Oral implants in radiated patients: a systematic review.

Colella G, Cannavale R, Pentenero M, Gandolfo S.


PURPOSE:

Oral malignancy is often treated with a combination of surgery and radiation therapy (RT). The aim of this systematic review was to examine the effects of pre- and postimplantation RT on dental implant failure.

MATERIALS AND METHODS:

The literature published from 1990 through 2006 was reviewed for studies assessing pre- and postimplantation RT. Potential studies were identified by searches of PubMed, SCIRUS, and the Cochrane Central Register of Controlled Trials (CENTRAL). The incidence of implant failure has been linked to the following variables: post- versus preimplantation RT, site of implant placement, RT dose, delay from RT to implant placement, and timing of implant failure after placement.

RESULTS:

Similar failure rates were found for implants placed post-RT compared to those placed pre-RT (3.2% and 5.4%). In preimplantation RT, the implant failure rate was lower for the mandible (4.4%) in comparison to the maxilla (17.5%; OR = 4.63; 95% CI: 2.25 to 9.49). Other results did not reach statistical significance. No failures were observed in association with an RT dose lower than 45 Gy. All implant failures observed occurred within 36 months after RT, and most occurred between 1 and 12 months after placement.

CONCLUSION:

Notwithstanding the low number of implants evaluated, this review showed similar failure rate for implants placed post-RT and those placed pre-RT (3.2% and 5.4%, respectively).

Impact of local and systemic factors on the incidence of late oral implant loss.

Alsaadi G, Quirynen M, Komárek A, van Steenberghe D.


BACKGROUND:

This retrospective study was set to assess the influence of systemic and local bone and intra-oral factors on the occurrence of implant loss from abutment connection up to 2 years.

MATERIALS AND METHODS:
The files of 700 patients, have been collected randomly from the total patient group treated by means of endosseous Brånemark system implants (Nobel Biocare, Gothenburg, Sweden) at the Department of Periodontology of the University Hospital of the Catholic University of Leuven. The end point observation was evaluating the loss of the implants 2 years after abutment installation. The study involved all implants that did not encounter early loss and implants for which it was possible to evaluate its status 2 years after abutment surgery. Thus, data of 412 patients (240 females) provided with 1514 implants were analyzed. For each patient, the medical history was carefully checked. Data collection and analysis were mainly focused on endogenous factors such as hypertension, coagulation problems, osteoporosis, hypo- hyperthyroidism, chemotherapy, diabetes type I or II, Crohn's disease, some local factors [e.g. bone quality and quantity, implant (length, diameter, location), type of edentulism, PTV, radiotherapy], smoking habits, and breach of sterility during surgery.

RESULTS:

Radiotherapy, implant (diameter and location), and higher PTV at implant insertion and abutment connection, all affected significantly the implant loss.

CONCLUSION:

Implant location in the oral cavity and radiotherapy seem predominant to explain the occurrence of implant loss. On the other hand, smoking and systemic health factors do not seem to be prominent players in the etiology of late implant loss.

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**Implant location and radiotherapy are the only factors linked to 2-year implant failure.**

Carr AB.


SUBJECTS:

The subjects in this retrospective case series were derived from a review of 700 patient files within the implant practice of the Department of Periodontology, University Hospital, Catholic University of Leuven. Inclusion criteria were met by 412 patients (240 females, 172 males) receiving a total of 1514 Nobel Biocare dental implants. These patients were included based on data availability for the time period 2 years after abutment surgery (considered to represent late implant failure). KEY EXPOSURE/STUDY FACTOR: Given the concern of the authors to assess the probability of late implant failure among clinic patients with certain local and systemic factors, the potential factors were multiple. The local factors included the following: implant length and diameter, bone quality and quantity, insertion site, type of edentulism, antibiotic use perioperatively, dehiscence and/or perforation of the site during surgery, and stability at insertion (measured by Periotest values). The related health and behavioral factors included the following: medications, smoking (<10 cigarettes/day, 10-20 cigarettes/ day, >20 cigarettes/day), hypertension, ischemic cardiac problems, coagulation anomalies, gastric ulcers, thyroid disorders, hypercholesterolemia, rheumatoid arthritis, asthma, diabetes (types 1 and 2), Crohn's disease, and chemotherapy. Main Outcome
Measure: The primary outcome was described as "late implant failure." The current study, which follows a similar study on early implant failure, aims to identify negative influences on maintenance of integration. The authors used the clinical experience related to the 412 patients with 1514 implants to identify whether the observed failure rates were influenced by local and systemic factors. Failure was defined as "late" when occurring between abutment connection surgery and 2 years after this date. Patients/implants that were not available for this interval of time were not included. However, even when records were available, not all patient records provided all data sought.

