

Impact of Posterior Single Tooth Loss on Oral Health–Related Quality of Life and Single-Unit Immediate Implant Loading: Six-Month Follow-up Study

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ABSTRACT: The current study sought to assess the impact on quality of life in individuals with a single posterior tooth loss, as well as its improvement after a single-unit immediate implant loading in a 6-month follow-up. Forty patients with a single posterior tooth loss were evaluated for oral health-related quality of life using the OHIP-14 before and six months after rehabilitation, as well as anxiety and depression symptoms using the Hospital Anxiety and Depression Scale (HADS). The Two-Way ANOVA was used to compare OHIP-14 scores at the tooth loss site and after rehabilitation. Descriptive statistics were computed for the HADS and OHIP-14 domains. Thirty-three patients that remained in the sample presented significantly reduced OHIP-14 scores after 6 months of rehabilitation, regardless the tooth loss site. Physical pain, psychological discomfort, psychological disability, and physical disability were the four most affected OHIP-14 domains and presented improvement after the rehabilitation. The individuals presented HADS scores for anxiety and depressive symptoms majorly within the normal range. Posterior single tooth loss has a detrimental impact on oral health-related quality of life. Either function or psychological domains appear to be impacted. The patients' rehabilitation was found to have a significant impact on quality-of-life improvement.

KEY WORDS: immediate loading, single implant, health-related quality of life

I. INTRODUCTION

Many factors are known to have an impact on oral health–related quality of life (OHRQoL).^{1,2} One of the most significant aspects of this disability is the loss of teeth. A single tooth loss can have a detrimental effect on a person's quality of life.^{3–6} This loss can result in masticatory and aesthetic impairments, which can cause physical issues in addition to psychological ones.^{1,7,8} This clarifies how OHRQoL has a substantial impact on oral physical disability in addition to psychological elements, such as anxiety and depression.

The multidimensional nature of OHRQoL can be measured by the validated Oral Health Impact Profile (OHIP-14).⁹ The OHIP-14, a condensed form of the original OHIP questionnaire, offers a

reliable and efficient approach to evaluate how oral health affects overall quality of life.^{9,10} Studies employing OHIP-14 has exhibited its efficacy in identifying enhancements in OHRQoL subsequent to dental rehabilitation.^{4,5,11,12}

According to these findings, even the loss of one posterior tooth can cause major psychosocial impairments and mainly disturb occlusal function, underscoring the need for comprehensive dental care.^{4,5,12} This scenario increases the demand for mainly implant-supported rehabilitations^{6,13} largely due to the difficulty of adapting to removable prostheses.¹⁴ Thus, immediate implant loading can bring benefits to the patient through fast rehabilitation, with good acceptance and satisfaction.^{4,5,11,14,15}

The present study aimed to evaluate the general impact on OHRQoL in individuals with a single

posterior tooth loss and also its improvement after a single-unit immediate implant loading in a 6-month follow up. Our hypothesis is that a single tooth loss can impact both psychosocial and physical domains and tends to improve after a well conducted rehabilitation in a short-term analysis.

II. MATERIAL AND METHODS

This prospective research was approved by local ethics committee (CAAE: 50811015.0.0000.5417 - 2015), which was carried out in compliance with the Declaration of Helsinki and the STROBE (The Strengthening the Reporting of Observational Studies in Epidemiology)¹⁶ guidelines. All subjects provided their informed consent.

A. Sample Selection

The sample consisted of patients who were at least 18 years old, had a single site of tooth loss with at least 8.5×5 mm in alveolar height and thickness. The volunteers were screened for the presence of any systemic diseases and local changes. When present, those patients were excluded. Moreover, bruxers, alcoholics, smokers, grafted regions, and insertion torques less than 32 N.cm were excluded as well.

B. Surgery Details of Single-Unit Immediate Implant Loading

For every participant, an internal conical connection implant (Unitite, S.I.N., São Paulo, São Paulo, Brazil) was positioned in the posterior region (maxilla or mandible). All patients underwent Cone-beam Computed Tomography (CBCT) scans for implant planning and bone volume analysis. Via virtual planning, the implants' length and diameter were chosen (Invivo5 3D, Kavo, Biberach, Germany). Depending on the availability of bone, implants with diameters of 3.5, 4.3, or 5.0 mm and lengths of 8.5, 10, 11.5, or 13 mm were utilized.

