Impact of Different Types of Dental Prostheses on Oral Health–Related Quality of Life: A Prospective Bicenter Study of Definitive and Interim Restorations

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Purpose: To assess the impact of different types of dental prostheses, including definitive and interim restorations, on oral health–related quality of life (OHRQoL) before and after prosthetic treatment. Materials and Methods: A total of 151 patients received prosthetic treatment at one of two German departments of prosthetic dentistry. The patients’ OHRQoL was assessed using the German version of the Oral Health Impact Profile (OHIP-G53) at baseline (T0) and at 1 week (T1) and 3 months (T2) after treatment. Patients were divided into 10 subgroups according to their pre- and posttreatment status. The effects of restoration type (no prosthesis; fixed prosthesis; removable prosthesis) and duration of wear (definitive; interim) were evaluated. Results were analyzed using Kolmogorov-Smirnov, Kruskal-Wallis, and Mann-Whitney U tests with a significance level of \( P = .05 \). Results: The highest OHRQoL was recorded for patients with fixed restorations, as indicated by the fact that their OHIP scores were lowest. A significant improvement in OHRQoL (\( P \leq .034 \)) was observed for patients who needed prostheses and were then treated with removable or fixed restorations. The OHIP score was affected by a change in restoration type. Rehabilitation with definitive prostheses had a significant effect on posttreatment OHRQoL (\( P \leq .006 \)). Conclusion: In general, prosthetic rehabilitation by use of fixed or removable prostheses resulted in an improvement in OHRQoL. The use of the same type of restoration before and after treatment had a positive effect on OHRQoL. If possible, a change of restoration type should be avoided. For patients who require permanent prostheses, the use of fixed and removable restorations is recommended. For oral rehabilitation, fixed restorations should be preferred in order to achieve best possible improvement of OHIP score. Int J Prosthodont 2021;34:441–447. doi: 10.11607/ijp.7180
can be assessed by means of various questionnaires; for example, the Dental Impact of Daily Living (DIDL), Geriatric Oral Health Assessment Index (GOHAI), and Oral Impacts on Daily Performances (OIDP). The Oral Health Impact Profile (OHIP) is a reliable and valid questionnaire for assessing OHRQoL and the effect of different dental treatments on it. It is available in different versions according to the number of questions, whereby the extended versions (eg, OHIP-G49/53) enable a very detailed assessment of oral health and well-being. The OHIP is available in several languages, enabling international comparisons of OHRQoL and cross-sectional usage.

The OHIP questionnaire has been used in previous studies to evaluate how specific dental treatments, fabrication procedures, and prosthetic materials affect OHRQoL. Depending on the treatment received, Schwindling et al and Grossmann et al observed an improvement in OHRQoL from the use of double crown–retained removable partial prostheses. A strategic insertion of dental implants under existing removable dentures can result in further improvement of the OHRQoL. For treatment of a single missing tooth, Park et al evaluated two different prosthetic treatments—single-tooth implant and three-unit fixed dental prostheses (FDPs)—and concluded that both showed a positive impact on OHRQoL. In a different study, however, the OHIPQoL of patients with missing molars and thus a shortened dental arch was similar to that of patients who had received removable partial dentures (RPDs). With regard to the material used for fixed restorations, an improvement in OHRQoL was observed for metal-ceramic and all-ceramic FDPs, with no difference between the materials. Thus, several studies have already investigated specific prosthetic treatments in consideration of the patient’s prosthetic needs, whereas only a few studies have concentrated on the general overview of the effects of different prosthetic treatments. However, most of these studies investigate definitive prosthetic restorations, and the impact of interim restorations on OHRQoL is not examined very well. Interim restorations are generally used to protect prepared teeth against external influences and to maintain the function of the masticatory system for a defined period. Moreover, interim restorations can be used for pretreatment diagnostics, as well as esthetic and functional rehabilitation prior to definitive prosthetic treatments. They therefore represent an essential part of prosthetic treatments, and a possible influence on OHRQoL should be investigated.

The aim of this prospective clinical study was to assess the general effect of prosthetic treatments placed during the students’ course of study. Furthermore, a possible association between OHRQoL and the type of pre- and posttreatment restoration, as well as the intended duration of the restoration (interim/definitive), was examined. The null hypotheses were that the dental prosthetic treatment would have no effect on OHRQoL and that the type of the restoration (including interim compared to definitive) would have no effect on the OHIP score.