MAIN RESULTS:

Regarding local factors, the authors reported that implant diameter and location were relevant to late implant loss, whereas implant length was not (P value = .01, = .34, respectively; univariate generalized estimating equation [GEE] logistic regression). Regarding implant diameter, significantly more loss was noted for 5.00-mm implants when compared with the 4.00-mm or 4.75-mm implants. Failure related to location revealed that the maxilla compared with the mandible, posterior jaws compared with anterior jaws, and the posterior maxilla compared with all other oral locations were associated with more late failures (Table 1). Assessment of systemic factors revealed radiotherapy to be related to more late implant loss (P = .003). Neither systemic disease nor smoking exposure was associated with late failure.

CONCLUSIONS:

The authors concluded that late implant failure was influenced by the local factor "implant location" and the systemic factor "radiotherapy." Neither smoking nor systemic health factors were found to adversely influence implant integration from abutment connection through 2 years' performance.

Comparison of five parameters as risk factors for peri-mucositis.

Karbach J, Callaway A, Kwon YD, d'Hoedt B, Al-Nawas B.


PURPOSE:

The aim of this study was to identify risk factors for the development of clinical signs of peri-implant mucositis and for the presence of periodontal pathogens and to determine a possible correlation between these clinical signs and the presence of periodontal pathogens.

MATERIALS AND METHODS:

In 100 patients, a modified Plaque Index (PI), a modified Sulcular Bleeding Index (BOP), and pocket probing depth (PPD) were recorded. Patients with one implant site that scored positive for PI, BOP, and PPD greater than or equal to 5 mm were considered to have peri-implant mucositis. A sample taken at the implant with the deepest pocket was analyzed for periodontal pathogens. Implant surface roughness, smoking, augmentation at the implant site, type of dentition, and radiation therapy were recorded as possible cofactors in the disease process.
RESULTS:

Thirty-one patients showed clinical signs of peri-implant mucositis and, in 25 implant sites, periodontal pathogens were found. Smoking showed a statistically significant correlation with clinical signs of peri-implant mucositis (univariate analysis). For periodontal pathogens at the implant site, the type of dentition was statistically significant. In the multivariate analysis of the clinical signs of peri-implant mucositis, smoking and radiation therapy were significant explanatory variables. Seventy-two percent of the patients showed agreement for finding either clinical signs of peri-implant mucositis and periodontal pathogens or for no clinical signs and no pathogens. The sensitivity for diagnosis of peri-implant mucositis was 45%, and the specificity was 84%.

CONCLUSIONS:

Smoking was the most important risk factor in the formation of peri-implant mucositis. Radiation therapy was an explanatory variable for the occurrence of inflammation. Implant surface roughness, augmentation at the implant site, and type of dentition had little influence on clinical signs of peri-implant mucositis. The type of dentition influences the periodontal microbiota at the implant site.

Head and neck cancer, dental implants, and dental oncology.

Garg A, Guez G.


Abstract

Head and neck cancer is a real presence in the dental-implant world--patients who undergo surgery, chemotherapy, and/or radiation often seek the assistance of dental-implant practitioners to restore them to better function; other patients who have had implants in place for years will return with questions regarding how their treatment will be affected by the presence of their dental implant. As oral-cancer treatment modalities are rapidly changing, practitioners struggle to keep up with the literature surrounding this important subset of the dental-implant population. This month, we look at the numbers of patients suffering from oral cancers, consider the different treatment options for patients with oral cancers, and investigate the role that implants play in improving therapeutic outcomes or changing treatment course.