The same surgical expert installed each implant under local anesthesia using an anesthetic solution consisting of 2% mepivacaine hydrochloride and 1:100000 epinephrine (Mepiadre 2%, Nova DFL,

Rio de Janeiro, RJ, Brazil). There was a complete flap incision and tissue dissection. With the assistance of a surgical guide, the manufacturer's recommended drill sequence for the osteotomy was followed. As recommended for immediate loading, all implants were inserted between 1.0 and 2.0 mm below bone level, with a minimum insertion torque of 32 N.cm.¹⁷⁻²⁰ Vicryl 5.0 suture thread (Ethicon J&J International, St-Stevens-Woluwe, Belgium) was used to stitch the flap. Impressions with putty and light body polyvinylsiloxane were made (Express, 3M Oral Care, St. Paul, MN, USA) and sent to the dental laboratory. Meanwhile, healing abutments were installed. Antibiotics (Amoxicillin 500 mg) and non-steroidal anti-inflammatory drugs (NSAIDs) (Ibuprofen 600 mg) were prescribed as postoperative medications for seven and five days, respectively. Four days following implant placement, prosthetic loading was carried out, involving occlusal adjustments to crowns to keep contacts in the maximal intercuspal position.

C. OHRQoL

The validated Portuguese version of the Oral Health Impact Profile-14 (OHIP-14) was used to assess the primary outcome: oral health-related quality of life (OHRQoL).¹⁰ The purpose of the OHIP-14 is to evaluate the social impact of issues that may compromise oral health by means of 14 questions and 7 domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. The response options ranges from 0 (never) to 4 (very often). In this instance, the higher the score, the lower the OHRQoL.^{9,10} The OHIP-14 was applied at baseline prior to the surgery, and at 6 months after surgery.

D. Hospital Anxiety and Depression Scale

In order to assess and understand the psychosocial behavior of the sample, this secondary outcome was assessed through a self-report questionnaire aiming to evaluate depression and anxiety symptoms, applied in the Brazilian Portuguese validated form.²¹ It contains 14 multiple-choice items divided into two

alternating subscales: 7 questions for anxiety and 7 questions for depression. Higher scores indicate more severe feelings of anxiety and/or depression. The scores for each subscale range from 0 to 21, with each item being rated on a scale from 0 to 3. The scores are interpreted as follows: 0–7 indicates normal, 8–10 indicates mild, 11–14 indicates moderate, and 15–21 indicates severe.²²

E. Statistical Analysis

Statistical analyses were conducted using the Jamovi software version 2.4.7, with a significance level of 5%. Two-way repeated-measures ANOVA test was used to compare the overall OHIP-14 score before and 6 months after implant placement and possible differences between placement sites (Maxilla or Mandible). A descriptive analysis was conducted to present the data regarding HADS and the frequency of responses on each domain of OHIP-14 questionnaire.

III. RESULTS

Forty subjects were initially selected according to the inclusion and exclusion criteria. All participants were operated and followed up for a period of 6 months. During this time, 7 patients were excluded from the sample (2 abutment fractures and 5 implant losses). Thus, 33 patients were followed for the sequence of the study with no more dropouts (Fig. 1). The mean age of the participants was 42.24 ± 9.84 . The sample was comprised of 26 (78.78%) women and 7 (21.22%) men.

Table 1 shows a reduction of OHIP-14 scores 6 months after implant-supported rehabilitation, with a statistically significant difference in the overall sample ($P < 0.001$). When comparing the implant sites, both patients rehabilitated in maxilla and mandible also had a significant reduction after 6 months ($P < 0.001$), but with no statistical difference when comparing the OHIP-14 score for both arches before ($P = 0.995$) and after ($P = 0.999$) rehabilitation.