**MATERIALS AND METHODS**

**Study Design**

This prospective clinical study was performed at two university departments of prosthetic dentistry in Germany. The study was approved by the ethics committee of each university’s school of dental medicine (reference numbers: Munich 18-48, Würzburg: 139/18).

Participants were recruited from among patients being treated in the clinical student course. The study was conducted between October 2018 and October 2019 and involved patients who received a prosthetic treatment (either an FDP or RDP) from a dental student in their fourth or fifth year of study. The RDPs consisted of complete dentures (CDs), as well as clasp-retained and telescopic double crown–retained partial dentures. Fixed prosthetic restorations comprised single crowns (SCs) and FDPs. Both fixed and removable restoration types included definitive and interim prostheses. The pretreatment group of patients with prosthetic needs but no existing prosthesis had decayed or missing teeth that required replacement or restoration by means of a crown. All prostheses considered were tooth supported; implant-supported restorations were not included in the study.

The inclusion criteria were: minimum age of 18 years; good oral hygiene; and underwent treatment in the dental students’ course. The exclusion criteria were: pregnancy; drug and alcohol abuse; and known allergies to dental materials.

The study participants were divided into three subgroups according to their dental status before and after prosthetic treatment: patients with the need for prosthetic treatment without prosthetic restorations; patients who received FDPs; and patients who received RDPs. A further distinction was made between interim (temporary SCs/FDPs/RDPs/CDs) and definitive prostheses.

**OHRQoL Assessment**

A total of 151 participants met the inclusion criteria and consented to participate in the clinical study. All patients completed the German version of the OHIP (OHIP-G49/53) at three defined times of assessment. This questionnaire consists of 50 questions (one repeated question) divided into 7 domains: functional limitation, physical pain, psychologic discomfort, physical disability, social disability, psychologic disability, and handicap. Patients with fixed restorations answered the OHIP-G49 questionnaire. Patients with RDPs answered three additional questions about removable dentures. Each question asked how frequently the patients had experienced the respective questionnaire item in the last week.
Responses were scored in the following way according to a standardized procedure: 0 = never; 1 = rarely; 2 = occasionally; 3 = fairly often; and 4 = often.6,7 Thus, a lower OHIP score signified better oral health. Each patient’s answers were summed to give a total OHIP score for each time of assessment. Only patients with three fully completed questionnaires were included in the study. The questionnaires were completed at baseline (T0 = on the day of the first treatment session) and then 1 week (T1) and 3 months (T2) after completion of the prosthetic dental treatment.

Statistical Analysis
The OHIP-49/-53 score and descriptive data for each patient were recorded in Excel (Microsoft) for T0, T1, and T2 separately. Kolmogorov-Smirnov test was used to determine whether the scores were normally distributed. Differences within groups were evaluated using Kruskal-Wallis test and Mann-Whitney U test with Bonferroni correction. Data were analyzed statistically using version 25.0 of SPSS (IBM) with a significance level of \( P = .05 \).

RESULTS

Patient Characteristics
The 151 patients comprised 80 men and 71 women. The mean age was 64.7 ± 10.5 years (men: 64.7 ± 10.5 years; women: 64.5 ± 10.6 years). The two study centers recruited an almost equal number of participants (Munich: n = 75; Würzburg: n = 76).

To assess the effect of restoration type (groups A1 to A5) and restoration duration (interim or definitive restoration; groups B1 to B5) on OHRQoL, 10 subgroups were defined (Table 1).

Impact of Type of Restoration
Before prosthetic treatment, the lowest OHIP total score (and thus the best OHRQoL) was recorded for patients who had an existing fixed restoration (median = 21), followed by those who were in need of treatment but had no prosthesis (median = 37). The highest total OHIP score was recorded for patients with an existing RDP (median = 62.5; Table 2). At baseline assessment, significant differences were identified between removable and fixed restorations (\( P < .001 \)), as well as between removable dentures and no prostheses (\( P < .001 \)). After prosthetic treatment, OHRQoL improved in all groups, as indicated by a decrease in OHIP score. However, the posttreatment OHIP scores for fixed restorations and removable prostheses differed significantly (T1: \( P = .001 \); T2: \( P = .004 \)).