Rehabilitation with dental implants of oral cancer patients.

Werkmeister R, Szulczewski D, Walteros-Benz P, Joos U.


Abstract

The aim of this study was to evaluate the risks and complications of rehabilitation with dental implants after tumour surgery and radiotherapy. After a disease-free survival of 18 months,
29 patients who had undergone oral cancer treatment were rehabilitated with dental implants. The complication rate of implants in irradiated, non-irradiated and grafted bone was analyzed at least 3 years after implant placement. In the healing period, 28.6% of the implants in irradiated bone and 8.4% in non-irradiated bone showed soft tissue complications. Of the implants, 26.7% in the irradiated and 14.7% in the non-irradiated mandibular bone were lost in the first 36 months after placement. Thirty-one point two percent of implants inserted in non-irradiated bone grafts were affected and did not osseointegrate. Of 109 inserted implants, 70 were suitable for prosthetic rehabilitation. There are high complication rates after implant placement in oral cancer patients. Irradiation adversely affects soft tissue healing. Osseointegration is frequently disturbed, especially when implants were placed in non-vascularized bone grafts.

**Implant survival in mandibles of irradiated oral cancer patients.**


**OBJECTIVE:**

The aim of this study was to analyze long-term implant survival in the mandible after radiotherapy and radical surgery in oral cancer patients.

**STUDY DESIGN:**

Between 1990 and 2003, 71 patients (15 females, 56 males; average age 57.8 years, range 16-84.1 years) were treated with dental implants after radiochemotherapy and ablative surgery of oral cancer. Radiation therapy was delivered in daily fractions of 2 Gy given on 25 days (total dose of 50 Gy). Oral defects were reconstructed microsurgically with jejunal, iliac crest or radial forearm grafts. Thereafter 316 dental implants were placed in the non-irradiated residual bone (84; 27%), irradiated residual bone (154; 49%) or grafted bone (78; 25%) at various intervals (mean interval 1.41 (+/- 1.01) years, range 0.34-6.35 years).

**RESULTS:**

The mean follow-up time after implant insertion was 5.42 (+/- 3.21) years (range 0.3-13.61 years). The overall 2-, 3-, 5-, and 8-year survival rates of all implants were 95%, 94%, 91% and 75%. Forty-four implants were lost in 21 patients during the observation period. Irradiation of the mandibular bone showed significantly (P = 0.0028) lower implant survival compared with non-irradiated mandibular bone. The 8-year survival rate in the non-irradiated residual bone (two loss), irradiated residual bone (29 loss) or grafted bone (13 loss) were 95%, 72% and 54%, respectively. Time of implantation after irradiation showed no statistically significant influence. Implant brand, length or diameter or the incidence of resective surgery on the mandible and gender of patients had no statistically significant influence on implant survival.
CONCLUSION:

Radiation therapy with 50 Gy was significantly related to shorter implant survival in mandibular bone. Survival was lowest in grafted bone. Time of implant placement had no statistically significant influence on survival under the conditions of this study. Although implant survival is lower in irradiated mandibles, implants significantly facilitate prosthodontic treatment and enhance outcome of oral rehabilitation in cancer patients.

Oral rehabilitation with dental implants after cancer treatment.

Barrowman R, Wilson P, Wiesenfeld D.


