

## Article

# Traditional Removable Partial Dentures versus Implant-Supported Removable Partial Dentures: A Retrospective, Observational Oral Health-Related Quality-of-Life Study

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**Abstract:** Removable partial dentures (RPD) are still a valid alternative for the restoration of missing teeth. Additionally, implant-supported removable partial dentures (ISRPD) represent a valid alternative as it allows to avoid the use of clasps and increase stability. The objective of this study was to evaluate through an OHIP-14 questionnaire the level of satisfaction and quality of life (QoL) of patients treated before RPD and then with ISRPD. Twenty patients were rehabilitated with traditional RPDs, and after one year the prosthesis was modified into ISRPD, by inserting an implant and a ball or locator attachment. At the end of both phases, patients completed the Oral Health Impact Profile (OHIP-14) questionnaire. The collected data were statistically analyzed through the Wilcoxon U test, as overall OHIP score and difference between treatments. The mean of the OHIP summary (range from 0 to 56) in the RPD Group was 20.95 ( $\pm 5.27$ ). In the ISRPD Group it was 13.95 ( $\pm 3.91$ ), with a statistically significant difference ( $p < 0.05$ ) between the two Groups. The same findings were highlighted for the differences between groups in every domain question. Patients showed significant improvements after rehabilitation in all areas of investigation, stating how the transformation of a removable prosthesis into an implant-supported one can improve patients' QoL with benefits in chewing ability, aesthetics and self-satisfaction.

**Keywords:** implant-supported removable partial denture; oral health quality of life; removable partial denture; dental implants; OHIP-14

## 1. Introduction

Despite the efforts for prevention and treatment of dental diseases to allow people to keep their teeth, the demand for restoring missing teeth is increasing [1–3]. This is mainly related to the increase in the average age of the population and a greater awareness of the importance of oral health [4], with repercussions on the quality of life (QoL), psychological aspects and social status of people [5,6]. The expectations of patients today are not only limited to the masticatory function but also to comfort, appearance and aesthetics [7]. Lack of teeth affects people's appearance, social interactions and safety. In this sense, some studies have shown how the loss of dental elements can have detrimental effects on social and psychological status, such as anxiety, self-confidence and emotional distress [3–7]. The ideal therapy for patients and clinicians remains fixed dental or implant-supported rehabilitation [8,9]. The success of such rehabilitations is extremely high both in the short and long term [10,11]. At the same time, however, removable partial dentures (RPD) are still a

viable alternative [12]. This is because fixed rehabilitations may not be feasible solutions due to high costs, general health issues, fear, anatomical problems or rejection [8,9]. For these reasons, a RPD represents an economical, fast, conservative and minimally invasive treatment [12,13]. However, at the same time, the RPD choice is often accompanied by patient discomfort [14]. This is especially true with regard to the stability of the prosthesis itself. Over the past decades, several studies, as well as the experience of clinicians, have demonstrated the criticality of RPDs [14–16]. At 5 years of follow-up, approximately 25% of prostheses required replacement or were no longer used [14]. This percentage doubles at 10 years [15]. Comfort during chewing and poor prosthetic fit were the main causes of dissatisfaction. Prostheses with both distal extensions represented the least tolerated ones [16]. In addition to instability, the presence of clasps in the anterior teeth was also a problem for the patient [14,16]. To solve these problems over the years, hybrid solutions have also been proposed, with RPD supported by implants [17,18]. The objective was to avoid the use of clasps and increase stability, thus limiting the number of implants inserted and consequently the biological and economic costs [17,18]. This solution has been extensively studied, and a good survival rate over the years was demonstrated [19]. At the same time, some authors have also evaluated the comfort of patients with implant-supported RPD (ISRPD) [20,21]. This possibility is offered by questionnaires validated over the years that aim to verify the perception of the oral health status and the treatments received by the patients [22–24]. In fact, a solution which is technically correct and satisfactory to the clinician, is not always an indication of patient satisfaction [25]. Research suggests how patients and clinicians define the concept of success differently [22–25]. Over the years, numerous questionnaires have been used to ascertain the level of patient satisfaction and the oral health-related quality of life (OHRQoL). Among these, the Oral Health Impact Profile (OHIP) is the most widely used. The original version included 49 questions on 7 different topics about function, social aspects, satisfaction, etc. [23,24]. Nowadays, a reduced and more patient-friendly version has been introduced, OHIP-14 [24]. This version is now widely used to validate the success of treatments [26,27].

