MULTIDISCIPLINARY ORAL REHABILITATION AFTER ORAL CANCER TREATMENT: CURRENT EVIDENCE, CHALLENGES, AND FUTURE DIRECTIONS

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ABSTRACT

The paper analyzes multidisciplinary oral rehabilitation after oral cancer treatment, with emphasis on the functional, aesthetic, and psychosocial recovery of patients. Oncological treatment — surgery, radiotherapy, chemotherapy, or combinations of these — may produce major anatomical defects involving the maxilla, mandible, tongue, palate, oral mucosa, salivary glands, and facial soft tissues. These changes affect mastication, swallowing, speech, facial aesthetics, oral comfort, and quality of life.

Oral rehabilitation should not be considered a secondary or strictly cosmetic intervention, but an essential component of oncological care. The paper emphasizes that treatment success depends on collaboration among prosthodontists, oral and maxillofacial surgeons, oncologists, speech therapists, swallowing therapists, physiotherapists, dietitians, dental hygienists, and mental health specialists.

The main rehabilitation methods include conventional removable prostheses, maxillary obturators, maxillofacial prostheses, implant overdentures, and fixed or removable implant-supported restorations. Obturators are important after maxillectomy because they restore the separation between the oral and nasal cavities, improving speech, swallowing, and facial support. In mandibular defects, implants can increase prosthesis stability and masticatory efficiency, especially when the altered anatomy does not allow good conventional retention.

Radiotherapy is identified as one of the greatest clinical challenges. It can cause xerostomia, fibrosis, trismus, mucosal fragility, impaired healing, radiation caries, and a risk of osteoradionecrosis. These effects reduce prosthesis tolerance, affect implant survival, and require long-term monitoring, strict hygiene, fluoride therapy, and regular prosthetic adjustments.

The paper also highlights the role of digital technologies, such as CBCT, intraoral scanning, CAD/CAM, surgical guides, and 3D printing. These allow more precise planning, faster prosthesis fabrication, and better integration between surgical and prosthetic teams. An important example is the fabrication of digitally planned immediate obturators after partial maxillectomy, which may reduce postoperative functional disability.

The limitations of the current literature include small sample sizes, heterogeneous studies, short-term follow-up, lack of standardized quality-of-life measures, and difficulties in comparing defect types and treatment methods. Future directions include the use of artificial intelligence, tele-rehabilitation, biomaterials, regenerative medicine, and the development of standardized rehabilitation protocols.

Key words: oral cancer; oral rehabilitation; multidisciplinary care; prosthetic rehabilitation; implant-supported prostheses; obturator prosthesis.

INTRODUCTION

Oral cancer remains a major global health problem and is frequently associated with substantial morbidity even after successful oncological treatment. Most malignant tumors of the oral cavity are

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squamous cell carcinomas, and their management often requires surgery, radiotherapy, chemotherapy, or combined treatment approaches [1,2]. Although these interventions are essential for disease control and survival, they may produce complex anatomical and functional defects involving the maxilla, mandible, tongue, palate, oral mucosa, salivary glands, and facial soft tissues. As a result, survivors may experience impaired mastication, swallowing dysfunction, altered speech, trismus, xerostomia, facial asymmetry, esthetic compromise, and reduced social participation [2,3].

The consequences of oral cancer treatment extend beyond tissue loss. Surgical resections such as maxillectomy, mandibulectomy, or glossectomy may disrupt the continuity of oral structures and compromise basic oral functions. Radiotherapy can further complicate rehabilitation by causing fibrosis, mucosal fragility, xerostomia, reduced vascularity, impaired wound healing, and increased risk of osteoradionecrosis [1,4]. These complications may negatively influence denture tolerance, implant survival, prosthesis stability, and long-term oral comfort. Therefore, oral rehabilitation should not be viewed as a secondary or purely cosmetic intervention, but as an essential part of comprehensive cancer care.

Current evidence suggests that oral rehabilitation can improve functional outcomes and quality of life in patients treated for oral cancer [1]. Prosthetic options include conventional removable prostheses, obturators, maxillofacial prostheses, implant-retained overdentures, and fixed or removable implant-supported restorations. In maxillary defects, obturator prostheses remain important for restoring separation between the oral and nasal cavities, improving swallowing, speech, and facial support [5]. In mandibular defects, implant-retained prostheses may improve retention and stability, particularly when conventional dentures are compromised by altered anatomy, reduced neutral zone, impaired tongue function, or poor load-bearing tissues [6].

Recent developments in digital dentistry have expanded the possibilities of oral rehabilitation. Cone-beam computed tomography, intraoral scanning, CAD/CAM design, surgical guides, and three-dimensional printing allow more precise planning and earlier prosthetic intervention, including immediate obturator placement after maxillectomy [5]. However, rehabilitation outcomes remain highly variable because patients differ in tumor location, defect size, reconstructive method, radiotherapy exposure, dentition status, psychological adaptation, and access to specialist care.

For these reasons, oral rehabilitation after oral cancer treatment requires a multidisciplinary approach involving prosthodontists, oral and maxillofacial surgeons, oncologists, speech and swallowing therapists, physiotherapists, dental hygienists, dietitians, and mental health professionals. This literature review examines current evidence, clinical challenges, and future directions in multidisciplinary oral rehabilitation after oral cancer treatment.

Aim of the review

The aim of this literature review is to evaluate current evidence regarding multidisciplinary oral rehabilitation after oral cancer treatment. Particular emphasis is placed on functional recovery, prosthetic and implant-based rehabilitation, digital technologies, radiotherapy-related challenges, psychosocial outcomes, and future developments in patient-centered rehabilitation care.

More specifically, this review seeks to analyze how different rehabilitative strategies contribute to the restoration of mastication, swallowing, speech, esthetics, oral comfort, and quality of life in patients treated for oral cancer. It also aims to examine the clinical limitations that may influence rehabilitation outcomes, including

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surgical defect characteristics, reconstructive procedures, radiotherapy-induced tissue changes, implant survival concerns, access to digital technologies, and the need for long-term multidisciplinary follow-up.

By synthesizing evidence from systematic reviews, clinical studies, narrative reviews, and selected case reports, this review aims to provide a structured overview of current rehabilitation approaches and to identify ongoing challenges and future directions in the management of oral cancer survivors.

Research questions

This literature review is guided by research questions that reflect the multidimensional nature of oral rehabilitation after oral cancer treatment. Because rehabilitation outcomes are influenced by surgical defects, radiotherapy-related tissue changes, prosthetic design, implant feasibility, digital planning, functional therapy, and psychosocial recovery, the review addresses both clinical and patient-centered aspects of care.

The following research questions guide this review:

What are the main functional and esthetic impairments experienced by patients after oral cancer treatment?

