensive caries, anatomical site of the tumor, habits that irritate the oral mucosa, such as alcohol and tobacco consumption; and the traumatic stimulation due to the irritation because of prosthesis or tooth extraction [3,6,7,15]. Therefore, the decision to carry out tooth extractions in irradiated patients should be based on several factors, such as the type of treatment, radiation area, tumor prognosis [5,16] and knowledge of the radiation dose, since at doses lower than 60 Gy the risk is minimal [2,4,14].

Similarly, the dental condition of the patient should be considered [5,6]. The patients with the following conditions should undergo extractions: teeth with a poor prognosis due to advanced carious lesions, with a questionable pulp status or advanced symptomatic pulpal involvement; periodontal disease especially with advanced bone loss, residual root tips not fully covered by the alveolar bone, and a high risk for radiation caries [5,6,17]. With the exception of periodontal disease, all the other conditions were observed in the present patient, thus, the procedure was largely indicated.

The first method to prevent either future tooth extractions or ORN should occur previously to the beginning of the oncotherapy, by performing an adaptation of the oral environment in order to decrease the

infection [1,3,6,12,18]. In the present case, this adjustment was carried out, however, caries eventually evolved, largely compromising the tooth structure and oral health.

Lack of motivation might also lead to a decision to extract questionable teeth. An unmotivated patient does not make the hygiene required for dental maintenance, which may cause infections, increasing, thus, the risk of ORN [5,12,19]. This was an important factor considered in this case, since the poor oral hygiene of the patient was worsened by hyposalivation. The quality of life of the patient is another fact to be respected, and the dental treatment plan should be determined by the circumstances in which the patient is at each moment [20]. The dental conduct in view of a patient with a poor prognosis may be limited to improving the comfort by extracting the symptomatic teeth with active infection and simple prosthetic rehabilitation [20].

It is important to remember that the adverse effects potentiated by the combined chemotherapy and radiotherapy [2,10] result from the decrease in local and systemic defense, and the consequent increased susceptibility to infections [11,21,22]. Therefore, a surgical procedure should be carried out at least one week before the start of chemotherapy so that nearly 2 weeks of healing are allowed before the decrease of white blood cell levels, which, depending on the oncotherapy regimen, usually occurs between 7 to 14 days after its beginning [11,23]. Following this recommendation, the surgery was carried out 10 days prior to the start of chemotherapy, and intraoperative care was taken by addressing a minimal trauma approach [4,24,25] with an emphasis on preserving the periosteal integrity, an important vascularization site, especially in affected tissues [4,26].

In case the extraction is the decision made, other actions should be employed to prevent ORN development, and antibiotic prophylaxis is an important method used. This is the most common initiative to prevent infections in compromised tissues; penicillin and clindamycin being the most used antimicrobials [4,27]. Due to its easy administration, availability and wide acceptance among surgeons and patients, this approach has been relevant for planning and carrying out extractions in irradiated patients [4,27]. In the present case, Clindamycin 300 mg was the antibiotic used for 7 days because of its increased tissue diffusion capacity. However, it was changed to Amoxicillin 500 mg for 7 days post surgical procedure due to gastrointestinal side effects shown.

New therapeutic regimens have been developed, for example, the combined pentoxifylline and tocopherol therapy, which has been proven to be effective either in the prevention or treatment of ORN [2,4,9,10,13]. Pentoxifylline, derived from methylxanthine, increases the erythrocytes flexibility, dilates the blood vessels, and decreases the potential for platelet aggregation and thrombus formation, improving, thus, the blood flow, and reducing its viscosity [2,9,10,13]. The endogenous tocopherol has the function of eliminating reactive oxygen species generated during oxidative stress, and partially inhibiting TGF-ß1 and the procollagen gene expression, reducing, thus, the fibrosis [2,9,13,28]. These drugs, when used alone, are not able to reverse the fibrosis development, but when combined, they act synergistically and have a potent anti-fibrotic action, which reduces the fibro-atrophic changes in the tissues, and improve wound healing, by stimulating defective osteoblasts [9,13]. In the present case, the protocol recommended in literature was followed, with the prescription of Pentoxifylline 400 mg twice a day, and Tocopherol 1,000 UI (Vitamin E) once a day for 8 weeks, starting one week before the procedure [2,4,9,13,28,29].

With regard to the oral rehabilitation after multiple tooth extractions, there are broad possibilities. The treatment by installing implants is described in the literature, however, because of the high risk of developing

osteoradionecrosis in irradiated patients [30], the lower osseointegration capacity in patients under chemotherapy [31], and the high cost, the use of this technique should be carefully evaluated [30,32]. The production of conventional dentures is another more commonly used method. Its main advantage is that if the denture is well suited, it is less traumatic, and the masticatory forces are distributed around the rim [33]. However, it has the disadvantage of not fitting properly on the bone rim, which is significantly resorbed, especially in the mandibular region [32]. Therefore, the production of overdenture prostheses on teeth is a possibility of rehabilitation in this area. This technique provides a reduced bone resorption, the maintenance of both the periodontal ligament and proprioception; and the possibility of using retentive systems for the prosthesis, improving, thus, their retention and stability, consequently generating a greater satisfaction to the patient [32,34]. In the present case, a maxillary complete denture was made, as well as a mandibular overdenture on teeth 33 and 45 by using the O-ring system which provided a greater retention degree, a better stability for the prosthetic device and a more effective distribution of stress, providing a lower risk of trauma to the mandibular rim and favoring the nutrition of the patient.

