Evidence-based management strategies for tooth extractions in oncologic patients: a narrative review of the literature

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Abstract

***Aim*: This narrative review critically evaluates the current evidence on managing dental extractions in oncologic patients. Special focus is placed on preventive, therapeutic, and palliative extractions, considering the risks associated with antineoplastic therapies and the lack of standardized clinical protocols.**
***Materials and Methods*: A comprehensive literature review was conducted using MEDLINE via PubMed, Web of Science, and Scopus databases. The search strategy involved combining controlled vocabulary and free-text terms related to "oncologic patients," "tooth extraction," "osteonecrosis," and "palliative care." Studies involving human subjects and published in English were included. The review encompassed randomized controlled trials, cohort studies, case series, clinical guidelines, and systematic or narrative reviews published without date restrictions, with particular focus on research from the past fifteen years.**
***Results*: The analysis indicated that preventive extractions before starting chemotherapy or radiotherapy notably reduce the risk of severe complications such as MRONJ and osteoradionecrosis. However, overly aggressive extraction protocols may impair oral function and aesthetics, particularly when removing more than eight teeth. Therapeutic extractions during cancer treatment require personalized protocols that consider immunosuppression, coagulation status, and pharmacologic risk factors. In palliative care, dental extractions can help relieve pain, restore basic oral function, and improve patient comfort. Nonetheless, conservative options should be considered for high-risk patients.**
***Conclusion*: Tooth extractions in oncologic patients require individualized clinical judgment, multidisciplinary coordination, and minimally invasive techniques. Preventive extractions remain crucial, but they must be balanced with quality-of-life factors. Urgent need exists for prospective, multicenter clinical studies to develop standardized, evidence-based protocols for dental extractions in cancer care settings.**

How to Cite

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Introduction

The International Agency for Research on Cancer (IARC) estimates that cancer will become the leading cause of premature death worldwide during this century and the biggest obstacle to further increases in life expectancy. Cancer is currently one of the main causes of death in Europe, and its prevalence is expected to climb as the population ages. It is estimated that among seniors aged 65 and older, the incidence of cancer is 58% in developed countries and 40% in developing countries (1).

Cancer is a profoundly personal diagnosis that affects not only the patient but also their family and social circle. According to the GLOBOCAN database, about 18.1 million new cancer cases occurred worldwide in 2018 (2). In 2020, over 2.7 million people in the European Union were diagnosed with cancer. It is estimated that one in two EU citizens will develop cancer at some point in their lives, with roughly half surviving the disease (3). According to data from AIRTUM (Italian Association of Cancer Registries), the number of new malignant tumor diagnoses in Italy for 2024—excluding non-melanoma skin cancers—is expected not to exceed 390,000, with 214,000 new cases in men and 175,000 in women (4). Analyzing cancer prevalence based on time since diagnosis, it is estimated that in 2024, nearly half a million Italians (488,751) will be living within two years of a cancer diagnosis—the most treatment-intensive phase, accounting for 13% of all prevalent cases. Over 2.5 million people, representing 69% of all prevalent cases, will be alive more than five years after diagnosis, which is equivalent to 4.3% of the Italian population. Furthermore, those living more than ten years post-diagnosis will comprise 47% of the total (5). The projections published by Guzzinati et al. (2024) (4) indicate that by 2030, more than 4 million individuals—or 7% of Italians—will be living after a cancer diagnosis. Notably, the most significant increase is expected in the population living more than ten years post-diagnosis, rising from 2.5% of Italians in 2018 (1.4 million) to 3.5% (2 million) in 2030 (10–12).

According to the Italian National Institute of Health (Istituto Superiore di Sanità), Italy has one of the highest five-year survival rates for cancer in Europe. However, advancements in oncologic therapies have introduced a new range of side effects and complications, especially in radiotherapy and immunotherapy (13). Along with surgery and systemic treatments, radiotherapy remains a primary treatment option for head and neck cancer (14). The shift toward more aggressive cancer treatments, including combined chemo-radiotherapy protocols and high-dose chemotherapy regimens, has significantly increased the frequency, severity, and duration of oral complications. This highlights a growing need for specialized dental care in oncology patients (15).