Which prosthetic and implant-based rehabilitation approaches are currently used in patients treated for oral cancer?

How do radiotherapy and reconstructive surgery influence oral rehabilitation outcomes?

What role do digital technologies play in improving rehabilitation planning, prosthetic design, and prosthetic delivery?

How does oral rehabilitation affect quality of life, psychosocial recovery, and social reintegration?

What are the main limitations in the current evidence, and what future directions are emerging in multidisciplinary oral rehabilitation after oral cancer treatment?

Functional and anatomical consequences of oral cancer treatment

Oral cancer treatment frequently produces complex functional and anatomical impairments that persist beyond the phase of tumor control. Surgical resection, radiotherapy, chemotherapy, and reconstructive procedures may alter the integrity of the maxilla, mandible, tongue, palate, floor of the mouth, salivary glands, dentition, and facial soft tissues. These changes affect not only oral function but also nutrition, communication, appearance, social interaction, and psychological well-being. Therefore, understanding the consequences of treatment is essential for planning individualized oral rehabilitation.

Surgical treatment is often necessary to obtain oncological clearance, but it may result in the loss of hard and soft tissues that are essential for mastication, swallowing, and speech. Procedures such as maxillectomy, mandibulectomy, and glossectomy can create defects that disturb occlusion, reduce prosthetic support, impair bolus control, and alter articulation. Maxillary defects may create communication between the oral and nasal cavities, leading to nasal regurgitation, hypernasal speech, swallowing difficulty, and impaired facial support. Mandibular resections may compromise jaw continuity, occlusal stability, tongue space, and masticatory efficiency. Tongue resections are particularly significant because tongue mobility is central to speech articulation, food manipulation, bolus formation, and swallowing.

Functional impairment after oral cancer treatment commonly involves mastication, swallowing, and speech. Saini et al. emphasized that surgery, radiotherapy, and chemotherapy can significantly impair chewing, swallowing, speaking, and facial esthetics, while oral rehabilitation aims to restore these domains through dental prostheses, implants, speech therapy, and other rehabilitative approaches [1]. Putra et al. similarly reported that oral cancer survivors frequently experience long-term impairments in speech, swallowing,

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mastication, and esthetics, supporting the need for rehabilitation as a core component of survivorship care [2].

Radiotherapy introduces additional complications that may worsen rehabilitation outcomes. Radiation-induced xerostomia reduces salivary flow, affecting oral comfort, denture retention, swallowing, taste, and mucosal protection. Fibrosis may limit tissue mobility and contribute to trismus, making oral hygiene, prosthesis insertion, dental treatment, and nutrition more difficult. Reduced vascularity and impaired healing increase the risk of mucosal ulceration and osteoradionecrosis, particularly when prosthetic loading or implant placement is considered. Recent reviews also identify radiotherapy as a factor associated with poorer mouth opening, swallowing complaints, mucosal discomfort, and reduced implant survival in some patient groups [1,8].

The esthetic consequences of treatment are also clinically important. Facial asymmetry, cheek collapse, lip incompetence, scar contracture, lack of lip support, and altered smile dynamics can affect self-image and social confidence. Hessloehl et al. described a patient treated for advanced oral squamous cell carcinoma who presented with trismus, impaired mastication, facial asymmetry, cheek collapse, and lower lip changes after mandibulectomy, fibula free flap reconstruction, and radiochemotherapy [3]. This illustrates that oral rehabilitation must address both intraoral function and extraoral appearance.

These functional and anatomical consequences are highly variable. Outcomes depend on tumor site, defect size, remaining dentition, type of reconstruction, radiotherapy exposure, soft-tissue quality, neuromuscular adaptation, and patient motivation. As a result, rehabilitation planning must begin with a detailed assessment of anatomical loss, functional impairment, oral environment, psychosocial needs, and long-term maintenance capacity.

Principles of multidisciplinary oral rehabilitation

Oral rehabilitation after oral cancer treatment should be planned as a multidisciplinary process rather than as an isolated prosthetic procedure. The functional deficits that follow surgery, radiotherapy, chemotherapy, and reconstructive treatment are rarely limited to missing teeth or tissue defects alone. They often involve mastication, swallowing, speech, mouth opening, salivary function, facial appearance, oral hygiene, nutrition, and psychosocial adaptation. For this reason, rehabilitation requires coordination between oral and maxillofacial surgeons, prosthodontists, restorative dentists, oncologists, speech and swallowing therapists, physiotherapists, dietitians, dental hygienists, psychologists, and nursing staff.

A central principle is early integration of rehabilitation into the cancer pathway. Rehabilitation planning should ideally begin before ablative surgery, not months after treatment has finished. Preoperative assessment allows clinicians to evaluate the expected defect, remaining dentition, occlusion, bone availability, need for reconstruction, radiation field, oral hygiene status, and the likely prosthetic requirements. This is particularly important when implant placement, obturator design, or free-flap reconstruction is being considered. Virtual surgical planning and prosthetically driven treatment planning can help align oncological resection, reconstructive surgery, and future prosthetic rehabilitation.

The timing of rehabilitation can be divided into preoperative, immediate, interim, and definitive phases. The preoperative phase includes dental assessment, extraction planning, oral hygiene optimization, fluoride prevention, patient counseling, and discussion of prosthetic possibilities. The immediate phase may include surgical obturators, immediate obturator prostheses, or early

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implant placement when clinically appropriate. The interim phase focuses on healing, tissue stabilization, speech and swallowing support, nutritional adaptation, and temporary prosthetic restoration. The definitive phase involves long-term prosthetic or implant-supported rehabilitation once the defect and soft tissues are sufficiently stable.

Individualization is essential because oral cancer patients vary widely in defect type, tumor location, remaining dentition, radiotherapy exposure, reconstructive method, manual dexterity, financial resources, motivation, and psychological readiness. A technically ideal prosthesis may fail clinically if the patient cannot insert, clean, tolerate, or maintain it. Therefore, treatment planning should balance function, esthetics, comfort, hygiene, cost, expected survival, recurrence monitoring, and patient preference.

Preventive and maintenance care are also core principles. Radiotherapy-related xerostomia, mucosal fragility, caries risk, trismus, and osteoradionecrosis risk require long-term monitoring. Fluoride trays, meticulous oral hygiene instruction, caries management, prosthesis adjustment, soft-tissue surveillance, and regular recall visits should be incorporated into the rehabilitation plan.

Finally, rehabilitation should include psychosocial and quality-of-life goals. The ability to eat, speak, smile, and appear in public with confidence directly affects social reintegration and emotional recovery. Therefore, successful rehabilitation should not be measured only by prosthesis survival or implant retention, but also by patient-reported outcomes, comfort, communication, nutrition, self-image, and participation in daily life.

