BioSCIENCE Review Article
DOI: https://doi.org/10.55684/2025.83.e00032

Osteorradionecrosis of the jaws: a bibliometric analysis

Osteorradionecrose dos maxilares: uma análise bibliométrica

Cinthya Luna Veloso Lima[1], Alessandra Figueredo[2]

ABSTRACT

Introduction: Initial treatment consists of antibiotics, anti-inflammatories, hyperbaric oxygenation, ultrasound, pentoxifylline combined with tocopherol and clodronate, followed by surgical resections with bone reconstruction for those requiring tooth extraction after radiotherapy.

Objective: To discuss and review articles that address the importance of understanding osteoradionecrosis of the jaw, emphasizing its etiology, clinical presentation, and treatment.

Method: Articles selected online and in print, in Portuguese, English, and Spanish, with 90% in original format and 10% revised.

Result: Twenty articles were reviewed.

Conclusion: Prevention and prior dental treatment of oral diseases before radiotherapy prevent the onset of osteoradionecrosis, bringing benefits to patients with head and neck cancer, improving their quality of life and increasing the possibility of a cure.

KEYWORDS: Osteorradionecrosis. Radiotherapy. Head and neck neoplasms.

RESUMO

Introdução: O tratamento inicial da osteorradionecrose dos maxilares consiste no uso de antibióticos, anti-inflamatórios, oxigenação hiperbárica, ultrassom, pentoxifilina associada ao tocoferol e clodronato, e a seguir as resseções cirúrgicas com a reconstrução óssea para os que precisam de exodontia após radioterapia

Objetivo: Discutir e rever os artigos que abordem sobre a importância do conhecimento da osteorradionecrose dos maxilares, enfatizando sua etiologia, clínica e tratamento.

Método: Artigos selecionados online e impressos, em português, inglês e espanhol com 90% em formato original e 10% de revisão.

Resultado: Foram revistos 20 artigos

Conclusão: A prevenção e o tratamento odontológico prévio das doenças da boca antes da modalidade de tratamento radioterápico dificultam o surgimento da osteorradionecrose, trazendo benefícios aos pacientes com neoplasias de cabeça e pescoço, dando-lhes melhor qualidade de vida e possibilidade de cura.

PALAVRAS-CHAVE: Osteorradionecrose. Radioterapia. Neoplasias de cabeça e pescoço.

Central Message

Mouth neoplasms arise from intrinsic and extrinsic factors, such as genetics, nutritional deficiencies, improper cleaning of the mouth, consumption of nitrites, nitrates, alcohol, and tobacco. Head and neck masks, on the other hand, are closely associated with smoking, alcoholism, occupational exposure, low income, and schooling. The signs and symptoms are not pathognomonic, ranging from small soft tissue ulcerations without symptoms to more severe processes with bone fractures. They greatly compromise the quality of life of their patients.

Perspective

The choice of therapeutic protocol is established according to oral manifestations. The best handling consists of prevention with elimination of oral diseases. The most indicated treatment regimens are patient awareness and education, especially with oral hygiene, reducing the appearance of other diseases; visits to the dentist; and elimination of harmful habits such as smoking and alcoholism. The therapy is appropriate to each case, being initially always clinical and, if without resolution, the variable means of treatment are both surgical and radiotherapy.

[1] *Universidade Federal de Alagoas, Maceió, AL, Brazil;*
[2] *Secretaria Municipal de Saúde de Maceió, Maceió, AL, Brazil*

Conflict of interest: None | Funding: None | Received: 10/08/2025 | Accepted: 27/10/2025 | Publication date: 28/11/2025 | Correspondence: cinthya_lunaveloso@yahoo.com.br | Associate Editor: Luiz Fernando Kubrusly

How to cite:
Lima CLV, Figueredo A. Osteorradionecrose dos maxilares: uma análise bibliométrica. BioSCIENCE. 2025;83:e00032