Abstract

Background: Patients who undergo surgical management of oral cancer may greatly benefit from an implant-supported prosthesis. This study reports on the clinical experience of dental implant placement in patients following resection of oral cancer over a 15-year period. Controversies including the use of dental implants in irradiated tissues, and hyperbaric oxygen treatment will also be discussed. Methods: Thirty-one patients who had dental implants placed as part of their oral rehabilitation between 1992 and 2007 were investigated. Demographic data and factors including implant survival, type of prosthesis provided, radiotherapy and the hyperbaric oxygen therapy were analysed. Results: In this retrospective study, there was a retention rate of 110 implants from a total of 115 implants placed. A high rate of implant retention was found, with 5 implant failures from a total of 115 implants placed. The 5 failed implants occurred in free flap bone that had been irradiated. Conclusions: Dental implants provide an important role in the oral rehabilitation of oral cancer patients. There may be an increased risk of implant failure in free flap bone that has been irradiated.

Interventions for replacing missing teeth: hyperbaric oxygen therapy for irradiated patients who require dental implants.

Esposito M, Grusovin MG, Patel S, Worthington HV, Coulthard P.


Abstract

BACKGROUND:

Dental implants offer one way to replace missing teeth. Patients who have undergone radiotherapy and those that have also undergone surgery for cancer in the head and neck region may benefit particularly from reconstruction with implants. Hyperbaric oxygen therapy (HBO) has been advocated to improve the success of implant treatment in patients who have undergone radiotherapy but this remains a controversial issue.
OBJECTIVES:

To compare success, morbidity, patient satisfaction and cost effectiveness of dental implant treatment carried out with and without HBO in irradiated patients.

SEARCH STRATEGY:

We searched the Cochrane Oral Health Group's Trials Register, The Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE and EMBASE. Handsearching included several dental journals. We checked the bibliographies of relevant clinical trials and review articles for studies outside the handsearched journals. We wrote to authors of the identified randomised controlled trials (RCTs), to more than 55 oral implant manufacturers; we used personal contacts and we asked on an internet discussion group in an attempt to identify unpublished or ongoing RCTs. No language restriction was applied. The last electronic search was conducted on 13 June 2007.

SELECTION CRITERIA:

Randomised controlled trials of HBO therapy for irradiated patients requiring dental implants.

DATA COLLECTION AND ANALYSIS:

Screening of eligible studies, assessment of the methodological quality of the trials and data extraction were conducted in duplicate and independently by two review authors. Results were expressed as random-effects models using mean differences for continuous outcomes and risk ratios for dichotomous outcomes with 95% confidence intervals.

MAIN RESULTS:

Only one RCT was identified and included. Thirteen patients received HBO therapy while other 13 did not. Two to six implants were placed in fully edentulous mandibles to be rehabilitated with bar-retained overdentures. One year after implant loading four patients died from each group. One patient, treated with HBO, developed an osteoradionecrosis and lost all implants so the prosthesis could not be provided. Five patients in the HBO group had at least one implant failure versus two in the control group. There were no statistically significant differences for prosthesis and implant failures, postoperative complications and patient satisfaction between the two groups.

AUTHORS' CONCLUSIONS:

Despite the limited amount of clinical research available, it appears that HBO therapy in irradiated patients requiring dental implants may not offer any appreciable clinical benefits. There is a definite need for more RCTs to ascertain the effectiveness of HBO in irradiated patients requiring dental implants. These trials ought to be of a high quality and reported as recommended by the CONSORT statement (http://www.consort-statement.org/). Each clinical centre may have limited numbers of patients and it is likely that trials will need to be multicentred.
Survival analysis and clinical evaluation of implant-retained prostheses in oral cancer resection patients over a mean follow-up period of 10 years.

Nelson K, Heberer S, Glatzer C.


Abstract

STATEMENT OF PROBLEM:

Dental implants have been increasingly used for prosthodontic rehabilitation of patients following oral tumor resection and postsurgical radiotherapy. However, only a few long-term studies have examined the implant survival rate and other factors related to prosthodontic treatment in oral tumor resection patients.

PURPOSE:

The purpose of this study was to evaluate the long-term survival of dental implants and implant-retained prostheses in oral cancer resection patients.