Prosthetic rehabilitation

Prosthetic rehabilitation is one of the central components of oral rehabilitation after oral cancer treatment. Its purpose is not limited to replacing missing teeth; it also aims to restore oral separation, support facial tissues, improve mastication, assist speech and swallowing, protect vulnerable tissues, and enhance patient confidence. The choice of prosthetic approach depends on the location and extent of the defect, remaining dentition, soft-tissue quality, bone availability, reconstructive method, history of radiotherapy, manual dexterity, hygiene capacity, cost, and patient expectations.

Conventional removable prostheses remain important, particularly for patients who are not suitable candidates for implant therapy or extensive reconstructive procedures. Partial or complete removable dentures may restore occlusal contacts, improve facial support, and assist mastication. However, conventional dentures can be difficult to retain in patients with major anatomical defects, scarred mucosa, xerostomia, reduced vestibular depth, limited mouth opening, or poor load-bearing tissues. These limitations are especially relevant after radiotherapy, where mucosal fragility, fibrosis, xerostomia, and reduced healing capacity can compromise comfort and prosthesis tolerance.

Obturator prostheses are particularly important after maxillectomy. By closing the communication between the oral and nasal cavities, obturators can improve swallowing, reduce nasal leakage, improve speech resonance, and restore facial support. Their success depends heavily on retention, stability, extension into the defect, weight, comfort, and the availability of remaining teeth or anatomical undercuts. Saini et al. reported that obturator retention and stability are critical factors influencing quality of life in patients rehabilitated after maxillary defects [1]. However, obturator rehabilitation is not universally successful. Large defects, limited residual dentition, irradiated tissues, and poor mouth opening may reduce effectiveness and increase patient burden.

Mandibular prosthetic rehabilitation presents different challenges. Segmental mandibulectomy may cause mandibular deviation, altered occlusion, reduced

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denture-bearing area, impaired tongue control, and loss of neuromuscular coordination. In reconstructed mandibles, especially after fibula free flap reconstruction, prosthetic planning must account for altered bone height, soft-tissue bulk, skin paddle characteristics, implant position, vestibular depth, and access for hygiene. Removable prostheses may be preferred in some reconstructed patients because they are easier to clean and adjust than complex fixed restorations. Arbelaez-Bonozo et al. described the use of a removable implant-supported overdenture in a mandibular oncologic patient, selecting this approach partly because it allowed better hygiene control in a patient with unfavorable local and behavioral conditions [7].

Implant-supported overdentures and implant-retained prostheses can improve prosthetic retention, stability, masticatory efficiency, and patient satisfaction compared with conventional removable prostheses. They are especially valuable when remaining anatomy provides inadequate support. However, implant-based prosthetic rehabilitation requires careful evaluation of bone quality, radiation exposure, soft-tissue condition, surgical history, prosthetic space, hygiene ability, and recurrence surveillance. Malgaj et al. reported a prosthetically driven approach for maxillary rehabilitation with an implant-supported overdenture after ablative surgery and free flap reconstruction, emphasizing the importance of precise implant planning when bone availability is limited [6].

Maxillofacial prostheses may also be required when oral cancer treatment produces extraoral defects involving the nose, orbit, cheek, or other facial structures. These prostheses contribute to appearance, tissue protection, and psychosocial reintegration. Although they may not fully restore natural anatomy or function, they can reduce visible disfigurement and improve confidence in social interactions.

Prosthetic rehabilitation must be individualized. No single prosthesis is ideal for all oral cancer patients. The best option is the one that restores function and esthetics while remaining tolerable, cleanable, maintainable, and realistic for the patient's clinical and personal circumstances.

Implant-based rehabilitation

Implant-based rehabilitation has become an important option for restoring oral function after oral cancer treatment, particularly in patients whose anatomy does not allow stable conventional prostheses. Surgical resection, flap reconstruction, scar formation, reduced vestibular depth, altered occlusion, xerostomia, and impaired tongue control can all reduce the retention and comfort of removable dentures. In these situations, dental implants may improve prosthesis stability, masticatory efficiency, speech confidence, facial support, and oral health-related quality of life [1,2].

The main indication for implant-based rehabilitation is insufficient retention or support for a conventional prosthesis. Implant-retained overdentures may be especially useful in mandibular defects, where segmental resection or reconstruction can compromise occlusal stability and prosthetic control. Schoen et al. argued that implant-retained mandibular prostheses can help stabilize dentures and reduce unfavorable pressure on compromised soft tissues in head and neck cancer patients [4]. In maxillary defects, implants may also improve retention of overdentures or obturators, particularly when remaining teeth, palatal support, or anatomical undercuts are inadequate [6].

Despite these advantages, implant placement in oral cancer patients is more complex than in routine edentulous patients. Treatment planning must consider tumor prognosis, recurrence surveillance, previous or planned radiotherapy, bone volume, bone quality, flap type, soft-tissue thickness, prosthetic space, oral hygiene ability, and patient motivation. A prosthetically driven approach is essential because implants placed only according to available bone may be poorly positioned for the final prosthesis.

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Malgaj et al. emphasized that careful digital implant planning was necessary in a post-ablative maxillary patient because limited bone availability and vulnerable flap tissues created biomechanical challenges for overdenture support [6].

Radiotherapy remains one of the most important risk factors in implant rehabilitation. Radiation can reduce vascularity, impair bone remodeling, increase mucosal fragility, and raise the risk of osteoradionecrosis. In the systematic review by Saini et al., radiotherapy was associated with adverse effects on oral function and implant survival, with a significant relationship between radiation treatment and implant survival outcomes [1]. However, the evidence is not completely uniform. Some included studies reported high implant survival even after postoperative radiotherapy, while others showed reduced survival in irradiated bone, especially when augmentation procedures were required [1]. This means radiotherapy should not be viewed as an absolute contraindication, but it must be treated as a major planning variable.

The timing of implant placement is another unresolved issue. Implants may be placed during primary cancer surgery, after ablative surgery, or after completion of oncological treatment. Immediate or primary implant placement may shorten the period without functional rehabilitation, but it must be balanced against oncological safety, healing, radiotherapy planning, and the possibility of recurrence. Delayed placement allows tissue stabilization and oncological monitoring, but it can prolong disability and may be more difficult in fibrotic or irradiated tissues [1,7].

Implant-supported prostheses may be fixed or removable. Fixed prostheses can provide strong function and comfort, but they may be difficult to clean, repair, or monitor in complex oncological defects. Removable implant-retained overdentures are often more practical because they allow easier hygiene access, prosthetic adjustment, and inspection of peri-implant and graft tissues. Arbelaez-Bonozo et al. selected a removable implant-supported overdenture in a mandibular oncologic patient because unfavorable local conditions and hygiene limitations made a more complex fixed restoration less appropriate [7].