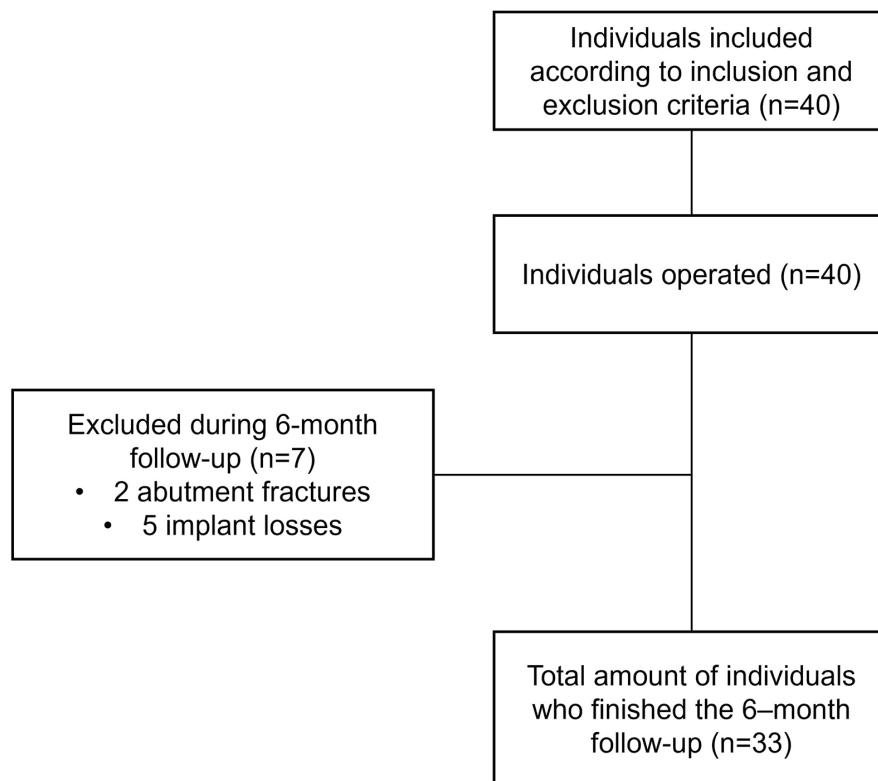


FIG. 1: Eligibility flowchart

TABLE 1: Mean $\pm$ standard deviation of OHIP-14 before and after 6 months of implant-supported rehabilitation

	Preoperative	6-months follow-up	<i>P</i> value
Maxilla (<i>n</i> = 14)	5.30 $\pm$ 4.10	1.75 $\pm$ 1.39	<i>P</i> < 0.001**
Mandible (<i>n</i> = 19)	5.00 $\pm$ 3.01	1.81 $\pm$ 1.12	<i>P</i> < 0.001**
<i>P</i> value	<i>P</i> = 0.995	<i>P</i> = 0.999	
Overall (<i>n</i> = 33)	5.13 $\pm$ 3.46	1.78 $\pm$ 1.22	<i>P</i> < 0.001**

Two-way repeated-measures ANOVA; **P* < 0.05; ***P* < 0.001.

Table 2 presents a detailed distribution of the answers' frequency in all questions and domains of OHIP-14, before and after the rehabilitation. Physical pain, psychological discomfort, physical and psychological disabilities were the domains which exhibited a higher frequency of answers indicative of greater impairment ("fairly often" and "very often"). However, all these domains showed a reduction in these responses of greater impairment following rehabilitation.

Figure 2 shows a plot distribution of HADS scores in both anxiety (HADS-A) and depression (HADS-D) subscales. The anxiety and depression subscale presented a median (25th–75th quartiles) of 5 (3–6) and 2 (2–5), respectively.

IV. DISCUSSION

The current assessment of the OHRQoL, in patients receiving immediately loaded implant-supported single crowns in the posterior area revealed: (1) the OHRQoL was impaired even with single posterior tooth loss, regardless of the loss site; (2) the most affected OHIP-14 domains were related to physical and psychological disabilities and discomfort; and (3) OHRQoL significantly increased 6 months after single implant rehabilitation.