The objective of this study was to investigate the level of satisfaction of patients who underwent first an RPD treatment and then an ISRPD one. More specifically, the aim was to evaluate possible change in quality of life in order to determine which of the two treatment options was the most acceptable and whether there were differences in the patient's satisfaction. This way, it was possible to decide on treatment on the basis of a subjective criterion, in addition to the biological criteria already described in the literature. The null hypothesis is that there were no perceived differences between the two solutions.

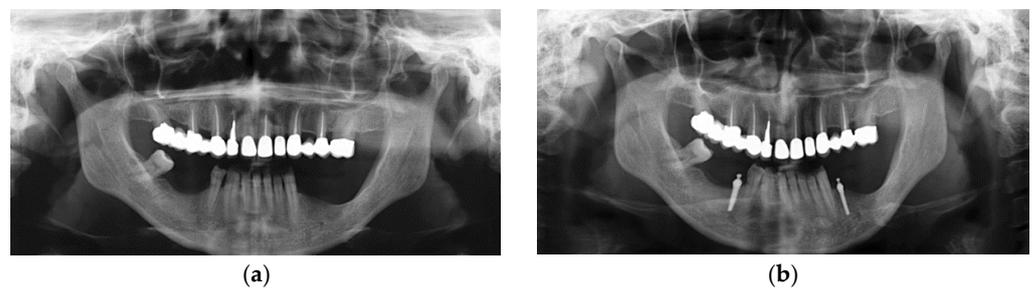
## 2. Results

All enrolled participants responded to the proposed questionnaires. Demographic data and characteristics are shown in Table 1. All inserted implants survived the 6-month follow-up (when the second questionnaire was performed). In Figure 1, an explanatory orthopantomography showed the same patient before and after implant placement. All summary scores were higher in the RPD group compared with the ISRPD. Only one patient reported a worsening in ISRPD, obtaining a positive difference ( $\Delta$ ) score of 2. The data collected showed statistically significant differences between the questionnaires taken 6 months after the delivery of the RPD and the ISRPD. Thus, the null hypothesis was rejected.

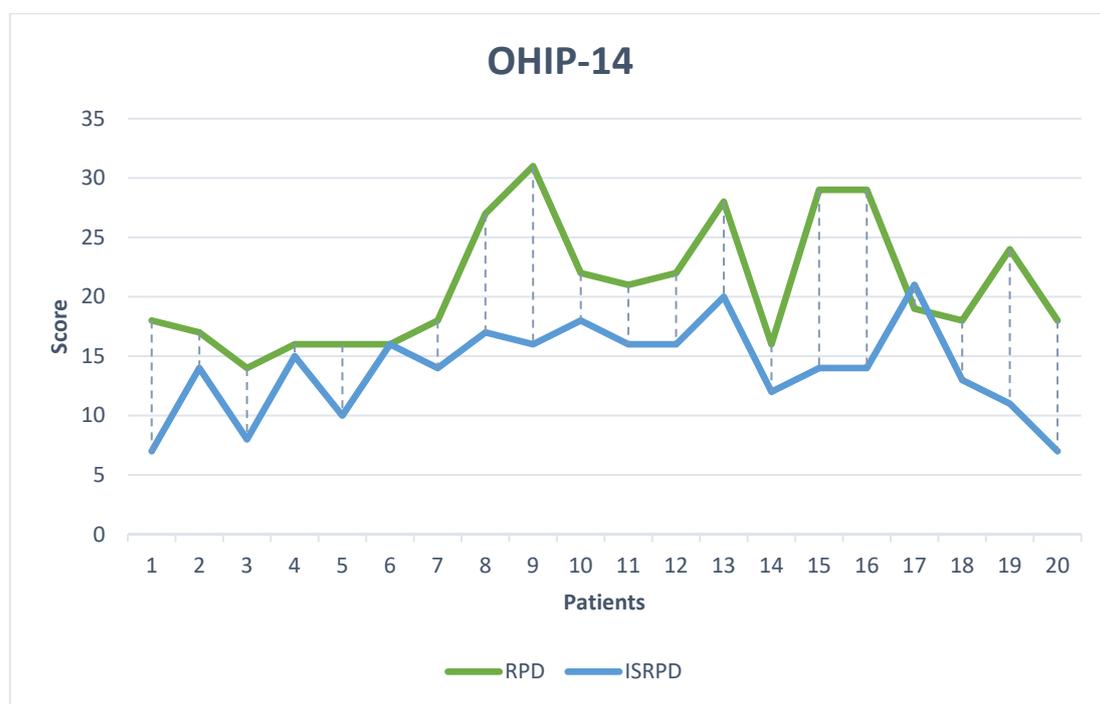
Specifically, a statistically significant difference emerged between the two groups of questionnaires ( $p < 0.05$ ). The mean of OHIP summary (range from 0 to 56) in the RPD Group was 20.95 ( $\pm 5.27$ ), and the median was 18.5. In the ISRPD Group it was 13.95 ( $\pm 3.91$ ), median was 14 as shown in Figure 2. The  $\Delta$  values for each patient and each domain showed an improvement in each of the domains, but especially in domains 2 and 3, physical pain and psychological discomfort, as shown in Table 2. By analyzing the table with the differential values (T0-T1), a statistically significant improvement was demonstrated for all domains, as shown in Table 3.