Implant-based rehabilitation can significantly improve function and quality of life in selected oral cancer patients, but success depends on careful case selection, prosthetically guided planning, radiation risk assessment, hygiene control, and long-term follow-up. The goal is not merely implant survival, but a maintainable prosthetic solution that improves mastication, speech, esthetics, comfort, and social participation.

Digital technologies in rehabilitation

Digital technologies have become increasingly important in oral rehabilitation after oral cancer treatment because they allow more precise planning, faster prosthetic fabrication, and better integration between surgical and prosthetic teams. Patients treated for oral cancer often present with complex defects, altered anatomy, limited mouth opening, scarred tissues, and unstable soft-tissue conditions. These factors can make conventional impressions, prosthetic design, and implant planning difficult. Digital workflows can reduce some of these limitations by using preoperative and postoperative imaging data to guide surgical reconstruction, prosthesis design, and implant positioning [5,2].

Cone-beam computed tomography (CBCT), intraoral scanning, facial scanning, computer-aided design/computer-aided manufacturing (CAD/CAM), virtual surgical planning, surgical guides, and three-dimensional printing are among the most relevant digital tools in this field. CBCT provides information about bone volume, defect anatomy, implant sites, and reconstructive possibilities. Intraoral scanning can capture dentition and soft-tissue surfaces without the discomfort of conventional impressions, although

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scanning may still be limited in patients with trismus, saliva control problems, or large defects. CAD/CAM technology allows clinicians and technicians to design obturators, surgical guides, frameworks, and implant-supported prostheses with improved reproducibility and precision [5,9].

One of the clearest applications of digital dentistry is the fabrication of immediate obturator prostheses after partial maxillectomy. Traditionally, definitive obturators are delayed until soft tissues have healed and stabilized. During this waiting period, patients may suffer from impaired speech, swallowing, mastication, nasal leakage, and psychological distress. Ta et al. developed a digital workflow using CBCT, intraoral scanning, CAD/CAM design, and three-dimensional metal printing to fabricate immediate obturator prostheses before surgery. These prostheses were inserted intraoperatively after partial maxillectomy, allowing earlier restoration of basic oral functions [5]. In their prospective clinical study of 20 patients, most participants reported only mild to moderate functional difficulties at one month, with masticatory function satisfactorily restored in 75% of cases and minimal fluid leakage during swallowing reported by 60% of patients [5].

Digital planning is also useful in implant-based rehabilitation. In patients with maxillary or mandibular defects, implants must be positioned according to the future prosthesis, not merely according to residual bone availability. Malgaj et al. described a prosthetically driven approach in which digital planning and a surgical guide were used for implant placement after maxillary ablation and free-flap reconstruction [6]. This approach is particularly relevant in reconstructed patients, where limited bone volume, altered soft-tissue thickness, and biomechanical constraints may compromise prosthetic outcomes if implant positioning is not planned carefully.

Three-dimensional printing and additive manufacturing can also improve the production of obturators, frameworks, guides, models, and facial prostheses. These technologies may reduce laboratory time, improve fit, and allow easier reproduction of prostheses when repair or replacement is needed. Putra et al. identified CAD/CAM, three-dimensional printing, and digital rehabilitation strategies as important developments in oral cancer rehabilitation, particularly when integrated into multidisciplinary care pathways [2].

However, digital technologies are not a complete solution. Their effectiveness depends on equipment availability, clinician training, software expertise, laboratory support, cost, and patient-specific limitations. In low-resource settings, access to CBCT, intraoral scanners, CAD/CAM systems, and three-dimensional printing may be limited. In addition, digital accuracy can be compromised by restricted mouth opening, mobile soft tissues, large defects, saliva, bleeding, and postoperative tissue changes. Therefore, digital workflows should be viewed as tools that improve planning and delivery, not as substitutes for clinical judgment.

The digital technologies offer major advantages in multidisciplinary oral rehabilitation after oral cancer treatment, especially for immediate obturators, implant planning, surgical guides, and complex prosthetic design. Their greatest value lies in improving precision, shortening rehabilitation time, reducing patient discomfort, and strengthening coordination between surgical and prosthetic teams.

Rehabilitation after reconstructive surgery

Reconstructive surgery plays a major role in restoring anatomical continuity after oral cancer resection, but reconstruction alone does not guarantee functional recovery. Free flaps, bone grafts, soft-tissue flaps, and composite reconstructions may close defects and restore facial contour, yet patients often continue to experience impaired mastication, speech, swallowing, oral hygiene difficulty, altered sensation, and prosthetic instability. Therefore,

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reconstructive surgery and oral rehabilitation should be planned together rather than as separate stages of treatment [1,2].

The type of reconstruction strongly influences the possibilities and limitations of later prosthetic rehabilitation. Fibula free flaps are commonly used for mandibular reconstruction because they provide vascularized bone that can restore mandibular continuity and may support dental implants. However, the fibula often differs from the native mandible in bone height, shape, and soft-tissue characteristics. This can create prosthetic challenges, including unfavorable implant angulation, excessive prosthetic space, reduced vestibular depth, soft-tissue bulk, and hygiene difficulty. In mandibular oncologic patients, rehabilitation must also address occlusal stability, mandibular deviation, perioral muscle function, and the patient's ability to maintain the prosthesis [7].

Arbelaez-Bonozo et al. described implant prosthetic rehabilitation in a patient treated for mandibular osteosarcoma. After reconstruction, the patient presented with complex local conditions, including implants placed in fibula bone, a free-end edentulous space, altered peri-implant soft tissues, hypotonic perioral musculature, and high esthetic expectations. The authors selected a removable implant-supported overdenture with a milled titanium bar, partly because this design allowed better hygiene access and was more realistic than a complex fixed prosthesis under the patient's conditions [7]. This case illustrates an important principle: in reconstructed patients, the best prosthetic option is not always the most technically advanced one, but the one that is functional, cleanable, maintainable, and adapted to the patient.

Maxillary reconstruction presents different challenges. Maxillary defects may involve loss of the palate, alveolar ridge, sinus floor, midfacial support, or separation between oral and nasal cavities. Reconstruction may be performed using soft-tissue or composite free flaps, but the choice between surgical reconstruction, obturator prosthesis, implant-supported overdenture, or combined treatment depends on defect size, remaining dentition, palatal support, bone availability, and patient factors. Malgaj et al. reported rehabilitation after maxillary ablation and radial free-flap reconstruction using a prosthetically driven implant-supported overdenture. Their report emphasized that limited bone availability required precise implant planning to achieve adequate biomechanical support for the final prosthesis [6].