INTRODUCTION

Like all diseases, malignant neoplasms must be fought efficiently in order to reduce their incidence. Among those diagnosed in the world, about 6% are located in the head and neck region.[1] In Brazil, malignant diseases are a major public health problem. Those located in the head and neck occupy the sixth position (3%),[2] it usually reaches 40% in the mouth, 25% in the larynx and 20% in the other anatomical regions. Overall, there is a prevalence of squamous cell carcinoma followed by basal cell carcinoma.[3] Mouth neoplasms arise from intrinsic and extrinsic factors, such as genetics, nutritional deficiencies, inadequate cleaning of the mouth[4], consumption of nitrites, nitrates, alcohol, and tobacco.[5] On the other hand, those of the head and neck are closely associated with smoking, alcoholism, occupational exposures,[6] low income and schooling.[3]

Among the post-treatment complications is osteoradionecrosis (ORN)[7] which is one of the late complications of radiotherapy, especially frequent in the treatment of head and neck tumors.

METHOD

This is a bibliometric review using 20 articles selected according to the proposed theme. The search included full-text articles in English, Portuguese, and Spanish, from 2015 to 2020, using search strings according to the descriptors in Health Sciences (Decs) and Medical Subject Headings (Mesh), which were: "head and neck radiotherapy"; "necrosis of the jaws"; "head and neck neoplasms"; and "etiology of osteoradionecrosis". The databases used were: Capes Journals, VHL, Pubmed, Medline, Lilacs, National Cancer Institute and University of Moji das Cruzes, SP. Articles published before 2015 were excluded (Table 1).

TABLE 1 — Search strings and databases used

Search strings	CAPES	PUBMED	SCIELO	VHL	MEDLINE	LILACS
"Radiotherapy"	62	11	38	2.082	51	52
"Necrosis" AND "maxillaries"	6	4	0	0	17	0
"head cancer" AND "neck"	145	75	71	9.462	25	162
"etiology" AND "osteoradionecrosis"	2	0	1	96	0	2

RESULT

Twenty articles were included, among them 95% online and 5% printed, 90% in original format and 10% in review and their keywords (Figures 1 and 2).

Table 2 shows the themes of the articles with their respective citations and general objectives of each research.

The journals used in the publication of the articles, according to Qualis, were A1 (5%), B1 (25%), B2 (5%), B3 (15%), B4 (25%) and not informed (25%).

Table 3 shows data from publications and journals that address the theme of this article.

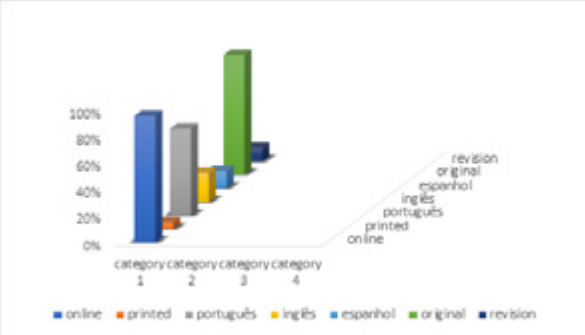

FIGURE 1 — Classification according to the categories: availability of the article (online/printed), language (Portuguese, English and Spanish) and text (original/review).

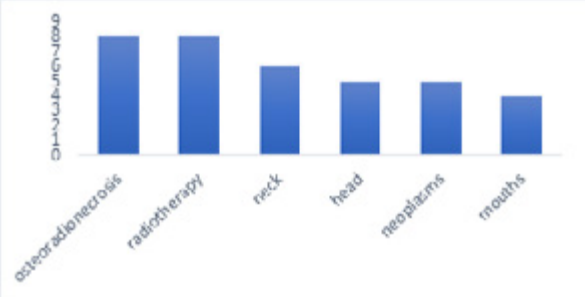

FIGURE 2 — Frequency of keywords

DISCUSSION

Head and neck radiation therapy

In the radiotherapy therapeutic modality, late injuries such as ORN are caused, due to the release of ionized electrons in the medium, causing deleterious effects to the DNA of the cells, preventing the replication of neoplastic cells and those adjacent to the tumor.[8] Radiotherapy is the most common modality for the treatment of head and neck cancer, with about 80% of cases treated.[9]