**Table 1.** Demographic data and characteristics of participants.

	<i>n</i>	%
Mean age	73	
Sex (men)	8	40%
Sex (women)	12	60%
Kennedy class I	11	55%
Kennedy class II	6	30%
Kennedy class III	3	15%
Kennedy class IV	0	0%



**Figure 1.** Orthopantomography of a treated patient. (a) before and (b) after implant insertion.



**Figure 2.** OHIP-14 recorded after RPD treatment (green) and after ISRPD treatment (blue). It possible to see the different score obtained in each patient. Items were scored on a 5-point scale ranging from 0 (never), 1 (hardly ever), 2 (occasionally), 3 (fairly often) and 4 (very often). The possible scores for the overall scale ranged from 0 to 56.

**Table 2.** Difference ( $\Delta$ ) values in all patients between score recorded in all domains.

Difference T2-T1	Patients																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Domain 1—functional limitation	0	0	0	0	-2	0	0	0	-1	0	0	-1	1	0	-1	-1	0	-1	-1	-1
Domain 2—physical pain	-2	1	-2	-1	-1	1	0	-2	-3	-2	0	0	-3	0	-3	-3	0	-1	-3	-2
Domain 3—psychological discomfort	-4	-2	-1	0	-1	-1	-2	-4	-3	1	-3	-1	-4	0	-3	-4	1	0	-3	-3
Domain 4—physical disability	-3	-1	-2	0	1	0	-1	-2	-1	-1	-1	-2	0	-2	-1	-3	0	-2	-1	0
Domain 5—psychological disability	-2	0	-1	0	-2	0	0	-2	-4	0	0	0	-1	0	-4	-3	1	-1	-2	-3
Domain 6—social disability	0	-1	0	0	-1	0	-1	0	-2	-2	-1	-2	0	-2	-2	0	0	0	-2	-2
Domain 7—handicap	0	0	0	0	0	0	0	0	-1	0	0	0	-1	0	-1	-1	0	0	-1	0
Total	-11	-3	-6	-1	-6	0	-4	-10	-15	-4	-5	-6	-8	-4	-15	-15	2	-5	-13	-11

**Table 3.** Statistical analysis of difference ( $\Delta$ ) values recorded in all domain.

Difference T2-T1	Statistical Analysis			
	Median Differences	First Quartiles	Third Quartiles	p Value
Domain 1—functional limitation	0	-1	0	0.021
Domain 2—physical pain	-1.5	-2.25	0	0.002
Domain 3—psychological discomfort	-2	-3	-0.75	0.001
Domain 4—physical disability	-1	-2	0	0.001
Domain 5—psychological disability	-1	-2	0	0.001
Domain 6—social disability	-1	-2	0	0.002
Domain 7—handicap	0	-0.25	0	0.025
Total	-6	-11	-4	<0.001

### 3. Discussion

Loss of teeth alters patients’ chewing and aesthetics, thus causing oral and general health issues and discomfort, with a negative impact on QoL [28,29].