Cancer treatments, including decreased salivary flow, altered eating habits, and reduced oral hygiene, often promote a cariogenic oral microbiota. These factors increase the risk of rapid demineralization and cavities, especially in severe and irreversible hyposalivation cases. In such patients, carious lesions frequently affect surfaces not typically involved in healthy individuals and may lead to tooth loss (13,16). Infectious complications like dental caries, odontogenic abscesses, and medication-related osteonecrosis of the jaw (MRONJ) can delay or interfere with cancer treatment, increase healthcare resource use, raise treatment costs, and decrease overall patient quality of life (17–19). Managing the side effects of cancer therapy is crucial to comprehensive care. Since each patient responds differently to treatment, continuous monitoring and timely intervention are necessary. Oral complications, in particular, must be addressed promptly to avoid jeopardizing cancer therapy or diminishing the patient's quality of life.

Furthermore, conditions such as dental caries, endodontic issues, and periodontal abscesses impair stomatognathic function and may negatively affect physical, social, and emotional well-being (20,21). Patients who develop osteonecrosis of the jaw may experience significant reductions in quality of life due to pain, dysphagia, and functional and aesthetic changes affecting diet, speech, and facial appearance (22). A study by Hong et al. (2010) (16) reported dental caries prevalence in cancer patients as 37. 3%, 24%, and 21. 4% for those treated with chemotherapy, radiotherapy, and combined therapy, respectively. Notably, the post-radiotherapy prevalence of caries increases significantly over time, reaching 55% and 74% at 5 and 7 years after treatment, respectively (23). It is also reported that most patients with oral cavity cancer had not visited a dentist in the year before diagnosis, with an average interval of 5. 5.6 years since their last dental appointment. As a result, many of these individuals present with both periodontal disease and caries, posing a challenge to achieving dental clearance within the limited timeframe before starting radiotherapy (24, 25). Before starting oncologic treatment, an oral health assessment is recommended, including the extraction of non-restorable teeth. Regular dental monitoring is also advised to detect early signs of caries and to initiate restorative treatment, delaying extraction whenever possible (13). Epstein et al. (2007) (15) state that a pretreatment dental evaluation is standard in only two-thirds of head and neck cancer patients receiving radiotherapy, one-third of patients undergoing hematopoietic stem cell transplantation, and one-fifth of cancer patients. Preventive oral care instructions are provided to only about a third of chemotherapy or stem cell transplant recipients and to fewer than half of head and neck cancer patients. Significant disparities in access to oral care among cancer patients across healthcare facilities remain evident (22). This narrative review aims to critically examine the existing literature regarding managing dental extractions in cancer patients, identify common clinical protocols, and assess the impact of antineoplastic therapies on the risk of post- extraction oral complications.

Materials e Methods

This narrative review was conducted to synthesize the available scientific literature on the indications, timing, and protocols related to dental extractions in oncologic patients. Special focus was placed on oral surgical interventions' preventive, therapeutic, and palliative aspects within cancer care. The selection of sources followed a rigorous and structured methodology, though not limited by the strict guidelines of systematic reviews, allowing for a broader and more interpretive synthesis of current knowledge. An extensive search was conducted to find relevant literature across three major biomedical databases: MEDLINE via PubMed, Web of Science, and Scopus. The search strategy was designed to include a wide range of studies using controlled vocabulary and free-text terms. The Boolean string combined terms such as "oncology," "cancer patient," and "oncologic patients" with keywords like "dental extraction," "tooth extraction," "oral surgery," and "exodontia." These were further linked with complication-specific terms including "osteoradionecrosis," "medication-related osteonecrosis," "MRONJ," and "osteonecrosis of the jaw," as well as care-related terms such as "oral management," "dental care," "dental treatment," "palliative care," and "end-of-life care."