Multifactorial changes in the oral environment are known to cause several decreases in OHRQoL, and this topic has been extensively covered in the literature.^{1,2,23} It is generally established that modifications on chewing and speech patterns, occlusal references may be associated with social anxiety, hypervigilance, and mental discomfort negatively impacting and impairing one's quality of life.^{2,23} It is also widely known that people with dental losses, whether multiple or unitary, have altered OHRQoL.^{1,3–5,11,14,24–26} To prove this point,

rehabilitations on these individuals are shown to improve quality of life by restoring adequate function and reversing these outcomes.²⁷

An accurate and proven method for visualizing these parameters is the OHIP-14, a shortened version of the OHIP questionnaire that is widely available in high-caliber literature.^{4,5,11,12,25} In this scenario, all studies support our findings and show that OHRQoL perception improved as early as two weeks after rehabilitation,^{14,25} in the first and third month,^{5,13} and up to five years following rehabilitation.⁴ Also, regarding the tooth loss site, the anterior tooth loss appears to lead a higher impact on OHRQoL than posterior loss,¹ but when regarding whether maxilla or mandible, the same differences are not found.^{11,25,26} Our study only evaluated posterior tooth loss and also found no differences in OHIP-14 scores between the maxilla and mandible before (*P* = 0.995) and after (*P* = 0.999) rehabilitation.

As important as analyzing the differences on overall OHIP-14 scores is to understand detailed information on each domain responded in the questionnaire. The OHIP domains for physical and psychological disabilities and discomfort seem to be the most compromised in our sample. This clarifies that even a single posterior tooth loss might worsen not only occlusal function metrics but several psychosocial factors as social embarrassment, hypervigilance regarding the mouth, and emotional distress as well. These findings seem to elucidate the complexity of a dental loss and the necessity of treating these people with a broader perspective.^{1,28} Accordingly, the literature clarifies that tooth loss may be a risk factor for development of psychosocial impairments.^{7,8,29} However, a secondary analysis on our sample did not present relevant signals and symptoms related to depression or anxiety (OHIP-14 score < 7), for example.²² This finding may be due to only a single tooth

TABLE 2: Frequency of responses on each domain and question presented on OHIP-14

	Preoperative					6 months follow-up				
	Never	Hardly ever	Occasionally	Fairly often	Very often	Never	Hardly ever	Occasionally	Fairly often	Very often
<i>Functional limitation</i>										
1. Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures?	29 (87.9%)	3 (9.1%)	1 (3.0%)	0 (0.00%)	0 (0.00%)	31 (93.9%)	2 (6.1%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
2. Have you felt that your sense of taste has worsened because of problems with your teeth, mouth or dentures?	32 (97.0%)	1 (3.0%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	33 (100.0%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
<i>Physical pain</i>										
3. Have you had painful aching in your mouth?	23 (69.7%)	8 (24.2%)	2 (6.1%)	0 (0.00%)	0 (0.00%)	29 (87.9%)	3 (9.1%)	1 (3.0%)	0 (0.00%)	0 (0.00%)
4. Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth or dentures?	14 (42.4%)	3 (9.1%)	11 (33.3%)	2 (6.1%)	3 (9.1%)	14 (42.4%)	9 (27.3%)	10 (30.3%)	0 (0.00%)	0 (0.00%)
<i>Psychological discomfort</i>										
5. Have you been self-conscious because of problems with your teeth, mouth or dentures?	8 (24.2%)	5 (15.2%)	12 (36.4%)	5 (15.2%)	3 (9.1%)	13 (39.4%)	14 (42.4%)	5 (15.2%)	1 (3.0%)	0 (0.00%)
6. Have you felt tense because of problems with your teeth, mouth or dentures?	16 (48.5%)	6 (18.2%)	8 (24.2%)	3 (9.1%)	0 (0.00%)	20 (60.6%)	8 (24.2%)	4 (12.1%)	1 (3.0%)	0 (0.00%)
<i>Physical disability</i>										
7. Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures?	16 (48.5%)	7 (21.2%)	8 (24.2%)	1 (3.0%)	1 (3.0%)	26 (78.8%)	7 (21.2%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
8. Have you had to interrupt meals because of problems with your teeth, mouth or dentures?	24 (72.7%)	5 (15.2%)	3 (9.1%)	1 (3.0%)	0 (0.00%)	26 (78.8%)	7 (21.2%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

TABLE 2: (continued)

