Implant-Based Rehabilitation in Oncology Patients Can Be Performed With High Long-Term Success

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Purpose: Radiotherapy and compromised vital bone and/or surrounding soft tissue can be a challenge to the successful osseointegration of dental implants. We evaluated the long-term results of dental implants in patients with oral cancer.

Materials and Methods: To address the research purpose, we designed and implemented a retrospective cohort study that included patients with oral cancer who had received dental implants from 2003 to 2011. The data were collected from a clinical oncology database. The predictor variables included a set of heterogeneous variables grouped into logical sets of demographics, surgical treatment, dental rehabilitation, radiotherapy type, and tumor entity. The primary outcome variable was implant survival; the secondary outcome variable was peri-implantitis. The descriptive statistics, survival time analysis, Kaplan-Meier implant survival curves, and Cox hazard proportional modeling were computed.

Results: The study sample included 59 patients with oral cancer (20 women [33.9%], 39 men [66.1%]; mean age at tumor diagnosis, 55 years), who had had 272 implants placed during the study period. The mean follow-up period was 30.9 months (range 3 to 82). Of the 272 implants, 269 (98.9%) and 264 (97.1%) had survived for 2 and 5 years, respectively. During the observation period, 10 implants were lost (3.7%). Of the implant failures, 82% occurred in transplanted bone (4 fibula flaps, 4 iliac crests, and 2 native mandibles). We observed peri-implantitis caused by insufficiently attached gingiva and bone loss in 182 of the implants (67%). The factors associated with implant failure were peri-implantitis, insufficient soft and hard tissue, muscle dysfunction, and xerostomia.

Conclusions: Implant-based rehabilitation in oncology patients can achieve a high long-term success rate, although risk factors such as impaired muscle function and a high frequency of peri-implantitis can affect healing.

Patients with oral cancer often undergo multimodal treatment composed of ablative surgery, reconstructive methods, radiotherapy, and chemotherapy. The outcomes of these therapies have often been associated with functional and aesthetic issues owing to the undesirable loss of soft and hard tissue. Patients diagnosed with oral and pharyngeal cancer are typically 60 to 79 years old.[1] In January 2009, 264,442 living men

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and women (172,708 men and 91,734 women) had a history of cancer of the oral cavity and/or pharynx. These data included any individuals with active disease and those with tumor recurrence in the oral cavity and/or pharynx.[2] The most frequent reasons for oral cancer remain alcohol abuse, tobacco abuse, betel nut chewing, tobacco chewing, dietary risk factors, and association with human papillomavirus.[3,4]

For oral and maxillofacial surgery, many reconstructive techniques are available to resolve the tissue losses in regions affected by ablative surgery.[5] The known reconstructive methods use vascularized and nonvascularized bone grafts and/or skin flaps to correct the maxillofacial defects. Small defects can be corrected with split-thickness skin grafts or local and regional flaps.[6]

Dental rehabilitation of these anatomic changes represents a challenge but is intended to preserve mastication, swallowing, speech, and oral comfort. Implants are the most suitable alternative for these patients.[7,8] A close linkage has been found between the presence of oral cancer and other problems that appear in the oral cavity, in particular, trismus, pain, xerostomia, speech, and swallowing disorders.[9] In many cases, conventional dentures will simply be unable to be integrated.[10]

In general, 2 prosthetic options are available for fixed-implant reconstruction: implant-supported and implant-retained prostheses.[11] Several factors have been reported to influence the wound healing and inflammation patterns of the peri-implant soft and hard tissue. Serious consequences have included peri-implantitis, osteoradionecrosis, and implant loss.[12]

Anticancer and implant therapy can also result in different outcomes regarding the patient's oral-related quality of life. Preoperative, intermediate, and post-treatment assessments can show significantly different types of limitations during the implant healing period.[13,14] Many patients will be hampered by physical and psychic pain. Implants have been used to improve patients' quality of life and can also be used with curative intent.[15]

Similar to quality-of-life assessments, denture satisfaction has tended to be greater for nonirradiated than for irradiated patients.[2,3,16-20] Because controversial aspects exist regarding the success rate of dental implants, the purpose of the present study was to evaluate the long-term results of dental implants in patients with oral cancer. We hypothesized that several variables could adversely affect implant survival. The specific aims of the present study were to estimate the 2- and 5-year implant survival and peri-implantitis rates and to identify the variables associated with implant failure (eg, tumor identity, implants based in bone and soft tissue, the occurrence of peri-implantitis, and whether radiation influenced implant healing).

Materials and Methods

STUDY DESIGN

In the present retrospective cohort study, we reviewed and analyzed the treatment records of patients with regular follow-up assessments. The study sample was derived from the population of patients who had presented to the Department of Oral and Craniomaxillofacial and Facial Plastic Surgery at the University of Cologne from 2003 to 2011 for evaluation and management of oral cancer. The ethical board of the Department of Oral and Craniomaxillofacial and Plastic Surgery at the University of Cologne granted an exemption; thus, it was not necessary to obtain the patients' informed consent.

The inclusion criteria were oral cancer or odontogenic tumors with a malignant course; a requirement for ablative surgery for rehabilitation; the only suitable option to preserve mastication, swallowing, and speech was implant placement; and prosthetic rehabilitation had been completed. The patients were excluded if they had small local defects that did not require rehabilitative implant treatment, if complete data collection was not possible, or if prosthetic rehabilitation had not been completed.

STUDY VARIABLES

Several predictive variables were grouped as follows: demographics (gender, age), surgical treatment (tumor operation, reconstruction), dental rehabilitation (fixed vs removable dentures [yes vs no]), radiotherapy (adjuvant or nonadjuvant), tumor identity (odontogenic tumors, other oncologic pathologic findings), area of implant placement (mandible, maxilla, native, reconstructive bone), and peri-implantitis (occurrence or absence). The primary outcome was implant survival (after 1 and 5 years), and the secondary outcome was the occurrence of peri-implant infections (peri-implantitis).

DATA COLLECTION

The data were collected retrospectively from the regional oncology database, medical case records, radiographs, and radiotherapy planning records.

STATISTICAL ANALYSIS

The results were transferred into Excel 2007 (Microsoft Corp., Redmond, WA), and statistical analysis was performed using the statistical package SPSS for Windows, version 19.0 (SPSS Inc, Chicago, IL). Descriptive statistics included frequency values (absolute abundance, relative abundance, percentage) and metric data (arithmetic mean, standard deviation, and median).

The implant was used as the statistical unit. The implant loss rate was calculated using a cumulative