CONCLUSION

Radiotherapy causes sequelae to the patient, which are enhanced if combined with chemotherapy. Osteoradionecrosis is considered the most severe complication, and it is mainly stimulated by trauma, such as tooth extractions. Therefore, the decision to carry out tooth extractions in cancer patients should consider not only their dental condition, but also other factors such as their prognosis and associated symptoms, in order to ensure better quality of life to the patient. Thus, despite the ORN present as a rare sequel, its consequences are disastrous for the patient. Therefore, despite the satisfactory outcome of this clinical case does not encourage professionals to widely treat their patients with extractions after full oncological treatment, but emphasizes the importance of professionals to be prepared if they are in rare and special situations such as this, which decision-making should be made after careful analysis of the general condition of the patient. In case this procedure is necessary, preventive measures that have proven to be effective against ORN should be taken with the use of medical protocols with antibiotics, pentoxifylline and tocopherol, and an atraumatic approach at the time of extraction. The prosthetic rehabilitation should also be taken into account; and the production of overdenture prostheses on teeth is a viable option.

REFERENCES

1. Curi MM, Kowalski LP. Osteoradionecrosis of the mandible and maxila. Rev. Bras Cir Cabeça Pescoço. 2003;(31)2:49-53.
2. Nadella KR, Kodali RM, Guttikonda LK, Jonnalagadda A. Osteoradionecrosis of the Jaws: Clinico-Therapeutic Management: A Literature Review and Update. J Maxillofac Oral Surg. 2015;14(4):891-901
3. Eliyas S, Al-Khayatt A, Porter RWJ, Briggs P. Dental extractions prior to radiotherapy to the jaws for reducing post-radiotherapy dental complications. Cochrane Database Syst Rev. 2013 Feb 28;(2):CD008857. doi: 10.1002/14651858.CD008857.pub2.
4. Nabil S, Samman N. Incidence and prevention of osteoradionecrosis after dental extraction in irradiated patients: a systematic review. Int J Oral Maxillofac Surg. 2011 Mar;40(3):229-43. doi: 10.1016/j.ijom.2010.10.005. Epub 2010 Nov 5.
5. Sulaiman F, Huryn JM, Zlotolow IM. Dental extractions in the irradiated head and neck patient: a retrospective analysis of Memorial Sloan-Kettering Cancer Center Protocols, Criteria, and end results. J Oral Maxillofac Surg. 2003 Oct;61(10):1123-31.
6. Grimaldi N, Sarmento V, Provedel L, Almeida D, Cunha S. Dental care in prevention and treatment of osteoradionecrosis: literature review. Rev Bras Cancerologia. 2005;51(4):319-324
7. Koga DH, Salvajoli JV, Alves FA. Dental extractions and radiotherapy in head and neck oncology: review of the literature. Oral Diseases. 2008;14:40–4. doi:10.1111/j.1601-0825.2006.01351.x
8. Schwartz HC, Kagan AR. Osteoradionecrosis of the mandible: scientific basis for clinical staging. Am J Clin Oncol. 2002 Apr;25(2):168-71.
9. M.P. Santhosh Kumar. Pentoxifylline and tocoferol in the treatment of osteoradionecrosis of jaw – an update. Int J Pharm Bio Sci. 2015;6(2): 551-6.
10. Lyons A, Ghazali N. Osteoradionecrosis of the jaws: current understanding of its pathophysiology and treatment. Br J

Oral Maxillofac Surg. 2008 Dec;46(8):653-60. doi: 10.1016/j.bjoms.2008.04.006. Epub 2008 Jun 17.

11. Brennan MT, Woo SB, Lockhart PB. Dental treatment planning and management in the patient who has cancer. Clin North Am. 2008 Jan;52(1):19-37, vii.

12. Silvestre-Rangil J, Silvestre FJ. Clinico-therapeutic management of osteoradionecrosis: a literature review and update. Med Oral Patol Oral Cir Bucal. 2011 Nov 1;16(7):e900-4.

13. Delanian S, Depondt J, Lefaix JL. Major healing of refractory mandible osteoradionecrosis after treatment combining pentoxifylline and tocopherol: a phase II trial. Head Neck. 2005 Feb;27(2):114-23.

14. Store G, Boysen M. Mandibular osteoradionecrosis: clinical behavior and diagnostic aspects. Clin Otolaryngol Allied Sci. 2000 Oct;25(5):378-84.

15. Kluth EV, Jain PR, Stuchell RN, Frich JC Jr. A study of factors contributing to the development of osteoradionecrosis of the jaws. J Prosthet Dent. J Prosthet Dent. 1988 Feb;59(2):194-201.