The results of this study allowed us to evaluate the impact of RPD and ISRPD in patients’ lives. One study focused on the subjective perspective of the patient with ISRPD [20], and never assessed the change in QoL in patients who received both types of treatment. The results show that there is a significant increase in QoL, rejecting the null hypothesis.

Improvement in QoL is understood to have positive implications on all aspects of the patient’s life, from physical pain to psychological, relational and social aspects [28,30,31]. This study evaluated how these aspects changed when moving from a traditional removable treatment to an implant-supported one.

Since the introduction of the OHIP questionnaire in the 1990s, it has proven to be a useful tool for the objective evaluation of patient satisfaction [23,24]. It is now a reliable tool that allows to objectify the patient’s perception but also to compare various studies and carry out research on psychological and social aspects of rehabilitation. Several studies have demonstrated an improvement in QoL after the treatments received [30–33]. On the other hand, the use of questionnaires allows to obtain interesting data on the perception of patients, but also from the dentist’s point of view [34]. In agreement with other studies, the present study’s results showed an improvement in OHR QoL after implant-prosthetic treatment [35–37]. Some of the main aspects which emerged are better function, reduced pain and improved mastication, which are reflected in improved daily activities.

Swelen et al. in 2014 administrated questionnaires at 3 and 6 months of follow-up, showing a more pronounced improvement during the first follow-up period. Patients reported an immediate reduction effect in problems present before treatment [33]. However, at the same time patients showed adaptation over time to the rehabilitations performed [33,38].

The OHIP sum showed statistically higher values in RPDs. This can be interpreted as a greater discomfort related mainly to psychological aspects and pain, as shown by a more significant change in domains 2 and 3, related to pain and psychological aspects. Other studies have shown similar data in RPD rehabilitation [39,40]. These studies agree that

traditional RPDs require more maintenance, and more attention during use by the patient, who will tend to lose motivation [41,42].

Previous findings demonstrate that traditional RPDs have worse OHIPs in comparison with other prosthetic rehabilitation [43]. The use of ISRPD compared with complete dentures and other fixed prosthetic rehabilitation offers better OHIP [43]. Moreover, the results of the current study demonstrate how ISRPD allow better scores in terms of OHIP in contrast to RPDs.

Obtained values were in line with other studies. Papagiannopoulou et al. in 2012 [44] reported a value of  $14.9 \pm 10.0$  in the general Greek population. In patients with an oral condition defined as “fair” by dentists, the score rose to 18.8 and 31.6 in patients with poor condition, demonstrating how the use of implant-supported removable partial dentures can significantly improve the quality of life for patients. Gates et al. in 2014 [20] used short implants in ISRPD rehabilitations, demonstrating an improvement in patients’ QoL. Patients reported improved function and to feel more comfortable with the prostheses themselves. In another study, Johns et al. in 2009 [45] reported a reduction in OHIP after RPD rehabilitation. Among the patients reviewed here, only one showed a worsening of some areas after implant treatment. As it is known, implant treatment is not exempt from possible complications [9–11]. No patient included here reported implant failure. However, possible minor complications can still occur during treatment. These may be biological, infectious or mechanical problems [46,47]. A possible worsening of QoL after implant treatment can be interpreted in this sense. The possibility of analyzing the same group of patients with two different types of treatments gives value to the results collected, although with a small number of patients. It might be interesting to repeat the study to further implement the rehabilitation by bringing the same group of patients, if possible, to a fixed type of rehabilitation.

## 4. Materials and Methods

### 4.1. Study Population

This is a single-center analytic study which aimed to evaluate through OHIP-14 the level of satisfaction and quality of life of patients treated before RPD and then with ISRPD. The authors interviewed 20 patients, aged between 59 and 81 years, treated in dental clinic of the Department of Dental Medicine, Medical University of Tirana. Patients were 8 men and 12 women.

Inclusion criteria included all clinical situations that were deemed appropriate for RPD rehabilitation [21]. Edentulism of a single or both arches of Kennedy class I, II, III and IV. In addition, the patients were in good systemic health and able to receive implant surgery. Another inclusion criterion was the presence of sufficient residual bone ridge to place an implant. On the other hand, patients who did not undergo both treatments, who were unable to answer the questionnaires independently, with severe parafunctions as well as those with local or general contraindications to implant treatment were excluded [21].