Table 3 shows the total OHIP scores according to the change between pre- and posttreatment findings and the type of restoration received. As indicated by a significant decrease in OHIP score, OHRQoL improved significantly between T0 and T1 in groups A1 (\( P = .034 \)), A2 (\( P = .009 \)), A3 (\( P = .041 \)), and A5 (\( P < .001 \); Table 3). The decrease in OHIP score between T0 and T2 was significant in groups A1 (\( P = .014 \)), A2 (\( P = .002 \)), and A5 (\( P < .001 \)). Comparison of T1 and T2 did not show significant differences for any subgroup (\( P > .05 \)).

In contrast, the pre- and posttreatment results indicated differences between different subgroups. Comparison of groups A1 and A2 showed a significantly lower total score in favor of group A1 at T0 (\( P = .022 \)) and T1 (\( P = .050 \)). Furthermore, a direct comparison of group A3 showed significantly better results compared to group A2 (T0: \( P = .007 \); T1: \( P = .012 \)), group A4 (T1: \( P = .013 \)), and group A5 (T0: \( P < .001 \); T1: \( P = .001 \); T2: \( P = .041 \)). In addition, the scores for group A5 showed a significant increase compared to groups A2 (\( P = .028 \))
Impact of Definitive Restoration Compared to Interim Restoration

Before prosthetic treatment, 63 patients had definitive prostheses, 23 patients had temporary prostheses, and 65 patients had no prosthetic restorations. Pretreatment OHIP scores were significantly higher for temporary prostheses than for definitive prostheses (P = .014) or no existing prostheses (P = .034; Table 4).

During dental treatment, 28 patients received interim prostheses and 123 received definitive prostheses. The change from an interim to definitive prosthesis resulted in a significant decrease in OHIP score, whereas the change from a definitive prosthesis to an interim one did not (Table 5).

DISCUSSION

This study investigated the impact of dental prosthetic treatments on self-assessed OHRQoL. The null hypothesis, which stated that prosthetic treatment would have no effect on OHRQoL, must be rejected. The results showed differences between the total OHIP scores depending on the type of prosthetic restoration before and after prosthetic rehabilitation. Of the three pretreatment groups, the group of patients with fixed restorations had the best pretreatment OHRQoL.

Table 2  Total OHIP Scores for Each Type of Restoration at Each Time of Assessment

<table>
<thead>
<tr>
<th>Time of assessment</th>
<th>No restorations</th>
<th>Fixed prostheses</th>
<th>Removable prostheses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Median</td>
</tr>
<tr>
<td>T0</td>
<td>41.2</td>
<td>31.6</td>
<td>37.0^a</td>
</tr>
<tr>
<td>T1</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>T2</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

IQR = interquartile range. Different superscript letters within rows indicate significant differences between restoration types at each time point.

Table 3  Influence of Prosthetic Restoration on OHIP Score

<table>
<thead>
<tr>
<th>Group</th>
<th>T0 Mean</th>
<th>SD</th>
<th>Median</th>
<th>IQR</th>
<th>T1 Mean</th>
<th>SD</th>
<th>Median</th>
<th>IQR</th>
<th>T2 Mean</th>
<th>SD</th>
<th>Median</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>32.6</td>
<td>31.2</td>
<td>21.5^a</td>
<td>45.0</td>
<td>18.6</td>
<td>21.8</td>
<td>9.50^b</td>
<td>32.0</td>
<td>16.9</td>
<td>21.2</td>
<td>5.00^b</td>
<td>24.0</td>
</tr>
<tr>
<td>A2</td>
<td>49.1</td>
<td>32.6</td>
<td>45.0^a</td>
<td>50.0</td>
<td>29.0</td>
<td>26.6</td>
<td>22.0^b</td>
<td>39.0</td>
<td>24.9</td>
<td>24.3</td>
<td>16.0^b</td>
<td>36.0</td>
</tr>
<tr>
<td>A3</td>
<td>28.7</td>
<td>30.4</td>
<td>15.0^a</td>
<td>44.0</td>
<td>14.9</td>
<td>19.3</td>
<td>8.00^b</td>
<td>21.0</td>
<td>17.7</td>
<td>21.0</td>
<td>12.0^b</td>
<td>25.0</td>
</tr>
<tr>
<td>A4</td>
<td>40.6</td>
<td>31.4</td>
<td>48.0^a</td>
<td>53.0</td>
<td>26.8</td>
<td>20.0</td>
<td>23.0^b</td>
<td>32.0</td>
<td>23.9</td>
<td>20.3</td>
<td>21.0^b</td>
<td>41.0</td>
</tr>
<tr>
<td>A5</td>
<td>69.8</td>
<td>40.7</td>
<td>62.0^a</td>
<td>57.0</td>
<td>33.4</td>
<td>28.4</td>
<td>23.0^b</td>
<td>48.0</td>
<td>31.9</td>
<td>30.8</td>
<td>17.0^b</td>
<td>59.0</td>
</tr>
</tbody>
</table>