Soft-tissue quality is a major determinant of rehabilitation success after reconstruction. Skin paddles, scar tissue, bulky flaps, mobile mucosa, radiation-induced fibrosis, and shallow vestibules may interfere with prosthesis extension, retention, speech, hygiene, and patient comfort. Even when bone reconstruction is successful, the overlying soft tissue may not behave like attached oral mucosa. This can increase the risk of soreness, peri-implant inflammation, food retention, and difficulty cleaning around bars, attachments, or prosthetic components [2,6].

Reconstructive surgery also affects timing. Some patients may benefit from primary implant placement during tumor surgery or reconstruction, potentially reducing the period without functional rehabilitation. Others require delayed prosthetic rehabilitation because of oncologic surveillance, radiotherapy, tissue healing, or uncertainty about recurrence. Saini et al. noted that implant timing remains clinically important, with immediate approaches potentially shortening rehabilitation but delayed approaches allowing stabilization and monitoring [1].

Rehabilitation after reconstructive surgery must be prosthetically driven, surgically coordinated, and patient-specific. Successful outcomes depend on aligning resection, reconstruction, implant placement, soft-tissue management, prosthesis design, oral hygiene, and long-

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term follow-up. The final goal is not only closure of the defect, but restoration of function, esthetics, comfort, and quality of life.

Radiotherapy-related challenges

Radiotherapy is a major component of oral cancer treatment, particularly in advanced disease or when there is a high risk of local recurrence. Although it improves oncological control, radiotherapy can create long-term complications that directly affect oral rehabilitation. These complications include xerostomia, mucosal fragility, fibrosis, trismus, radiation caries, osteoradionecrosis risk, impaired wound healing, and reduced implant predictability [1,2]. As a result, rehabilitation in irradiated patients requires more cautious planning, stronger preventive care, and long-term follow-up.

Xerostomia is one of the most common and clinically significant radiation-related complications. Damage to the salivary glands reduces salivary flow and alters saliva quality, leading to dry mouth, impaired lubrication, difficulty swallowing, taste changes, mucosal discomfort, and increased caries risk [2,8]. From a prosthetic perspective, xerostomia reduces denture adherence and comfort because saliva normally contributes to lubrication, retention, and protection of the mucosa. Patients with xerostomia may therefore experience prosthesis instability, soreness, ulceration, and reduced tolerance of removable appliances [8].

Radiation-induced mucosal fragility and reduced vascularity also complicate oral rehabilitation. Irradiated mucosa is more vulnerable to trauma from denture borders, occlusal overload, food impaction, and poor prosthetic fit. Even minor irritation may result in ulceration, delayed healing, pain, and infection. These problems are especially relevant when prostheses are supported by scarred, thin, or mobile tissues. Consequently, prosthetic design in irradiated patients must minimize pressure points, allow easy hygiene, and be reviewed regularly for adjustment.

Fibrosis and trismus are additional barriers to rehabilitation. Radiation-induced fibrosis can reduce tissue elasticity and restrict mandibular opening, making oral hygiene, dental treatment, impressions, prosthesis insertion, and speech or swallowing therapy more difficult [2,3]. Putra et al. noted that trismus and xerostomia further compromise oral function and that jaw-mobilizing devices and stretching protocols may help prevent severe post-radiotherapy trismus [3]. In practice, limited mouth opening may force clinicians to modify impression techniques, prosthesis design, and clinical procedures.

Osteoradionecrosis remains one of the most serious complications of head and neck radiotherapy. Reduced vascularity and impaired bone remodeling make irradiated bone more vulnerable to necrosis, especially after extractions, trauma, infection, or surgical implant placement [8,10]. For this reason, dental extractions and invasive procedures must be carefully justified. Hessloehl et al. reported that root remnants were preserved when clinically feasible in an irradiated patient to reduce the risk of osteoradionecrosis [10]. This illustrates the need for conservative, risk-aware decision-making in post-radiotherapy dental rehabilitation.

Radiotherapy also affects implant rehabilitation. Saini et al. found that radiotherapy was associated with adverse effects on oral function and implant survival, although outcomes varied across studies [1]. Implant failure risk appears to depend on multiple factors, including radiation dose, implant site, bone quality, time since radiotherapy, augmentation procedures, soft-tissue condition, and maintenance. Therefore, radiotherapy should not be treated as an absolute contraindication to implants, but it must be considered a major risk modifier requiring careful patient selection and follow-up.

Preventive oral care is essential in irradiated patients. This includes dental

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assessment before radiotherapy, oral hygiene instruction, caries control, salivary stimulation where possible, fluoride therapy, prosthesis adjustment, and lifelong surveillance. Hessloehl et al. described the use of custom fluoride trays fabricated from digital impressions and lifelong 2000 ppm fluoride gel to prevent radiation-induced dental caries [3]. Their case also emphasized continued caries surveillance, prosthetic modifications, and long-term follow-up as part of a broader rehabilitative framework [11].

Overall, radiotherapy-related complications represent one of the greatest challenges in oral rehabilitation after oral cancer treatment. Successful management requires prevention, conservative treatment planning, careful prosthetic design, cautious implant assessment, trismus management, and continuous follow-up. In irradiated patients, rehabilitation should be judged not only by prosthetic replacement or implant survival, but by long-term comfort, tissue health, function, and quality of life.

Functional outcomes and quality of life

The success of oral rehabilitation after oral cancer treatment should be evaluated not only by prosthesis retention, implant survival, or defect closure, but also by functional recovery and quality of life. Patients treated for oral cancer often experience persistent difficulties with mastication, speech, swallowing, facial appearance, oral comfort, social participation, and psychological well-being. Therefore, patient-centered outcomes are essential when assessing the effectiveness of rehabilitation [1,2].

Mastication is one of the most frequently affected functions after oral cancer treatment. Surgical resection, loss of teeth, mandibular discontinuity, maxillary defects, tongue impairment, altered occlusion, xerostomia, and trismus can all reduce chewing efficiency. Prosthetic and implant-supported rehabilitation may improve mastication by restoring occlusal contacts, stabilizing dentures, supporting facial tissues, and improving bolus manipulation [1,4]. In the systematic review by Saini et al., oral rehabilitation was associated with improved functional outcomes and quality of life in oral cancer patients, although results varied depending on defect type, radiotherapy exposure, prosthesis type, and implant status [1].

Speech outcomes are also central to rehabilitation. Oral cancer surgery may affect the tongue, palate, lips, floor of the mouth, mandible, and maxilla, all of which are important for articulation and resonance. Maxillary defects may cause hypernasal speech due to communication between the oral and nasal cavities, while tongue and floor-of-mouth resections may impair articulation and speech intelligibility. Obturator prostheses can improve speech by separating the oral and nasal cavities and improving resonance control [5]. However, speech recovery is often incomplete and may require combined prosthetic treatment and speech therapy [2].