### 4.2. Study Design

All patients were rehabilitated with traditional RPDs by a single experienced prosthodontist. After one year of treatment, the same patients underwent implant surgery for the placement of at least one implant in the edentulous area. All biphasic implants from different companies were inserted by the same operator, who followed a two-stage protocol and placed them according to the manufacturer’s instructions: with a sufficient insertion torque. The implant was placed in the ridge immediately adjacent to the last remaining tooth [46]. The previously fabricated prosthesis was modified to accommodate a ball or locator attachment (based on patients’ needs) and thus be transformed into an ISRPD. The minimum osseointegration time was 3 months. The choice of this type of rehabilitation and the selection of patients was made mainly for economic reasons. In fact, in this way it was possible to divide the cost of the prosthesis and the cost of the implants in two successive

years [48]. At the end of both phases of work, the OHIP-14 questionnaire was submitted to patients.

#### 4.3. OHRQoL Measurement

OHRQoL was measured by using the original version of the OHIP-14, which has been shown to be valid and reliable [24]. The questionnaire included seven domains—functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap—with two questions each. For each item response were: never, hardly ever, occasionally, fairly often and very often. Items were scored on a 5-point scale ranging from 0 (never), to 1 (hardly ever), 2 (occasionally), 3 (fairly often) and 4 (very often). Higher OHIP total summary scores and subscales for each domain indicated lower OHR QoL. The questionnaire was dispensed with supervision, to all patients at two times: six months after treatment with RPD (T1), and six months after treatment with ISRPD (T2). Participants were given prior clarification and instruction concerning the different aspects of the questionnaire. Participants were interviewed by one of the authors. The one-month period was considered correct to make informed and objective judgment about the prosthesis.

#### 4.4. Ethical Consideration

Participants provided their written informed consent to the processing of personal data in accordance with the 95/46/CE directive and the EU General Data Protection Regulation GDPR (UE) n. 2016/679. The study was approved by the Ethic committee of the Medical University of Tirana, Albania, on 10.05.2021.

#### 4.5. Statistical Analysis

##### 4.5.1. Sample Size Calculation

After taking into consideration the difference in terms of OHIP in another study in which short implants were evaluated [20], a sample size of 17 subjects was calculated to have at the end of the study a possible statistically significant difference between the two groups. The value of  $\alpha$  was determined at 0.05 while the Power of the test at 0.80.

Considering the possible causes of exclusion, an increase of 10% was inserted. In this way, the minimum number of patients was 19. The website <https://clincalc.com/stats/samplesize.aspx> was used for the calculation (accessed on 20 July 2021) [49].

##### 4.5.2. Statistical Analysis

The collected data were entered into an Excel spreadsheet (Microsoft Corporation, Redmond, WA, USA) and the sums, means, medians and interquartile range were calculated. The interquartile range (IQR) is defined as between the first and third quartiles, thus with an interval of confidence between 25% and 75%. An overall OHIP score was computed by adding the scores of all questions, and the same was done for each subscale.

The possible scores for the overall scale ranged from 0 to 56. A change in score was also computed by subtracting T1 to T2 values. Negative scores indicated improvement in OHRQoL and positive scores indicated worsening. The Shapiro–Wilk test of normality was used to determine the distributions of the OHIP scale, which were not normal; thus, nonparametric statistics were used in data analysis. Comparison of the median change in OHIP scores after treatments was performed by using the Wilcoxon U test. Statistical significance was set at 0.05. The statistical analyses were performed using the GraphPad version 8 (GraphPad Software 2365 Northsides Dr. Suite 560, San Diego, CA, USA) statistical software.

## 5. Conclusions

Results obtained from this retrospective observational study showed significant improvements after rehabilitation in all areas of investigation. Specifically, the transformation of a removable prosthesis into an implant-supported one can help all patients with benefits

in chewing ability, aesthetics and satisfaction. Implant-supported rehabilitation can be used in place of for replace RPDs higher QoL in all aspects of patients' life.

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**Institutional Review Board Statement:** The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of the Medical University of Tirana, Albania, on 10 May 2021.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study in accordance with the 95/46/CE directive and the EU General Data Protection Regulation GDPR (UE) n. 2016/679.

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