IQR = interquartile range. Different superscript letters within rows indicate significant differences between time points within one subgroup.

Table 4  Impact of Change Between Interim and Definitive Restoration on OHIP Score

<table>
<thead>
<tr>
<th>Group</th>
<th>T0–T1 Mean SD Median IQR</th>
<th>T0–T2 Mean SD Median IQR</th>
<th>T1–T2 Mean SD Median IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>.005*</td>
<td>.003†</td>
<td>.703</td>
</tr>
<tr>
<td>B2</td>
<td>.217</td>
<td>.028*</td>
<td>.365</td>
</tr>
<tr>
<td>B3</td>
<td>.000*</td>
<td>.000*</td>
<td>.960</td>
</tr>
<tr>
<td>B4</td>
<td>.805</td>
<td>.456</td>
<td>.535</td>
</tr>
<tr>
<td>B5</td>
<td>.004*</td>
<td>.006*</td>
<td>.422</td>
</tr>
</tbody>
</table>

*Significant (P < .05).

Table 5  Statistical Analysis of Change in OHIP Score Depending on Duration of Wear of Prostheses

<table>
<thead>
<tr>
<th>Group</th>
<th>T0–T1</th>
<th>T0–T2</th>
<th>T1–T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>.005*</td>
<td>.003†</td>
<td>.703</td>
</tr>
<tr>
<td>B2</td>
<td>.217</td>
<td>.028*</td>
<td>.365</td>
</tr>
<tr>
<td>B3</td>
<td>.000*</td>
<td>.000*</td>
<td>.960</td>
</tr>
<tr>
<td>B4</td>
<td>.805</td>
<td>.456</td>
<td>.535</td>
</tr>
<tr>
<td>B5</td>
<td>.004*</td>
<td>.006*</td>
<td>.422</td>
</tr>
</tbody>
</table>

*Significant (P < .05).
After prosthetic rehabilitation, OHRQoL improved in both posttreatment groups at the first and second follow-up appointments. Fixed restorations resulted in lower OHIP scores than removable dentures. This is in agreement with the results of other studies that used the extended OHIP questionnaire to show a general improvement in OHRQoL after prosthetic treatment.16,22–24

Similar to the results recorded in the current study, Szabó et al observed lower OHIP scores for patients with FDPs than for those with RDPs.22 This can be caused by problems with design and comfort; in addition, fixed restorations are more similar to natural teeth.22

The second part of the tested hypothesis—ie, that the type and duration of wear (interim or definitive) of the restoration would have no effect on OHIP—can also be rejected. The OHIP score and OHRQoL of these subgroups according to their prosthetic status (Table 1) differed significantly depending on the type of restoration used. Significant improvements were achieved by the prosthetic rehabilitation of patients with no existing prosthetic restoration. For both fixed and removable prostheses, a significant decrease in OHIP score was observed between T0 and the follow-up evaluations, with a positive effect on OHRQoL. This corresponds to the findings of Sanadhya et al, who showed that decayed and missing teeth had a negative effect on OHRQoL.25 The improvement in OHRQoL can be further explained by the improvement in oral function. A significant improvement in speech quality after prosthetic treatment of patients with missing teeth was described.26 Even if the insertion of removable prostheses did not lead to a significant improvement in all groups, prosthetic rehabilitation can generally be recommended.

Moreover, the OHRQoL improved significantly after the renewal under the use of the same type of restoration before and after treatment.