Swallowing function is similarly affected by oral cancer treatment. Dysphagia may result from tongue resection, reduced bolus control, fibrosis, xerostomia, pain, or impaired coordination after surgery and radiotherapy. Rehabilitation may improve swallowing by restoring oral separation, improving prosthetic support, reducing nasal leakage, and supporting bolus formation [2,5]. In the prospective study by Ta et al., digitally planned immediate obturator prostheses after partial maxillectomy were associated with early functional benefits, with 60% of patients reporting minimal fluid leakage during swallowing at one month [5]. This suggests that early prosthetic intervention may reduce postoperative functional disability, although longer-term evidence is still needed.

Esthetic rehabilitation is another important determinant of quality of life. Facial asymmetry, cheek collapse, altered lip support, scar contracture, missing teeth, and visible prosthetic defects can affect self-

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image and social confidence. Hessloehl et al. described a patient with facial atrophy and asymmetry after segmental mandibulectomy, fibula free flap reconstruction, and radiochemotherapy, where combined prosthetic rehabilitation and hyaluronic acid injections improved facial support, symmetry, sociability, and perceived quality of life [3]. Although this is only a case report, it illustrates the importance of addressing extraoral appearance as part of comprehensive rehabilitation.

Patient satisfaction and oral health-related quality of life are influenced by multiple factors, including prosthesis comfort, retention, speech, chewing ability, swallowing, esthetics, pain, hygiene, maintenance burden, and psychological adaptation. Saini et al. highlighted the importance of obturator retention and stability for quality of life in maxillectomy patients [1]. Implant-retained prostheses may improve patient satisfaction by increasing stability and reducing movement during function, but they also require adequate hygiene, maintenance, and tissue surveillance [4,6].

Psychosocial recovery is closely linked to functional rehabilitation. Difficulty eating in public, unclear speech, facial disfigurement, drooling, oral odor, and prosthesis instability can lead to embarrassment, avoidance of social situations, anxiety, depression, and reduced participation in daily life [2]. Putra et al. emphasized that rehabilitation after oral cancer must include psychosocial care, counseling, peer support, and psycho-oncology integration, particularly for patients struggling with body image, communication, and social reintegration [2].

The oral rehabilitation can improve mastication, speech, swallowing, esthetics, patient satisfaction, and quality of life, but outcomes are highly individualized. The strongest rehabilitation plans are those that combine prosthetic, surgical, functional, preventive, and psychosocial interventions. Future studies should use standardized patient-reported outcome measures, longer follow-up periods, and clearer comparisons between rehabilitation methods to better define which interventions provide the greatest functional and quality-of-life benefits.

Psychosocial and Aesthetic rehabilitation

Psychosocial and aesthetic rehabilitation are essential components of oral cancer survivorship care. Although survival and tumor control remain the primary oncological goals, many patients continue to live with visible facial changes, impaired speech, difficulty eating in public, prosthesis-related insecurity, drooling, oral discomfort, and altered self-image. These consequences may lead to social avoidance, reduced confidence, anxiety, depression, and difficulty returning to family, professional, and community life [1,2].

Facial appearance has a direct influence on psychological well-being after oral cancer treatment. Surgical resection, flap reconstruction, radiotherapy-induced fibrosis, scar contracture, soft-tissue atrophy, mandibular deviation, lip incompetence, and loss of dental support can all alter facial symmetry and expression. Even when intraoral function is partially restored, patients may remain dissatisfied if the rehabilitation does not address facial support, smile appearance, speech confidence, and social visibility. For this reason, aesthetic outcomes should not be dismissed as cosmetic; they are closely connected to dignity, identity, and social participation [2,3].

Body image disturbance is particularly relevant in patients with maxillary, mandibular, tongue, lip, or facial soft-tissue defects. Visible disfigurement may make patients reluctant to speak, smile, eat with others, or appear in public. Putra et al. emphasized that oral cancer rehabilitation must include psychosocial care because depression, anxiety, altered body image, and social reintegration difficulties are common

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after treatment [2]. In this context, successful rehabilitation should be measured not only by chewing efficiency or prosthesis stability, but also by patient confidence, communication ability, comfort in social settings, and perceived quality of life.

Prosthetic rehabilitation can contribute significantly to psychosocial recovery. Obturators, dentures, implant-retained prostheses, and maxillofacial prostheses may improve facial support, oral competence, speech intelligibility, and the ability to eat in public [1,8]. Improved prosthesis retention and stability may reduce embarrassment caused by prosthesis movement, food leakage, nasal regurgitation, unclear speech, or facial collapse. However, prosthetic rehabilitation may also create psychological burden if the device is uncomfortable, difficult to clean, unstable, visibly artificial, or requires frequent adjustment. Therefore, patient education and expectation management are essential.

Aesthetic rehabilitation may also include adjunctive interventions beyond conventional prosthodontics. Hessloehl et al. described a patient treated for advanced oral squamous cell carcinoma who presented with facial asymmetry, cheek collapse, lower-lip changes, impaired mastication, and social discomfort after segmental mandibulectomy, fibula free flap reconstruction, and radiochemotherapy [3]. The rehabilitation combined dental treatment, fluoride trays, mandibular partial removable prosthesis, occlusal bonding, and hyaluronic acid injections. The authors reported improvements in facial symmetry, soft-tissue quality, function, sociability, and quality of life [3]. Although this is a case report and should not be generalized too strongly, it demonstrates that selected adjunctive aesthetic approaches may complement prosthetic rehabilitation in complex patients.

Psychological support should be integrated into rehabilitation pathways. Counseling, psycho-oncology, peer support, patient education, and family involvement may help patients adapt to changes in appearance, oral function, communication, diet, sexuality, and social identity [2]. Speech and swallowing therapists also contribute psychosocially because improved communication and safer eating can reduce embarrassment and isolation. Dietitians may help patients regain confidence around eating, while physiotherapists may support trismus management and facial mobility.

Social reintegration should be treated as a major rehabilitation outcome. The ability to speak clearly, smile confidently, eat with others, and maintain facial appearance affects participation in daily life. Therefore, multidisciplinary oral rehabilitation should aim not only to reconstruct anatomy or replace teeth, but also to restore confidence, autonomy, dignity, and social participation. Future studies should include validated psychological and aesthetic outcome measures, because these dimensions are often underreported compared with prosthesis survival or implant success.

Current challenges and limitations

Despite major progress in oral rehabilitation after oral cancer treatment, several challenges continue to limit clinical outcomes and the strength of the available evidence. These challenges are related both to the complexity of the patients themselves and to methodological weaknesses in the literature. Oral cancer survivors often present with highly individualized anatomical defects, different treatment histories, variable radiotherapy exposure, diverse reconstructive procedures, and different levels of functional impairment. This heterogeneity makes it difficult to compare rehabilitation methods directly or to define one ideal treatment pathway for all patients [1,2].