No restrictions were set on the publication date to ensure historical context. However, the focus was on studies published in the last fifteen years, reflecting the evolution of cancer treatments and their effects on oral health. Only articles in English involving human subjects were eligible. The selected studies included various scientific contributions, such as randomized controlled trials, cohort studies, observational research, clinical case series, systematic and narrative reviews, and evidence-based clinical guidelines. Abstracts without full texts, in vitro and animal studies, non-English publications, and studies not directly related to oral surgical management in cancer patients were excluded from the final review. The reference lists of all included articles were manually checked to find additional relevant studies. After searching and screening, a qualitative analysis was conducted. The literature was critically evaluated to identify key clinical challenges and current evidence regarding dental extractions in cancer patients. This included preventive extractions before cancer treatments, therapeutic extractions due to infection or pain during treatment, and palliative extractions to improve quality of life in terminal stages. Additional focus was given to managing risks such as osteoradionecrosis and medication-related osteonecrosis of the jaws, as well as the effects of immunosuppression and systemic weakness. Throughout the process, special attention was paid to the lack of universally accepted protocols and the importance of personalized treatment plans developed through teamwork among oncologists, oral surgeons, and palliative care specialists.

Results

Preventive Extraction

A 1989 National Institutes of Health (NIH) consensus conference on the "Oral Complications of Cancer Therapies" recommended oral health evaluation and management for patients preparing to undergo oncologic treatments (15). By 2000, a report from the U.S. Department of Health and Human Services advised including an oral examination as a standard part of general medical assessments and referring patients to dental professionals for primary and secondary preventive care before any medical or surgical cancer treatment that could affect the oral tissues, such as chemotherapy or head and neck radiotherapy.

A 2018 evidence-based guideline highlighted that patients preparing for or undergoing cancer treatment should receive a dental evaluation, preventive counseling, and necessary treatments (1). Partial dental assessments and treatment protocols performed before chemotherapy or hematopoietic stem cell transplantation—such as addressing moderate to severe dental issues—have been associated with significantly lower rates and severity of odontogenic complications during cancer therapy (23).

Dental treatment should ideally be completed before starting chemotherapy and/or radiotherapy, avoiding procedures with a high risk of failure based on initial dental health or cancer status. In particular, dental extractions should be done before the start of radiotherapy (1,24). Supporting the preventive benefit of extractions, it has been shown that the incidence of osteonecrosis decreases in patients who undergo comprehensive dental management before radiotherapy (15,22).

Pre-existing inflammatory dental disease at the start of cancer treatment appears to contribute to the development of medication-related osteonecrosis of the jaw (MRONJ) in up to 50% of cancer patients. Hasegawa et al. (2021) reported that 97.4% of patients who developed MRONJ due to denosumab had pre-existing inflammation, with apical periodontitis identified as a significant risk factor.

Dental procedures should be scheduled based on the available time before starting cancer treatment, avoiding complex procedures that could delay oncologic care and favoring quick, definitive treatments such as extractions (1). Reasons for pre-treatment extractions include caries, odontogenic infections, periodontal disease, retained root fragments, and partially impacted third molars. The concern with third molars is due to their frequent deterioration over time and their location within radiation hotspots, which makes them more susceptible to osteoradionecrosis.

Pre-radiotherapy extractions are advised to eliminate oral infectious sources and reduce the risk of radiation-induced bone necrosis. They also aim to prevent post-radiotherapy extractions, which are technically difficult and closely associated with osteoradionecrosis (26,27). Treatments with uncertain outcomes that need multiple sessions or long healing times should be avoided, as they may raise the risk of complications after cancer therapy begins. Unlike in healthy people, where saving the tooth is the main goal, oncologic patients have a higher chance of failure and complications, making extraction a faster and more definitive option.

Nevertheless, overly aggressive extraction protocols should be avoided. For example, removing more than eight teeth before cancer therapy has been associated

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with a lower quality of life (28). With improved prognosis and longer survival rates for cancer patients thanks to modern treatments, it is also important to consider functional and aesthetic needs. Extractions that affect chewing or appearance can impair social interactions and nutrition. Generally, maintaining at least 21 natural teeth is necessary for adequate oral function. Removing additional teeth beyond this number can directly impair oral function (29). However, current evidence still indicates that pre-treatment extractions offer significant protection against serious complications like osteoradionecrosis, which outweigh the disadvantages of tooth loss.

Deciding which and how many teeth to extract before starting cancer treatment is complex. This task becomes even more challenging due to the higher rates of cavities and gum disease among cancer patients compared to the general population (30,31). Schuurhuis et al. (2011) found that about 75% of patients undergoing pre-radiotherapy dental screening had oral infection sites requiring treatment, with an average of 7.7 teeth extracted per patient, highlighting the poor oral health in this group.

Allowing sufficient healing time before starting oncologic therapy is crucial to prevent complications that extractions aim to avoid. Whenever possible, osteotomy procedures should be avoided during extractions, especially in candidates for head and neck radiotherapy. A healing period of at least two weeks appears adequate for epithelial proliferation to seal the post-extraction socket and prevent necrosis (22).

Meta-analyses have highlighted difficulties in applying a structured preventive approach in oral care for cancer patients, showing that decisions about pre-treatment extractions often rely on clinician experience rather than evidence-based guidelines (22).

Finally, extractions may sometimes be necessary before surgically removing oral cancers to improve access or facilitate osteotomies. However, teeth directly involved in the tumor should not be removed to prevent local and systemic tumor spread.

Therapeutic Extraction

Proper oral care during and after oncologic treatment significantly decreases the severity and duration of oral complications and supports overall therapy success (32). Therefore, compromised and symptomatic teeth should be extracted promptly following proper clinical protocols to relieve pain, eliminate infection, prevent worsening complications (such as jaw osteonecrosis), and avoid interruptions in oncologic treatment or decline in the patient's quality of life (33).

Multiple risk factors must be considered when performing a dental extraction in oncologic patients, including immune dysfunction and coagulation abnormalities, as well as risks of MRONJ and osteoradionecrosis. Some extractions can be performed using standard protocols, while others require specific clinical, pharmacologic, and surgical precautions or may be temporarily contraindicated. Additionally, oncologic patients often experience delayed healing and increased susceptibility to infections, regardless of other comorbidities (34).

As survival rates and life expectancy for cancer patients increase, the need for extractions in this group is also rising, requiring specific protocols. The dental or maxillofacial surgeon performs extractions correctly and understands the risks and indications to preserve or improve the patient's quality of life.

Following extraction, regular postoperative monitoring, such as weekly checks for 6–8 weeks, is recommended to ensure complete healing.

Palliative Extraction

According to the European Code of Cancer Practice, patients can access optimal palliative and supportive care at all stages of their cancer journey. Oral health, which is often overlooked in this population, must be prioritized. Dental extractions may be needed for immediate symptom relief in patients with poor prognoses when pain, infection, or unresponsive oral lesions are present.

In this context, extractions help reduce pain and improve feeding and communication skills. In cases of incurable cancer, nutritional care has been shown to greatly influence patient and caregiver well-being, as well as oncologic outcomes (35).

The prevalence of dental caries in patients with advanced cancer ranges from 20% to 51% (36). In terminal-stage cancer patients receiving only palliative care, comprehensive dental treatment planning is usually discontinued in favor of urgent, symptom-relieving procedures (37,38). Palliative dentistry—care for patients with progressive and advanced disease who have compromised oral function—has become an ethical and moral obligation for dental professionals (59).

Tooth extraction is crucial for reducing chronic oral pain and maintaining proper nutrition. The dentist plays an important role in the multidisciplinary palliative care team (26). People with terminal dentition often experience advanced disease. Full-mouth dental clearance can serve as a palliative measure, removing oral pathology and enhancing comfort. However, such decisions must carefully weigh the patient's remaining quality of life. Risks and benefits should be thoroughly discussed with patients and their families (27).

Although extraction is generally the most definitive method to treat oral pathology in terminal oncologic patients, alternatives may be considered for those at high risk of post-surgical complications. These alternatives include temporary restorative procedures, non-definitive endodontic therapy, caries excavation, or glass ionomer or calcium hydroxide-based restorations (27).

Before proceeding with any extraction, clearly communicate with the oncology team, patient, and caregivers. A detailed medical history must be reviewed to prevent serious complications (e.g., osteonecrosis, hemorrhage, sepsis) that could further diminish the patient's quality of life more than the dental issue.