The change from a fixed restoration to a removable one resulted in a decreased OHIP score; however, it must be noted that this decrease was not statistically significant. Oral function and health can be affected by insufficient fixed and removable restorations.27,28 In one study, OHRQoL actually improved after the renewal of a removable denture, which is in agreement with the results of the current study.29 Nonetheless, if possible, it is recommended that the patient’s type of restoration should not be changed.

With the exception of group A3, analysis showed a further decrease in OHIP score between T1 and T2, which is in agreement with a previous study.24 The lack of statistical significance between T1 and T2 perhaps indicates that patients had already adapted well to their restorations by the time of the first follow-up assessment, and that this adaptation then continued to improve between T1 and T2.

According to the effect of the intended duration of wear, the baseline evaluation demonstrated higher OHRQoL for patients with a definitive restoration or no prostheses than for those with temporary prostheses.

Furthermore, patients with no existing prosthetic restoration showed significant improvements after rehabilitation with definitive prostheses, as did patients whose definitive prostheses were renewed. In contrast, rehabilitation using interim prostheses resulted in a delayed change in OHIP score at T2 (group B2) or no significant change (group B4). Nevertheless, fixed and removable temporary prostheses both constitute an essential pretreatment option in prosthetic dentistry, enabling a physiologic healing process and restoration of esthetics and function.30,31 Thus, the short-term use of temporary prostheses is indicated and advantageous. To achieve a more positive effect on OHRQoL, however, definitive prostheses should be used for long-term rehabilitation. In most cases, they are made from better quality materials and are less bulky in appearance. Moreover, the decrease in OHIP score between T1 and T2 was significant for patients with prosthetic needs who had been rehabilitated with interim prostheses. This suggests that patients with no prior prosthesis need more time to adapt to interim restorations.

When interpreting the results of this study, several limitations must be taken into consideration. First, the general health and demographic factors of the patients were not evaluated in detail. Nevertheless, prosthetic rehabilitation seems to substantially affect patients’ OHRQoL.24 It has been shown that the use of a prospective study design results in a less biased evaluation of dental treatments when using the OHIP than with the use of retrospective assessments.32 Furthermore, the time chosen for the first follow-up (1 week after treatment) is a valid time of assessment and was recommended in a previous study.33 Thus, the design of the current study was appropriate for the question investigated.

Second, the group of RDPs included complete, clasp-retained, and double crown–retained dentures. Comparing the outcomes of previous studies concerning different kinds of removable dentures, double crown–retained prostheses show in general lower posttreatment OHIP summary scores than clasp-retained dentures and CDs.34–36 Thus, double crown–retained dentures seem to have a higher impact on OHRQoL. It must be considered that the different effect of these included types of RDPs could not be evaluated in detail due to the limited sample size of each denture type.

Furthermore, the groups of restoration types included interim and definitive prostheses. Because of different fabrication procedures, these types can differ in their design and fit. Due to the makeup of the groups, a different impact on OHRQoL of interim and definitive
ACKNOWLEDGMENTS

All study procedures involving human participants were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Individual informed consent was obtained from all participants included in the study. The authors report no conflicts of interest.

REFERENCES

Race to Invade: Understanding Soft Tissue Integration at the Transmucosal Region of Titanium Dental Implants

The success of a dental implant system not only depends on appropriate osseointegration at the bone-implant interface, but also on robust soft tissue integration (STI)/mucointegration at the transmucosal region. However, numerous studies have reported that the STI quality of conventional smooth and bioinert titanium-based transmucosal components is significantly inferior to that of natural teeth, which may compromise the long-term success of implant restorations. In this review article, the structural and histologic characteristics of peri-implant soft tissue support in single-implant treatment are discussed. In addition, the challenges of achieving robust STI are detailed and discussed, targeting future directions to enhance the long-term survival of implant restorations. Based on its histologic characteristics, STI on current implant/abutment surfaces is suboptimal compared to the periodontal attachment found at natural teeth, making implants potentially more susceptible to disease initiation and progression. To obtain stable STI at the transmucosal region, it is essential for future studies to design customized implant systems with enhanced surface bioactivity and tailorable therapeutic capacity, which can improve the long-term success of implant restorations, especially in compromised conditions.

—Carlo Marinello, Switzerland