16. Niewald M, Fleckenstein J, Mang K, Holtmann H, Spitzer WJ, Rübe C. Dental status, dental rehabilitation procedures, demographic and oncological data as potential risk factors for infected osteoradionecrosis of the lower jaw after radiotherapy for oral neoplasms: a retrospective evaluation. Radiat Oncol. 2013 Oct 2;8:227. doi: 10.1186/1748-717X-8-227.

17. Zlotolow IM. Dental oncology and maxillofacial prosthetics. In: Shah JP Editor. Atlas in Clinical Oncology. Cancer of Head and Neck. 2th.ed. 2001; Hamilton (Ontário): American Cancer Society. p.376

18. Gal T, Munoz-Antonia T, Muro-Cacho C, Klotch D. Radiation effects on osteoblasts in vitro. Arch Otolaryngol Head Neck Surg. 2000 Sep;126(9):1124-8.

19. Jaco Jacobson AS, Buchbinder D, Hu K, Urken ML. Paradigm shifts in the management of osteoradionecrosis of the mandible. Oral Oncol. 2010 Nov;46(11):795-801. doi: 10.1016/j.oraloncology.2010.08.007. Epub 2010 Sep 16.

20. Joshi VK. Dental treatment planning and management for the mouth cancer patient. Oral Oncol. 2010 Jun;46(6):475-9. doi: 10.1016/j.oraloncology.2010.03.010. Epub 2010 Apr 18.

21. Vieira DL, Leite AF, Melo NS; Figueiredo PTS. Tratamento odontológico em pacientes oncológicos. Oral Sci. 2012;4(2):37-42.

22. Heimdahl A. Prevention and management of oral infections in cancer patients. Support Care Cancer. Support Care Cancer. 1999 Jul;7(4):224-8.

23. Han HS, Rybicki LA, Thiel K, Kalaycio ME, Sobecks R, Advani A, Brown S, Sekeres MA.White blood cell count nadir following remission induction chemotherapy is predictive of outcome in older adults with acute myeloid leukemia. Leuk Lymphoma. 2007 Aug;48(8):1561-8.

24. Epsteins JB, Rea G, Wong FL, Spinelli J, Stevenson-Moore P. Osteonecrosis study of the relationship of dental extractions in patients receiving radiotherapy. Head Neck Surg. 1987 Sep-Oct;10(1):48-54.

25. Lye KW, Wee J, Gao F, Neo OS, Soong YL, Poon Cy. The effect of prior radiation therapy for treatment of nasopharyngeal cancer on wound healing following extractions: incidence of complications and risk factors. Int J Oral Maxillofac Surg. 2007 Apr;36(4):315-20. Epub 2007 Jan 10.

26. Beumer J 3rd, Curtis T, Harrison RE. Radiation therapy of the oral cavity: sequelae and management, part 2. Head Neck Surg. 1979 May-Jun;1(5):392-408. Review.

27. Kanatas NA, Rogers SN, Martin MV. A survey of antibiotic prescribing by maxillofacial consultants for dental extraction following radiotherapy to the oral cavity. Br Dent J. 2002 Feb 9;192(3):157-60.

28. Azzi A, Ricciarelli R, Zingg JM. Nonantioxidant molecular functions of alpha-tocopherol (vitamin E). FEBS Lett. 2002 May 22;519(1-3):8-10.

29. Kahenasa N, Sung EC, Nabili V, Kelly J, Garrett N, Nishimura I. Resolution of pain and complete healing of mandibular osteoradionecrosis using pentoxifylline and tocopherol: a case report. Oral Surg Oral Med Oral Pathol Oral Radiol. 2012 Apr;113(4):e18-23. doi: 10.1016/j.oooo.2011.10.014.

30. Granström G. Osseointegration in irradiated cancer patients: an analysis with respect to implant failures. J Oral Maxillofac Surg. 2005 63(5):579-85.

31. Al-Mahalawy H, Marei HF, Abuohashish H, Alhawaj H, Alrefaee M, Al-Jandan B. Effects of cisplatin chemotherapy on the osseointegration of titanium implants. J Craniomaxillofac Surg. 2016 Apr;44(4):337-46. doi: 10.1016/j.jcms.2016.01.012. Epub 2016 Jan 22.

32. Fajardo RS, Zingaro RL, Monti LM. System-retained O'ring and bar-clip overdenture designs. Arch Health Invest. 2014;3(1):77-86

33. Pegoraro RA, Dettenborn HL, Bergesch V. Maxillary complete denture rehabilitation of a patient with marked maxillomandibular discrepancy: a clinical case report. RGO, Rev Gaúch Odontol. 2014;62(3)305-8

34. Kenney R, Richards MW. Photoelastic stress patterns produced by implant- retained overdentures. J Prosthet Dent. 1998 Nov;80(5):559-64.

Andressa Bolognesi Bachesk
(Corresponding address)
Av. Mandacarú, nº 1550.
CEP 87.083-240.
Maringá- PR, Brazil.
Phone/fax: +55 44 3011-9051

Date submitted: 2016 Jun 21

Accept submission: 2016 Nov 28