MATERIAL AND METHODS:

Ninety-three patients (63 men, 30 women) with a mean age of 59 years (range of 26-89 years) received 435 implants after the resection of a head and neck tumor. Twenty-nine patients received postsurgical radiotherapy prior to implant placement. The factors related to implant survival or failure were monitored over a mean observation period of 10.3 years (range of 5 to 161 months). Prosthodontic rehabilitation was evaluated with respect to the rates of technical failures and complications. Data were analyzed using a Kaplan-Meier curve and comparisons were made with the log-rank test or the Wilcoxon test (a=.05).

RESULTS:

Of the 435 implants, 43 implants were lost; the cumulative survival rate was 92%, 84%, and 69% after 3.5, 8.5, and 13 years, respectively. Twenty-eight implants in 6 patients were counted as lost since the patients had died. Twenty-nine irradiated patients received 124 implants, of which 6 implants were lost prior to prosthodontic rehabilitation. In 68 patients with 78 rigid bar-retained dentures, only minor technical complications were identified. However, all 25 fixed implant-supported restorations had no technical component failures and did not require technical maintenance.

CONCLUSIONS:

This study demonstrates that implant-retained and -supported prostheses in oral cancer resection patients, irrespective of the cancer treatment procedure, show lower long-term survival rates than those in patients without prior cancer surgery. Rigid fixation of the implant-supported prosthesis appears to minimize the complication rates. The poor implant survival rate was due to the higher mortality rate among these patients, and not to a lack of osseointegration.
**Life table analysis and clinical evaluation of oral implants supporting prostheses after resection of malignant tumors.**

Mericske-Stern R, Perren R, Raveh J.


Abstract

Seventeen mostly elderly patients, 13 men and 4 women, were consecutively admitted for implant-prosthodontic treatment after they had undergone resection of malignant tumors in the oral cavity. A total of 53 dental implants (ITI-Straumann) was placed, 12 in the maxilla, 41 in the mandible. The prosthetic rehabilitation consisted of overdenture therapy in 15 patients, and 2 patients were treated with fixed partial prostheses. Thirty-three implants were prescribed for patients who received radiotherapy either before or after implant placement. The average dose varied between 50 and 74 Gy. Eighteen implants were located in grafted bone from the fibula, scapula, or hip. For 2 patients, hyperbaric oxygen therapy was also prescribed after osteoradionecrosis had developed. One implant was lost before prosthetic loading. During an observation period of up to 7 years after loading, 3 more implants were removed. All implant losses occurred in the mandibles of patients who had received radiotherapy. A life table analysis was performed, and the cumulative survival rates, calculated for 2, 3, and 5 years, were 93%, 90%, and 90% respectively. No failures or complications were observed with technical components of the implants or prostheses. All prostheses could be maintained during the entire observation time. Although in the present investigation the survival rate of implants was slightly lower than under standard conditions, the treatment with implant-supported prostheses seemed to be advantageous for patients who had undergone intraoral resections.

**Kaufunktion und orofaziale Rehabilitation nach Tumor-therapeutischer Kopf-Hals-Bestrahlung**

Grötz KA.


**Zusammenfassung:**


Eine tierexperimentelle Studie zum Einheilverhalten enossaler Implantate im bestrahlten Knochen

Lange K-P, Laaß M, Retemeyer K.

Zusammenfassung:
Die Ergebnisse unserer tierexperimentellen Studie zeigen, daß bereits eingehaltte Implantate trotz tumortherapeutischer Bestrahlung fest im Knochen verbleiben können. Eine Implantation im zeitlichen Umfeld der Bestrahlung sowohl kurz vorher als auch wenige Monate danach erscheint nicht erfolgversprechend. Wir können jedoch nachweisen, daß auch ein im Tiermodell voll ausbestrahlter Knochen nach einer gewissen Zeit, bei unseren Untersuchungen nach 8 Monaten, wieder ausreichend osteogene Potenzen aufweist, um ein Implantat knöchern einzubauen.

Klinische Evaluation von Implantaten bei Tumorpatienten

Linsen S, Schmidt-Beer U, Martini M, Koeck B.
Dtsch Zahnärztl Z. 2008 May;63(5):306-316.

Zusammenfassung: