Oral health-related quality of life and implant therapy: A prospective multicenter study of preoperative, intermediate, and posttreatment assessment

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ABSTRACT

Purpose: Loss of teeth is associated with a significant reduction in quality of life. The aim of this prospective multicenter study was to assess the impact of dental implants on oral health-related quality of life (OHRQoL).
Material and methods: Patients with various kinds of indications for dental implants ranging from single-tooth loss to edentulous jaws were included. Quality of life related to dental implants was assessed through the Oral Health Impact Profile (OHIP-G 21), which has a score from 0 to 20 in healthy patients.
Results: In total, 8689 patients from 17 centers from 2009 to 2014 were enrolled in the study. The sex distribution was almost even (53.3% men, 46.7% women). The most frequent indications for the insertion of dental implants were free-end gaps (30.6%) and posterior single-tooth gaps (27%). In all, 12.4% of patients had an edentulous jaw. For all indications, patients reported significant changes in mean OHIP scores after prosthetic reconstruction. The most significant improvements in the OHIP score occurred in the groups of patients with edentulous jaws (pretreatment score: 42.3) after prosthodontic reconstruction (score: 24.8) and in the patient group with an anterior single-tooth gap (pretreatment score: 36.4) after prosthodontic reconstruction (score: 24.8).
Conclusion: The insertion of dental implants and prosthodontic rehabilitation led to an improved OHRQoL for patients with all indications for dental implants, with the most significant improvements in patients with edentulous jaws and anterior single-tooth gaps.

1. Introduction

Most studies concerning the impact of dental implants on oral health-related quality (OHRQoL) of life focus on the edentulous jaw. The fully edentulous condition negatively affects OHRQoL through the inability to chew, poor speech, pain, and dissatisfaction with personal appearance (Szentpetery et al., 2005; Walton and MacEntee, 2005; van Gemert et al., 2015). Implant therapy seems to have a positive effect on OHRQoL (Nickenig et al., 2015). Dental implants significantly enhance the functionality of dental prostheses in the mandible (Melas et al., 2001; Timmerman et al., 2004; Heydecke et al., 2003; Allen et al., 2006; Attard et al., 2006; Awad et al., 2003; van Gemert et al., 2015; Sanchez-Siles et al., 2015). Recent studies also deal with the OHRQoL in cases of immediate implant insertion (Dolz et al., 2014; Raes et al., 2012). Immediate loading with temporary crowns of the implants of incisors results in an OHRQoL similar to the situation after integration of the definitive crowns (Raes et al., 2012).

OHRQoL is also affected by several other factors. A strong relationship exists between the number of natural teeth and OHRQoL; tooth loss is associated with increasing age and negative effects on OHRQoL, whereas increasing age alone is associated with fewer negative effects on OHRQoL (McGrath and Bedi, 2002; Steele et al., 2004). Population-based oral health studies have frequently defined satisfactory oral health as the presence of a minimum of 20

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teeth or a particular number of occluding posterior tooth pairs (Sheiham et al., 2001; Shimazaki et al., 2001).

However, there are also numerous studies that suggest indications for implant therapy in the case of loss of fewer teeth. Even the loss of a single tooth can affect the OHRQoL in a negative way (Eitner et al., 2012; Nickenig et al., 2008). Recent studies implicate the special role of tooth replacement through implants in the case of loss of front teeth (Yu et al., 2013).

Strassbuger et al. reviewed the influence of prosthodontic and dental implant therapy on patient satisfaction and OHRQoL, concluding that although research in the field of patient-based outcomes has concentrated on dental implant treatment for the edentulous patient, other indications for implant therapy are not yet well investigated (Strassburger et al., 2006).

The purpose of this prospective clinical multicenter study was to determine whether three phases of implant therapy and various indications of implant therapy differentially affected patient OHR-QoL. The study period included the preoperative stage (phase 1), an intermediate stage consisting of the healing time (4–5 months in the upper jaw, 3 months in the lower jaw; phase 2), and a post-treatment stage following completion of the prosthodontic treatment (phase 3).

