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.

Outcomes of placing dental implants in patients taking oral bisphosphonates: a review of 115 cases.

Grant BT, Amenedo C, Freeman K, Kraut RA.


Comment in:


Abstract

PURPOSE: In recent years, numerous cases of bisphosphonate-associated osteonecrosis of the jaw have been reported involving both intravenous and oral therapy regimens. The majority of these cases have involved intravenous bisphosphonates. Subsequently, drug manufacturers and the US Food and Drug Administration issued warnings about possible bisphosphonate-associated osteonecrosis of the jaw. The American Dental Association and the American Association of Oral and Maxillofacial Surgeons assembled expert panels to formulate treatment guidelines. Both panels differentiated between patients receiving bisphosphonates intravenously and those receiving the drugs orally. However, the recommendations were based on limited data, especially with regard to patients taking oral bisphosphonates. We wanted to ascertain the extent to which bisphosphonate-associated necrosis of the jaw has occurred in our dental implant patients. We also wanted to determine
whether there was any indication that the bisphosphonate therapy affected the overall success of the implants as defined by Albrektsson and Zarb.

PATIENTS AND METHODS: We identified 1,319 female patients over the age of 40 who had received dental implants at Montefiore Medical Center between January 1998 and December 2006. A survey about bisphosphonate therapy was mailed to all 1,319 patients. Responses were received from 458 patients of whom 115 reported that they had taken oral bisphosphonates. None had received intravenous bisphosphonates. All 115 patients were contacted and informed about the risk of bisphosphonate-associated osteonecrosis of the jaw. Seventy-two patients returned to the clinic for follow-up clinical and radiological evaluation.

RESULTS: A total of 468 implants were placed in the 115 patients who reported that they had received oral bisphosphonate therapy. There is no evidence of bisphosphonate-associated osteonecrosis of the jaw in any of the patients evaluated in the clinic and those contacted by phone or e-mail reported no symptoms. Of the 468 implants, all but 2 integrated fully and meet criteria for establishing implant success. Implant success rates were comparable for patients receiving oral bisphosphonate therapy and those not receiving oral bisphosphonate therapy.

CONCLUSIONS: Guidelines for treatment of dental patients receiving intravenous bisphosphonate treatments should be different than for patients taking the oral formulations of these medications. In this study, oral bisphosphonate therapy did not appear to significantly affect implant success. Implant surgery on patients receiving bisphosphonate therapy did not result in bisphosphonate-associated osteonecrosis of the jaw. Nevertheless, sufficient evidence exists to suggest that all patients undergoing implant placement should be questioned about bisphosphonate therapy including the drug taken, the dosage, and length of treatment prior to surgery. For patients having a history of oral bisphosphonate treatment exceeding 3 years and those having concomitant treatment with prednisone, additional testing and alternate treatment options should be considered.

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.

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**Simulation of scattering effects of irradiation on surroundings using the example of titanium dental implants: a Monte Carlo approach.**

Friedrich RE, Todrovic M, Krüll A.


**Abstract**

Occasionally, head and neck cancer patients treated with high-energy X-rays and gamma rays have titanium dental implants. The aim of this study was to calculate alterations in the irradiated bone caused by a foreign body, representing a titanium implant in size and physical qualities, using a stochastic (Monte Carlo) simulation. A clinical linear accelerator was simulated using BEAM/EGS4. The calculations showed that the presence of an implant results in differences of the dose distribution all around the implant. Titanium dental implants in the field of irradiation were capable of causing significant radiation scattering. The risk for dose enhancement was notably important for the bone in direct contact with the foreign body. Therapists involved in radiation planning should consider the impact of dental implants on the radiation beam as a putative cause of osteoradionecrosis.
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.