One major limitation is the heterogeneity of surgical defects. Maxillary, mandibular, tongue, floor-of-mouth, palatal, and composite defects create different functional problems and require different

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rehabilitative approaches. Even within one category, such as maxillectomy or mandibulectomy, outcomes depend on defect size, remaining dentition, occlusal support, soft-tissue quality, flap type, scar formation, and patient adaptation [1,5]. As a result, findings from one patient group cannot always be applied to another. This is especially problematic in studies that group different defect types together without sufficient subgroup analysis.

Small sample sizes are another important weakness. Many studies in this field are case reports, case series, or small clinical studies because oral cancer rehabilitation cases are complex, individualized, and relatively difficult to standardize. Case reports, such as those describing implant-supported overdentures after mandibular or maxillary reconstruction, are clinically useful because they illustrate real treatment decisions, but they cannot prove general effectiveness or superiority of one method over another [7,6]. Even stronger clinical studies may include limited numbers of patients, which reduces statistical power and makes conclusions less reliable.

Limited long-term follow-up also restricts interpretation. Oral rehabilitation success should be measured over years, not only weeks or months, because prostheses and implants must remain functional under changing tissue conditions, hygiene challenges, radiotherapy effects, recurrence surveillance, and aging. Short-term outcomes may show improved chewing, speech, or swallowing, but they do not necessarily predict long-term prosthesis maintenance, implant survival, peri-implant tissue health, caries control, or patient satisfaction [5,3].

Another major problem is inconsistency in outcome measures. Studies may evaluate mastication, speech, swallowing, quality of life, prosthesis survival, implant survival, patient satisfaction, or psychosocial outcomes using different tools. This makes comparison difficult and limits meta-analysis. Some studies prioritize technical outcomes, such as implant survival or prosthesis retention, while underreporting patient-centered outcomes such as confidence, social participation, body image, eating in public, or psychological distress [1,2]. Future research needs standardized functional and quality-of-life measures that reflect both clinical and patient priorities.

Access barriers also remain significant. Advanced rehabilitation may require prosthodontists, maxillofacial surgeons, speech and swallowing therapists, psychologists, dental hygienists, dietitians, CBCT imaging, CAD/CAM systems, three-dimensional printing, surgical guides, implant components, and long-term maintenance. These resources are not equally available across healthcare systems. Putra et al. emphasized that disparities persist, particularly in low-resource settings where access to advanced prosthetic, digital, and multidisciplinary rehabilitation remains limited [2]. Cost may also prevent patients from receiving implant-supported prostheses, digital workflows, or frequent maintenance appointments.

Maintenance burden is another practical limitation. Complex prostheses and implant-retained devices require hygiene, manual dexterity, motivation, regular follow-up, and repair access. In irradiated or reconstructed patients, poor hygiene can rapidly lead to mucosal inflammation, peri-implant complications, caries, discomfort, and prosthesis failure. Therefore, the most advanced option is not always the best option. A simpler removable prosthesis may sometimes be more appropriate than a fixed implant-supported restoration if it is easier to clean, monitor, and adjust [7].

Overall, the current evidence supports the value of multidisciplinary oral rehabilitation after oral cancer treatment, but it remains limited by heterogeneity, small samples, short follow-up, inconsistent outcome reporting, cost, access barriers, and unequal availability of specialist care. Future

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studies should use larger multicenter designs, standardized outcome measures, longer follow-up periods, and clearer reporting of defect type, radiotherapy dose, reconstruction method, prosthesis type, complications, maintenance burden, and patient-reported outcomes.

Future directions

Future developments in multidisciplinary oral rehabilitation after oral cancer treatment are likely to focus on earlier intervention, improved digital planning, artificial intelligence, tele-rehabilitation, biomaterials, regenerative strategies, and standardized care pathways. Although current rehabilitation approaches can improve mastication, speech, swallowing, esthetics, and quality of life, outcomes remain inconsistent because patients differ widely in defect type, radiotherapy exposure, reconstruction method, soft-tissue quality, access to specialist care, and long-term maintenance capacity [1,2].

Artificial intelligence may become increasingly useful in treatment planning and outcome prediction. In oral rehabilitation, AI could assist with segmentation of CBCT scans, identification of defect morphology, prosthetic design support, implant planning, prediction of implant survival risk, and selection of individualized rehabilitation pathways. AI-assisted systems may also help analyze patient-reported outcomes, detect complications during follow-up, and support decision-making in complex cases. However, AI should be considered a supportive tool, not a replacement for clinical judgment, because oncologic rehabilitation depends on biological, functional, psychological, and social factors that cannot be reduced to imaging data alone [2,5].

Tele-rehabilitation and mobile health follow-up may improve access to care, especially for patients living far from specialist centers or in low-resource settings. Remote follow-up could be used to monitor speech and swallowing exercises, trismus therapy, oral hygiene, prosthesis tolerance, diet adaptation, and patient-reported quality of life. Mobile applications may help patients report pain, xerostomia, ulceration, prosthesis instability, swallowing difficulty, or psychological distress between clinic visits. Putra et al. identified tele-rehabilitation and mobile health as future directions in oral cancer rehabilitation, particularly for improving continuity of care and access [2].

Digital workflows will continue to expand in prosthetic and implant rehabilitation. CBCT, intraoral scanning, facial scanning, CAD/CAM, virtual surgical planning, surgical guides, and three-dimensional printing can improve communication between surgeons, prosthodontists, and laboratory teams. Ta et al. demonstrated that digitally planned immediate obturator prostheses can be fabricated using preoperative imaging and inserted immediately after partial maxillectomy, allowing earlier functional rehabilitation [5]. Future work should evaluate whether such workflows improve long-term function, cost-effectiveness, patient satisfaction, and access compared with conventional methods.

Regenerative medicine and biomaterials may also influence future rehabilitation. Improved scaffold materials, tissue engineering, bioactive surfaces, and reconstructive biomaterials may support bone regeneration, soft-tissue repair, implant osseointegration, and reconstruction of complex oral defects [8]. These approaches are particularly relevant for irradiated patients, where reduced vascularity, fibrosis, xerostomia, and impaired healing limit conventional rehabilitation. However, most regenerative strategies remain experimental or early-stage in this context, and stronger clinical evidence is needed before they can be considered routine care.

Another important future direction is the development of standardized rehabilitation protocols. At present,

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treatment pathways vary widely between centers. Standardized protocols could define when patients should receive dental assessment, preventive care, fluoride therapy, speech and swallowing evaluation, nutritional support, psychological screening, prosthetic planning, implant assessment, and long-term follow-up. Such protocols would not eliminate individualized treatment, but they could reduce delays, improve interdisciplinary coordination, and ensure that rehabilitation begins early in the cancer pathway rather than after functional deterioration has already occurred [1,2].