Discussion

Tooth extraction poses a high risk for oncologic patients because of their weakened health caused by systemic or local cancer treatments. Oncologic

therapies—including chemotherapy, radiotherapy, and antiresorptive or antiangiogenic drugs—may cause serious oral complications that heavily influence dental treatment planning. Therefore, dental extraction should only be carried out after a multidisciplinary assessment and a careful evaluation of risks and benefits based on the latest evidence.

Multiple studies demonstrate that performing dental extraction before high-intensity oncologic therapy is a prudent preventive measure, as it eliminates potential sources of infection that could cause serious complications during neutropenia or immunosuppression. Hasegawa et al. (2021), in a retrospective study of denosumab-treated patients, found that 97.4% of those who developed MRONJ had pre-existing inflammation, with apical periodontitis identified as the primary risk factor (39). These findings support longstanding recommendations such as the NIH's 1989 guidelines, which stress the importance of oral evaluation prior to oncologic treatment (40).

Nevertheless, aggressive extraction protocols should be avoided. Schuurhuis et al. (2011) reported an average of 7.7 extractions per patient in pre-radiotherapy settings, indicating poor oral health but raising concerns about functional and aesthetic outcomes (23). Recent studies suggest that extracting more than eight teeth is linked to a significant decline in quality of life, affecting chewing, speech, and psychosocial well-being (41). Surpassing the minimum functional dentition threshold of 21 teeth is common in such cases, emphasizing the need for more conservative options (42).

MRONJ remains the most feared complication in cancer patients treated with bisphosphonates or denosumab, with the risk increasing due to traumatic extractions, untreated periapical infections, and concurrent corticosteroid use (24,25). While some guidelines (e.g., SICMF-SIPMO) recommend temporarily stopping medication ("drug holiday"), there is no definitive evidence. Instead, a move toward personalized treatment planning is gaining ground, based on pharmacologic history, systemic condition, and specific agents used.

Surgical risk should be minimized when performing therapeutic extractions to manage acute infections, fractures, or pain. Extractions should be delayed in cases of severe neutropenia (<1000 neutrophils/ mm^3), thrombocytopenia, or active infection until hematologic parameters stabilize (13). Minimally invasive protocols, avoidance of osteotomies, and primary wound closure are crucial for reducing MRONJ and osteoradionecrosis (43). Antibiotic prophylaxis is advised for immunocompromised patients, as recommended by Elad et al. (2017) and supported by transplant literature (13).

Timely communication with the oncologist and the multidisciplinary team is vital. Informed consent and active postoperative follow-up until complete mucosal healing (2–8 weeks) are essential (14).

In the palliative setting, the dental approach shifts to symptom management. The European Cancer Organisation recommends early, multidisciplinary palliative care, including oral health management. Extractions at this stage help reduce pain, improve feeding, and support verbal communication (44). As de Oliveira et al. (2020) reported, extractions are among the most common interventions in hospitalized patients with hematologic and head and neck cancers, significantly improving comfort (17). However, clinical and prognostic evaluation is essential before performing an extraction. Conservative options such as temporary restorations or minimally invasive endodontic therapy should be considered when surgical risks outweigh the potential benefits (45).

Conclusion

Within this narrative review, tooth extraction in oncologic patients is a critical clinical procedure that requires individualized decision-making based on interdisciplinary assessment and the latest evidence. Preventive extractions before initiating cancer therapy can greatly reduce serious oral complications, especially medication-related and radiation-induced osteonecrosis. However, an overly aggressive approach to extractions may harm long-term oral function and quality of life, highlighting the importance of maintaining a functional dentition whenever possible. Therapeutic and palliative extractions must carefully consider the patient's overall health, blood counts, and medication use. Protocols that reduce surgical trauma, provide proper antimicrobial coverage, include close postoperative follow-up, and involve coordination with oncology teams are vital for patient safety and continuous treatment.

The lack of universally accepted clinical guidelines highlights a significant gap in current research. More prospective, multicenter clinical studies are needed to develop validated protocols for the timing, indications, and management of dental extractions in cancer patients across preventive, therapeutic, and palliative settings.

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