	Preoperative					6 months follow-up				
	Never	Hardly ever	Occasionally	Fairly often	Very often	Never	Hardly ever	Occasionally	Fairly often	Very often
<i>Psychological disability</i>										
9. Have you found it difficult to relax because of problems with your teeth, mouth or dentures?	18 (54.5%)	4 (12.1%)	9 (27.3%)	2 (6.1%)	0 (0.00%)	29 (87.9%)	4 (12.1%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
10. Have you been a bit embarrassed because of problems with your teeth, mouth or dentures?	9 (27.3%)	6 (18.2%)	10 (30.3%)	3 (9.1%)	5 (15.2%)	29 (87.9%)	3 (9.1%)	1 (3.0%)	0 (0.00%)	0 (0.00%)
<i>Social disability</i>										
11. Have you been a bit irritable with other people because of problems with your teeth, mouth or dentures?	20 (60.6%)	5 (15.2%)	8 (24.2%)	0 (0.00%)	0 (0.00%)	32 (97.0%)	1 (3.0%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
12. Have you had difficulty doing your usual jobs because of problems with your teeth, mouth or dentures?	25 (75.8%)	3 (9.1%)	4 (12.1%)	1 (3.0%)	0 (0.00%)	28 (84.8%)	5 (15.2%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
<i>Handicap</i>										
13. Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?	23 (69.7%)	5 (15.2%)	4 (12.1%)	1 (3.0%)	0 (0.00%)	29 (87.9%)	4 (12.1%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
14. Have you been totally unable to function because of problems with your teeth, mouth or dentures?	30 (90.9%)	2 (6.1%)	1 (3.0%)	0 (0.00%)	0 (0.00%)	33 (100.0%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

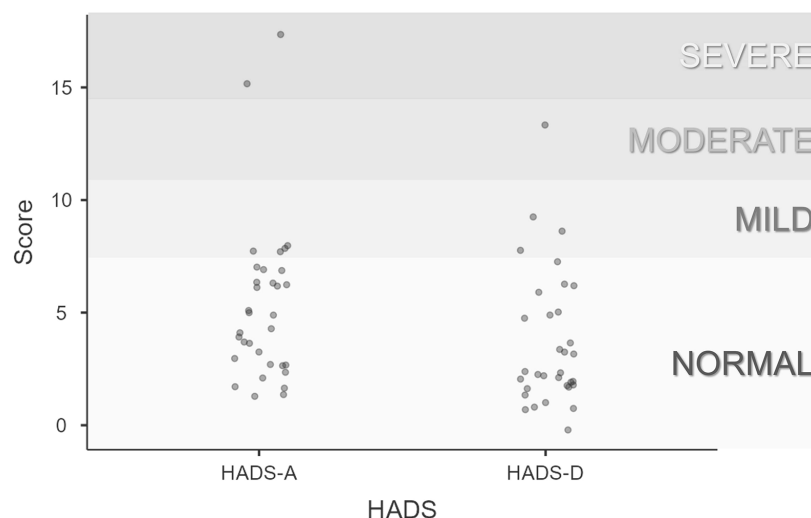


FIG. 2: Plot distribution of HADS scores on both subdomains: anxiety (HADS-A) and depression (HADS-D). The level of severity is divided on the figure according to Zigmond and Snaith, 1983²²: normal (0–7), mild (8–10), moderate (11–14), and severe (15–21).

loss²⁹ and shows that the higher frequent negative responses on psychological domains of OHIP-14 in this sample is probably more related to functional consequences of tooth loss itself than individual's psychosocial impairment.³⁰

Regarding limitations, this study was conducted with a relatively small convenience sample. Furthermore, OHRQoL may be impacted by additional psychosocial factors that were not tested or controlled, such as hypervigilance, perceived stress, and resilient coping. Also, higher OHRQoL improvement may be probably resulted from appropriately controlled pre-, transoperative, and postoperative periods and the low morbidity of a single tooth loss, which directly influenced OHIP-14 scores and should be considered when interpreting these findings.

V. CONCLUSIONS

In conclusion, our research emphasizes the negative effects on OHRQoL of a posterior single tooth loss. Individuals' function and psychological domains appear to be impacted by even a single tooth loss. A well-executed rehabilitation is crucial to reduce these effects and restore the individual's baseline quality of life.

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