Using electromagnetic ionizing energy, radiotherapy is indicated post- or preoperatively; it should be applied in low doses and repeated sessions ensuring fewer sequelae, following protocols from 50 Gy to 70 Gy (centiGray unit of measurement), fractionated in 5 to 7 weeks 5 days a week with 2 Gy per session.[10] When this dose exceeds 66 Gy in the head and neck region, the greater the chances of triggering ORN. However, the pathophysiology of ORN is unknown and there are several theories about its appearance.[11]

ORN is a complication induced by ionizing radiation from conditions of hypoxia, hypocellularity and hypovascularization, forming from infection the bone exposure by opening in the oral mucosa, with predominance in the mandibular region, with higher bone density and less vascularization, compared to the maxilla.[8] This condition of hypovascularization promotes fibrous spaces in bone tissue, hypocellularity in blood vessels, and the replacement of connective tissue by fibrous tissue, triggering bone necrosis.[13]

The hypocellularity process causes the destruction of osteocytes and the absence of osteoblasts from the marginal bone intertwined with the inflammatory

TABLE 2 — Citations, article themes, and objective of each study[1-20]

QUOTE	ARTICLE	OBJECTIVE
Aquino et al.[1]	Epidemiological aspects of oral cancer mortality: knowing the risks to enable the early detection of communication disorders	To characterize the epidemiological aspects of oral cancer mortality in the municipality of Olinda, Brazil, from 2008 to 2012.
Ribeiro et al.[2]	Factors associated with lip and oral cavity cancer	To identify factors associated with the occurrence of primary cancer in the lip and oral cavity regions compared to other types of head and neck cancers according to demographic, socioeconomic and lifestyle data in Brazil, from 2000 to 2011.
Santos et al.[3]	Osteoradionecrosis in patients undergoing head and neck radiotherapy: case report	Perform a literature review and report a clinical case of osteoradionecrosis (ORN)
Avelar et al.[4]	Fatigue in patients with head and neck cancer undergoing radiotherapy treatment: a prospective study	To identify the frequency of fatigue symptom and affected domains in patients with head and neck cancer undergoing radiotherapy treatment, at the beginning, middle and end of treatment.
Carvalho et al.[5]	Prevention and therapeutic management of osteoradionecrosis of the jaws: a literature review	To review the literature and emphasize aspects related to the preventive and therapeutic management of osteoradionecrosis of the jaws
Rocha et al.[6]	Epidemiological characteristics of patients with head and neck neoplasms submitted to radiotherapy in Juiz de Fora-MG	To conduct an epidemiological survey on head and neck neoplasms in patients who underwent radiotherapy at a high-complexity oncological hospital in the city of Juiz de Fora, Minas Gerais, Brazil.
Carvalho et al.[7]	Head and neck cancer in Brazil	To identify the anatomical locations and histological classifications of head and neck cancers recorded in Brazil between 2000 and 2014.
Pedrosa et al.[8]	Clinical evaluation of symptoms of patients with head and neck cancer	To assess the most frequent symptoms presented by patients with head and neck cancer and associated factors
Silva et al.[9]	Osteonecrosis of the jaws associated with the use of bisphosphonates: recurrence after radiotherapy of the head and neck	To address an unprecedented case in which the recurrence of mandibular osteonecrosis was described after surgical debridement and PRP infusion in a patient who was subsequently submitted to head and neck radiotherapy for the treatment of a case of recurrence of multiple myeloma (MM)
Ortiz-Rubio et al.[10]	Dental management of oral complications as a result of cancer therapy	Update and inform the dentist about the management of patients with cancer in the head and neck region, before, during and after oncological therapy
David et al.[11]	Therapeutic and preventive management of osteoradionecrosis: an integrative literature review	To conduct an integrative literature review in order to discuss the preventive and therapeutic management of ORN
Torres et al.[12]	Pathology treated with hyperbaric oxygen therapy in the central defense hospital	To know the pathologies of patients treated with HBOT in the Autonomous Community of Madrid (CAM) and to review the scientific evidence on the subject
Ribeiro et al.[13]	Osteonecrosis of the jaws: a review and update in etiology and treatment	To review the current knowledge on the etiology and management of osteonecrosis of the jaws, both by pipeline and related to medications, in order to improve the knowledge of professionals who seek to improve the quality of life of their patients
Aricigil et al.[14]	Anti-inflammatory effects of hyperbaric oxygen on irradiated laryngeal tissues	In this study, biochemical and histopathological methods were used to investigate the efficacy of hyperbaric oxygen against the inflammatory effects of radiotherapy on blood and laryngeal tissues, when radiotherapy and hyperbaric oxygen are administered on the same day.
Moraes et al.[15]	Successful in a conservative treatment of osteoradionecrosis of the jaw: a case report and review of literature	To present a case of osteoradionecrosis in the mandible of a 58-year-old patient after tooth extraction and to explore a conservative treatment modality with a three-year follow-up
Fernandes et al.[16]	The importance of the dentist in the adverse effects on the oral cavity of head and neck cancer treatment	To analyze the participation of Hospital Dentistry at Hospital Heliópolis in a multiprofessional health team, by means of a questionnaire designed for patients undergoing head and neck cancer treatment who presented adverse effects in the oral cavity
Alves et al.[17]	Surgical approach to mandibular osteoradionecrosis caused by idiopathic fracture	To report a case of ORN resulting from an idiopathic fracture in the mandible, evidencing the diagnostic process and the therapeutic approach employed
Santos et al.[18]	Weaknesses and potentialities in the care network for patients with oral cancer in Palmas Tocantins, Brazil	To verify the knowledge of dental surgeons in the primary, secondary and tertiary care network of the municipality of Palmas, Tocantins, about the flow of care for patients diagnosed with oral cancer in the Unified Health System, from the beginning of treatment to its conclusion
Aarup-Kristensen et al.[19]	Osteoradionecrosis of the mandible after radiotherapy for head and neck cancer: risk factors and dose-volume correlations	Determine the incidence of mandibular osteoradionecrosis (ORN) after radiotherapy, possible risk factors, and mandibular dose-volume effects in a large cohort of patients with head and neck cancer (CCP)
Bellé et al.[20]	Maintenance of oral health in a patient after head and neck radiotherapy: a case report	Oral rehabilitation of a patient after head and neck radiotherapy treatment, through exodontic, restorative and prosthetic procedures, through a clinical case report