Future research should also prioritize stronger evidence. Larger multicenter studies, longer follow-up, standardized outcome measures, and better reporting of tumor site, defect classification, radiation dose, reconstruction type, prosthetic design, complications, maintenance needs, and patient-reported outcomes are needed. Without this, the field will remain dependent on small clinical studies and case reports. The most useful future studies will compare not only implant survival or prosthesis retention, but also mastication, speech, swallowing, esthetics, psychosocial recovery, social participation, cost, and long-term quality of life.

The future of oral rehabilitation after oral cancer treatment should be multidisciplinary, preventive, digitally supported, patient-centered, and evidence-driven. The goal should not simply be survival after cancer treatment, but the restoration of function, appearance, dignity, autonomy, and participation in daily life.

CONCLUSIONS

Oral rehabilitation after oral cancer treatment is a complex and essential component of survivorship care. Although surgery, radiotherapy, chemotherapy, and reconstructive procedures are often necessary for tumor control, they may produce long-term impairments in mastication, swallowing, speech, esthetics, oral comfort, and psychosocial well-being. Current evidence shows that oral rehabilitation can improve functional outcomes and quality of life, particularly when treatment is individualized and adapted to the patient's anatomical defect, remaining dentition, radiotherapy exposure, reconstructive history, oral hygiene capacity, and personal expectations.

A multidisciplinary approach is necessary because no single intervention can address the full range of consequences experienced by oral cancer survivors. Prosthetic rehabilitation, implant-supported prostheses, obturators, digital workflows, speech and swallowing therapy, preventive dental care, nutritional support, physiotherapy, psycho-oncology, and long-term maintenance all contribute to successful recovery. Rehabilitation should therefore begin early in the oncology pathway, ideally before surgery or radiotherapy, so that preventive care, prosthetic planning, implant assessment, and functional support can be coordinated from the beginning of treatment.

Prosthetic and implant-based rehabilitation remain central to restoring oral function, but their success depends on careful case selection and maintenance. Obturators can improve speech, swallowing, and oral-nasal separation after maxillectomy, while implant-retained prostheses may improve retention and stability in selected maxillary and mandibular defects. However, radiotherapy-related xerostomia, fibrosis, mucosal fragility, trismus, osteoradionecrosis risk, and reduced implant predictability remain major challenges. For this reason, rehabilitation plans must prioritize tissue protection, hygiene, preventive fluoride care, prosthetic adjustability, and regular follow-up.

Digital technologies, including CBCT, intraoral scanning, CAD/CAM, surgical guides, and three-dimensional printing, offer promising ways to improve planning accuracy, prosthetic fit, and early rehabilitation. Immediate digitally planned obturators and prosthetically driven implant

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planning demonstrate how digital workflows can reduce treatment delays and improve coordination between surgical and prosthetic teams. Nevertheless, these technologies are not universally available, and their benefits must be evaluated through larger studies with longer follow-up.

The available literature also highlights important limitations. Evidence remains heterogeneous, with many studies involving small samples, short observation periods, inconsistent outcome measures, and case-level data. Future research should use standardized functional and patient-reported outcome measures, multicenter designs, and longer-term follow-up to clarify which rehabilitation strategies provide the greatest benefits for different patient groups.

Ultimately, successful oral rehabilitation should not be measured only by prosthesis retention, implant survival, or anatomical reconstruction. The broader goal is to restore the patient's ability to eat, speak, smile, interact socially, and live with dignity after cancer treatment. Multidisciplinary oral rehabilitation should therefore be understood as a patient-centered process aimed at restoring function, esthetics, confidence, psychosocial well-being, and long-term quality of life.

REFERENCES

1. Saini RS, Vyas R, Mosaddad SA, Heboyan A. Efficacy of Oral Rehabilitation Techniques in Patients With Oral Cancer: A Systematic Review and Meta-Analysis. Journal of Surgical Oncology. 2025;131:1272–1283.
2. Putra MADT, Utami ANV, Akbar MF, Endratamma MA. Rehabilitation after Oral Cancer: Functional, Prosthetic, and Psychosocial Perspectives. Journal of Head & Neck Physicians and Surgeons. 2025;13:148–154.
3. Hessloehl N, Collart-Dutilleul PY, Romieu O, Carayon D. Functional and aesthetic oral rehabilitation after cancer treatment using dental prosthesis and hyaluronic acid injections: A case report and review of literature. World Journal of Clinical Cases. 2026;14(2):110627.
4. Schoen PJ, Reintsema H, Raghoebar GM, Vissink A, Roodenburg JLN. The use of implant retained mandibular prostheses in the oral rehabilitation of head and neck cancer patients. A review and rationale for treatment planning. Oral Oncology. 2004;40(9):862–871.
5. Ta AT, Le DT, Dam MT, Phuong TT, Nguyen DM, Pham HT, Tong MS. Design Process and Early Functional Outcomes of Digitally Planned Immediate Obturator Prostheses After Partial Maxillectomy. Prosthesis. 2025;7:80.
6. Malgaj T, Kansky A, Ludvig Ribič A, Kobe T, Berce B, Jevnikar P. Prosthetically Driven Approach to Post-Ablative Maxilla Rehabilitation with an Implant-Supported Overdenture: A Case Report. Prosthesis. 2024;6:1300–1309.
7. Arbelaez-Bonozo L, Luis-Sanchez L, Oliva-Ferrusola E, Fernandez-Morales C, Albornoz-Cabello M, Gutierrez-Perez JL, Torres-Lagares D. Implant Prosthetic Rehabilitation in a Mandible Osteosarcoma Patient: A Clinical Report. Prosthesis. 2025;7:22.
8. Hindi MH. Prosthetic Rehabilitation in Oral Cancer Patients: A Pathological and Functional Perspective. Global Journal of Forensic Pathology and Medicine. 2026 Apr 14;1(1):26-35.
9. Marrapodi MM, Uzunçıbuk H, Minervini G. Prosthetic Rehabilitation in Oral Cancer Patients. Prosthesis. 2026;8:52.
10. El-Rabbany M, Duchnay M, Raziee HR, Zych M, Tenenbaum H, Shah PS, Azarpazhooh A. Interventions for preventing osteoradionecrosis of the jaws in adults receiving head and neck radiotherapy. Cochrane Database of Systematic Reviews. 2019;2019:CD011559.
11. Epstein JB, van der Meij EH, Lunn R, Stevenson-Moore P. Effects of compliance with fluoride gel application on caries and caries risk in patients after radiation therapy for head

DOI : 10.62610/RJOR.2026.2.18.17

and neck cancer. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 1996;82:268–275.

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