2. Material and methods

2.1. Patient selection and informed consent

After approval by the local ethics committees, all patients referred to the 17 German treatment centers of the "European Centers for Dental Implantology" (ECDI, www.zahnimplantate.com) for implant therapy over a 5-year period were screened for the following inclusion criteria:

- No general medical risks (ASA I and II), including previous or current radiotherapy or chemotherapy, osteoporosis, or bisphosphonate therapy.
- Absence of soft or hard tissue inflammation in the oral cavity.
- Adequate oral hygiene.
- Presence of one or more of the following indications for implant therapy:
  1. A single missing tooth with the potential for preservation of tooth substance in the adjacent teeth.
  2. A dental gap requiring more than one implant with the potential for preservation of tooth substance, and a clear static disadvantage for conventional therapy.
  3. A free-end gap with posterior teeth in the opposing jaw contraindicating removable partial dentures.
  4. Reduced residual dentition with only one to three remaining teeth, indicating a need for implants to provide sufficient support for a fixed partial denture.
  5. Edentulous upper or lower jaw.

Based on these criteria, a total of 8689 patients had an indication for implant therapy.

All patients provided informed consent, which included a full discussion of the potential benefits, risks, and complications of the proposed implant treatment and a discussion of alternative options.

2.2. Measurement of OHRQoL with the OHIP-G 21 (Table 1)

After providing informed consent, patients completed a version (John et al., 2004) of an OHRQoL-measuring questionnaire, the Oral Health Impact Profile (OHIP) (Slade and Spencer, 1994). A total of 21 OHRQoL factors were rated on a scale of 0–4 (0 = never, 1 = hardly

ever, 2 = occasionally, 3 = fairly often, and 4 = very often). OHRQoL impairment was characterized by the OHIP summary score, calculated as the sum of the 21 subscores (possible summary score range: 0–84). High OHIP scores indicated poor OHRQoL, whereas low OHIP scores indicated satisfactory OHRQoL. The patients first completed the OHIP questionnaire before the beginning of implant surgery, and they repeated the self-assessment after successful osseointegration (4–5 months in the upper jaw, 3 months in the lower jaw) during the healing period and 1–2 months after prosthodontic rehabilitation therapy, for a total of three patient self-assessments.

To identify the most frequently reported problems in this study, "minor problems" were defined as categories with answers of "never," "hardly ever," and "occasionally." Categories including responses of "fairly often" and "very often" were considered "frequently reported problems" (Szentpetery et al., 2005; Walton and MacEntee, 2005).

2.3. Statistical analysis

Data were collected and analyzed using SPSS for Windows (SPSS Inc., Version 22, Chicago, IL, USA). Patient consent was indicated on the medical chart. Patient questionnaires were analyzed anonymously; each case was assigned a registration number before evaluation, allowing explicit and anonymous data analysis.

The effect of implant therapy on OHRQoL was assessed by comparing preoperative, intermediate, and posttreatment (i.e., after prosthodontic treatment) OHIP-G scores. Additionally, the most frequently reported problems were compared between the groups.

Descriptive statistics, frequencies, means, standard deviations (SD), and explorative data analysis were used. In addition, the chi-

Table 1
The 21 items from the original Oral Health Impact Profile (OHIP) that were selected for the OHIP-G 21.

Selection of OHIP items, original numbering	Questions on the OHIP-G 21 (*Each question below ended with the phrase*: "*because of problems with your teeth, mouth, or dentures*")
	Functional limitation questions
1	Have you had difficulty chewing any foods…
2	Have you had trouble pronouncing any words…
3	Have you noticed a tooth which doesn't look right?
4	Have you felt your appearance has been affected…
	Physical pain
10	Have you had painful aching in your mouth?
11	Have you had a sore jaw?
13	Have you had sensitive teeth?
14	Have you had toothache?
15	Have you had painful gums?
17	Have you had sore spots in your mouth?
	Psychological discomfort
19	Have you been worried by dental problems?
22	Have you felt uncomfortable about the appearance …
	Psychological disability
36	Have you felt depressed …
37	Has your concentration been affected…
38	Have you been a bit embarrassed …
	Social disability
39	Have you avoided going out …
40	Have you been less tolerant of your spouse or family …
42	Have you been a bit irritable with other people …
43	Have you had difficulty doing your usual jobs …
	Handicap
48	Have you been totally unable to function …
49	Have you been unable to work to your full capacity …