TABLE 3 — Journals used, Qualis reference, descriptors, number of pages, institutions where the research was carried out, and the references cited both national and international.

JOURNAL	QUALIS	DESCRIPTORS	PAGES	INSTITUTION	REF. NAC.	REF. INTERNAC.
Brazilian Journal of Epidemiology	B1	Oncology; Hospital Oncology Service; Oral Neoplasms; Mouth; Public health; Neoplasms.	12	National Cancer Institute (INCA)	18	18
CEFAC journal	B1	Oral Neoplasms; Mortality Records; Stomatognathic System.	8	Federal University of Pernambuco - UFPE	31	7
Latin American Journal of Nursing	A1	Nursing; Radiotherapy; Fatigue; Cancer; Quality of Life; Head and Neck Neoplasms.	9	Radiotherapy Center in a university hospital in the interior of the state of São Paulo	1	32
Federal Journal of Dentistry - Passo Fundo	B4	Tumors; Osteoradionecrosis; Radiotherapy.	6	Outpatient Specialty Service of the Unified Health System at the São Vicente de Paulo Hospital, in Passo Fundo, Rio Grande do Sul	5	14
Dental Journal of Araçatuba		Osteoradionecrosis; Radiotherapy; Jaws.	7	University of Campina Grande, Jatobá, Patos, Paraíba	8	48
HUJournal		Epidemiology; Neoplasms; Radiotherapy.	5	High complexity oncology hospital in the city of Juiz de Fora	10	3
Cuban Journal of Stomatology		epidemiology; head and neck neoplasms; database.	13	National Cancer Institute (INCA)	6	20
Advances in Nursing	B4	Symptom assessment; Oncology; Head and neck neoplasms; Inpatients	11	National Cancer Institute (INCA)	12	13
Administration and Science Journal	B1	Cancer; mucositis; trismus; xerostomy; caries by radiación; osteoradionecrosis	5	Centro Universitario de Ciencias de la Salud. Universidad de Guadalajara. Guadalajara - Mexico	0	20
Brazilian Journal of Dentistry		Osteoradionecrosis; therapeutics; prevention; Jaws.	7	Federal University of Uberlândia	3	22
Brazilian Journal of Otorhinolaryngology		Hyperbaric oxygen; Neck radiotherapy; Inflammation.	6	Necmettin Erbakan University – Turkey	0	23
Central Brazilian Journal of Dentistry	B1	Osteonecrosis; Bisphosphonates; Osteoradionecrosis; Multiple Myeloma	5	Stomatology Service of the University Center of Anápolis	0	22
Brazilian Journal of Otorhinolaryngology	B1	Osteoradionecrosis; Osteonecrosis; Therapy; Revision	7	Federal University of Santa Catarina (UFSC)	0	50
Military Health Journal	B4	Hyperbaric oxygen therapy; Radioinduced lesions	7	Autonomous Community of Madrid (CAM)	0	51
Gaucho Journal of Dentistry		Osteoradionecrosis; cone beam computed tomography; treatment.	7	São Leopoldo Mandic College	0	28
Brazilian Journal of Cancerology	B3	Osteoradionecrosis/radiotherapy; Osteoradionecrosis/therapy; Oral Neoplasms/complications; Mandibular Osteotomy; Oncology.	8	National Cancer Institute	5	20
Journal of Pathology of Tocantins	B3	Oral Neoplasms; Unified Health System; Health Care.	4	Unified Health System of the municipality of Palmas	10	0
UMC Scientific Journal	B4	Head and Neck Cancer; Radiotherapy; Chemotherapy; Oral Manifestations; Hospital Dentistry.	16	Hospital de Helióplis	18	0
REFACER Journal	B4	Head and neck cancer; Oral complications; Side effects; Radiotherapy.	18	Evangelical College of Ceres, Ceres-Goiás	35	1
Catholic Health Expression Journal	B2	Dental caries; Head and neck cancer; Radiotherapy.	9	Cascavel Oncology Center (CEONC)	15	5

REF. NAC= national references; REF. INTERNAC.=international references

process with the presence of endoarteritis, hyperemia, loss of hyalinization, hypovascularization, thrombosis and fibrosis, hindering the repopulation of bone cellular components.[8]

The pathogenesis of ORN is usually related to trauma, such as tooth extraction, ill-fitting dentures, periodontal disease, bone trauma, and endodontics.[7]

ORN Clinic

Clinically, the first step to identify it is to perform a very detailed anamnesis with physical and radiographic examinations, in addition to collecting details of the previous medical history. Generally, the patient during the anamnesis will say that he has a surgical wound from tooth extraction that has not healed for more than 3 months.[1] The symptoms and signs of ORN are: severe pain, bone exposure in the oral cavity, soft tissue ulcerations, edema, paresthesia, trismus, and radiographic changes with areas of radiopacity that move away from vital bone and radiolucidity with poor definition.[14]

These signs and symptoms are not pathognomonic, ranging from small ulcerations in the soft tissue without symptoms, to more severe processes with bone fractures that must be differentiated between merely infectious processes and tumor recurrences;13 they may also have no symptoms and be stable.[3,5,15]

Treatment of ORN

The most effective standard of care is prevention and patient awareness. This prevention occurs when diseases such as periodontitis, cavities and abscesses are eliminated before radiotherapy treatment, in addition to improving oral hygiene.[16] Endodontics procedures, restorations, tooth extractions, must be performed by dentists before the start of radiotherapy in 10 to 21 days.[1]

There is no pre-established treatment protocol; however, the more conservative ones are performed with debridement and cleaning of fetid wounds also using antibiotic therapy.[17] For treatment, antibiotics, pentoxifylline and tocopherol, mouthwash with antiseptics, hyperbaric oxygenation, use of bone proteins to increase the ability to form new bone can be used, especially in cases of reconstruction of the face and maxilla after radiotherapy. Laser light offers good results and, in diversified lesions, has promoted bone replacement in fractures, formation and biomodulation of osteoclasts, osteoblasts and osteocytes.[1] Hyperbaric oxygenation is indicated for lesions secondary to radiotherapy.[18]

Malignant oral neoplasms occupy the sixth place in incidence in the world19, corresponding to 10% of malignant tumors, 40% of which are in the oral cavity, 25% in the larynx, 15% in the pharynx, 7% in the salivary glands and about 13% in the other sites.[13]

The estimate in Brazil for the year 2010 was [4],891 new cases of mouth cancer, 4,891 in men and 1,009 in women. This estimate increased a lot for the following years, which went to 15,190 new cases, with 11,180 in men and 4,010 in women, between 2020-2022.[4] In 2015, INCA expanded the anatomical sites, including the nasal cavity and paranasal sinuses.

The factors involved in the etiology of this neoplasm are alcohol, tobacco use, sun exposure, viral infections, along with the previous occurrence of cancer and socioeconomic factors. Also, the difficulty of access to treatment and late diagnosis increases the morbidity and mortality of the disease. ORT can also present spontaneously or as an infection in the region20 preferably the mandible.[1,11]

The initial treatment, in addition to those already mentioned above, is followed by surgical resections with bone reconstruction for those who need extraction after radiotherapy.[1,11] It is also noteworthy the need for mouthwash with 0.12% chlorhexidine digluconate for 14 days, before and after surgeries and, in invasive procedures, prophylaxis with clindamycin at 300 mg 2 h before the procedure, maintaining it every 6 h for 1 week.[1]

The use of hyperbaric oxygenation combined with conservative treatment, with daily sessions and 2 atmospheric pressures for 90 min, 20 sessions before and 10 after the operation and 100% oxygenation, will improve hypoxia conditions by promoting revascularization of the irradiated tissue.[4] With this, it is possible to reach the resolution of 65% of the cases, and cure of up to 73%. Also mentioned in the literature, treatment with platelet-rich plasma is part of a treatment protocol associated with antibiotic therapy and extensive surgery, reaching 80% cure when compared to the rate of 60.6% of cases treated with ozone therapy alone. There is also photodynamic therapy that can be associated with antibiotic therapy.[20]

As a final message, the choice of the therapeutic protocol is established according to the oral manifestations following the options mentioned above[14,17], although the best management consists of prevention with elimination of oral diseases.[16] Treatment regimens are carried out with patient awareness and education, reducing the appearance of other diseases associated with visits to the dentist and eliminating harmful habits, such as smoking and alcoholism.[20]

Authors' contributions
Cinthya Luna Veloso Lima – Conceptualization, Methodology
Alessandra Almeida Silva Figueredo - Formal Analysis, Project Administration

REFERENCES

1. Carvalho LGA, Bezerra RV, Santos MVCR, Gonçales ES, Araújo Filho JCWP, Rocha JF. Prevenção e manejo terapêutico da osteorradionecrose dos maxilares: revisão de literatura. Rev Odontol Araçatuba. 2019;40(3):38-44.
2. Aquino RCA, Lima MLLT, Menezes CRCX, Rodrigues M. Aspectos epidemiológicos da mortalidade por câncer de boca: conhecendo os riscos para possibilitar a detecção precoce das alterações na comunicação. Rev CEFAC. 2015;17(4):1254-61. https://doi.org/10.1590/1982-0216201517414914
3. Carvalho LGA, Saqntiago CPL, Andrade ACM, Valença AMG, Ribeiro ILA, Castro RD. O câncer de cabeça e pescoço no Brasil. Rev Cubana Estomatol. 2018;55(3):1-13.
4. Santos RA, Cruz EZ, Araújo RO, Rosa CB, Rosa ACG. Fragilidades e potencialidades na rede de assistência aos pacientes com câncer de boca em Palmas, Tocantins, Brasil. Rev Patol Tocantins. 2019;6(2):70-3. http://dx.doi.org/10.20873/uft.2446-6492.2019v6n2p70

5. Rocha BQC, Eneas L, Oliveira RG, Junqueira RB, Verner FS. Características epidemiológicas de pacientes portadores de neoplasias de cabeça e pescoço submetidos à radioterapia em Juiz de Fora, Minas Gerais. HU Rev. 2017;43(1):71-5. https://doi.org/10.34019/1982-8047.2017.v43.2644

6. Pedrosa TM, Martins TCF, Souza ALLP, Silva DGF, Moura SF, Muzi CD, et al. Avaliação clínica dos sintomas de pacientes com câncer de cabeça e pescoço. Av Enferm. 2019;37(2):158-68. https://doi.org/10.15446/av.enferm.v37n2.73149

7. Moraes PC, Thomaz LX, Silva MBF, Junqueira JLC, Teixeira RG. Successful in a conservative treatment of osteorradionecrosis of the jaw: a case report and review of literature. RGO Rev Gaúch Odontol. 2016;64(2):212-8. https://doi.org/10.1590/1981-86372016000200143190

8. Oliveira VDP, Aires DMP. Complicações bucais da radioterapia no tratamento do câncer de cabeça e pescoço. Rev REFACER. 2018;7(1):1-18. https://doi.org/10.36607/refacer.v7i1.3323

9. Avelar JMP, Nicolussi AC, Toneti BF, Sonobe HM, Sawada NO. Fadiga em pacientes com câncer de cabeça e pescoço em tratamento radioterápico: estudo prospectivo. Rev Latino-Am Enfermagem. 2019;27:e3171. https://doi.org/10.1590/1518-8345.2813-3168

10. Bellé F, Albino FR, Cuba L. Manutenção da saúde bucal em um pós-radioterapia de cabeça e pescoço: um relato de caso. Rev Expr Catól Saúde. 2019;4(1):91. http://dx.doi.org/10.25191/recs.v4i1.2526

11. Alves LDB, Santos MTC, Menezes ACS, Heimlich F, Dias FL, Moreto MB, et al. Abordagem cirúrgica de osteorradionecrose mandibular causada por fratura idiopática. Rev Bras Cancerol. 2020;66(3):e-1020. https://doi.org/10.32635/2176-9745.RBC.2020v66n3.1028

12. Aricigil M, Dundar MA, Yucel A, Arbag H, Arslan A, Aktan M, et al. Anti-inflammatory effects of hyperbaric oxygen on irradiated laryngeal tissues. Braz J Otorhinolaryngol. 2017;84(2):206-11. https://doi.org/10.1016/j.bjorl.2017.02.001

13. Santos R, Dall'Magro AK, Giacobbo J, Lauxen JR, Dalla'Magro E. Osteorradionecrose em pacientes submetidos à radioterapia de cabeça e pescoço: relato de caso. Rev RFO. 2015;20(2):232-7.

14. Silva ECA, Sanches MB, Flores DF, Watanabe S, Yamamoto-Silva FP, Silva BS de F. Osteonecrose dos maxilares associada ao uso de bisfosfonatos: recidiva após radioterapia de cabeça e pescoço. Rev Odontol Bras Cent. 2015;24(68):49-53. https://doi.org/10.36065/robrac.v24i68.944

15. Fernandes IS, Fraga CPT. A importância do cirurgião-dentista nos efeitos adversos na cavidade bucal do tratamento oncológico de cabeça e pescoço. Rev Cient Univ Mogi Cruzes. 2019;4(1):1-16.

16. Ortiz Rubio A, López Verdín S, Ochoa Velázquez H. Manejo odontológico de las complicaciones orales como resultado de la terapia contra el cáncer. Rev ADM. 2015;73(1):6-10.

17. David EF, Ribeiro CV, Macedo DR, Florentino ACA, Guedes CCFV. Manejo terapêutico e preventivo da osteorradionecrose: revisão integrativa da literatura. Rev Bras Odontol. 2016;73(2):150-6.

18. Torres LJM, Domínguez AAR, Navarro TM, Brinquis CMA, Espigares CA, Pérez MJF. Patologías tratadas con oxigenoterapia hiperbárica en el Hospital Central de la Defensa. Sanid Mil. 2015;71(2):77-83. https://dx.doi.org/10.4321/S1887-85712015000200002

19. Ribeiro ILA, Medeiros JJ, Rodrigues LV, Valença AMG, Lima Neto EA. Fatores associados ao câncer de lábio e cavidade oral. Rev Bras Epidemiol. 2015;18(3):618-29.

20. Ribeiro GH, Chrun ES, Dutra KL, Daniel FI, Grando LJ. Osteonecrosis of the jaws: a review and update in etiology and treatment. Braz J Otorhinolaryngol. 2017;84(1):102-8. https://doi.org/10.1016/j.bjorl.2017.05.008