

Evaluation of a Series of Overdentures Made in a Higher Education Dental Institution in Southern Brazil

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ABSTRACT

Aim and objective: This study aimed to evaluate the epidemiological profile, oral health self-perception index, and level of satisfaction of users of complete implant-supported overdentures that had been used for at least 1 year and were made at the School of Dentistry of the University of Passo Fundo, Rio Grande do Sul, Brazil (FO/UPF), between 2014 and 2019.

Materials and methods: The sample consisted of 30 patients with overdentures, who were selected from the dental records filed at the institution. Data on general health and the dental implants involved (brand, type of prosthetic connection, number of implants, and additional overdenture retention system) were collected from the medical records. The 30 patients were invited to answer the Oral Health Impact Profile-14 (OHIP-14) and visual analog scale (VAS) questionnaires, and due to the coronavirus disease 2019 pandemic, it was possible to contact 15 patients.

Results: Most of the prostheses studied were mandibular overdentures, and 66.66% of the cases were retained by the O-ring system. As for the oral health self-perception of the individuals, it was concluded that male patients had a lower mean overall score ($p = 0.047$) and functional domain ($p = 0.042$) in the OHIP-14. The number of implants and the installation arch interfered with functional domain and psychological capacity ($p < 0.05$). The VAS showed that women have greater esthetic satisfaction with prostheses ($p = 0.048$) and that the bar-clip retention system is more satisfactory than the O-ring ($p = 0.017$).

Conclusion: Despite the limitations of overdentures, it was noted that, when properly indicated, they are a viable option for oral rehabilitation on implants.

Clinical significance: Oral rehabilitation well-indicated with overdentures, especially those retained by the bar-clip system, results in an improvement in the patients' quality of life.

Keywords: Dental implants, Edentulous arcade, Implants, Overdenture, Prostheses.

The Journal of Contemporary Dental Practice (2021): 10.5005/jp-journals-10024-3149

INTRODUCTION

The total loss of natural teeth, or edentulism, is one of the most striking problems affecting oral health, resulting from the cumulative effects of oral diseases throughout life, combined with socioeconomic factors that also contribute significantly.¹ Edentulism is considered a deficiency that affects the quality of life and nutritional aspects and causes morbidity to individuals, considering that related chewing problems predispose to poor intake and malnutrition. Moreover, periodontal diseases as the causes of tooth loss promote chronic inflammation that may be related to lower survival rates.²

Harming esthetics and function and being associated with the deterioration of orofacial tissues, such as bone ridges, nerves, and musculature,³ edentulism is treated with prosthetic rehabilitation that includes conventional complete dentures, overdentures, and in some cases, fixed complete dentures supported by implants.⁴ The selection criteria will vary for prosthesis retention and stability, phonation, masticatory efficiency, comfort when eating, confidence in intimate situations, satisfaction, and self-esteem. Either way, oral rehabilitation after total or partial tooth loss leads to a significant improvement in the quality of life of patients.³

The removable complete prosthesis is the classic therapy for edentulism. Currently, however, this type of rehabilitation is no longer considered the standard treatment due to the diversity of problems resulting from it, especially regarding patient complaints about insufficient ability to grind food, joint problems, psychological tension, and social disability.⁵ Overdentures, in turn, offer advantages, such as improved prosthesis retention and stability; increase in overall

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How to cite this article: Dillenburg C, Dogenski LC, Kopper TE, et al. Evaluation of a Series of Overdentures Made in a Higher Education Dental Institution in Southern Brazil. *J Contemp Dent Pract* 2021;22(7):778–783.

Source of support: Nil

Conflict of interest: None

oral comfort, function, and psychosocial well-being of patients; and a potential decrease in the resorption of residual bone ridges,^{4,6} with high success rates ranging from 94 to 100%.⁷

When planning an overdenture treatment, the number of implants, their length, and distribution should be considered. Moreover, bone quality and shape, as well as the opposite arch, are decisive to select the number of implants to be installed.⁸ Installing two implants is the standard to support a mandibular overdenture in edentulous patients. However, there is a lack of information on the number of implants required for a maxillary prosthesis, and low survival rates have been reported when few implants (<4) were installed in the maxilla to support this treatment.⁹ Therefore, it seems essential to define reproducible treatment protocols that support the experience of individuals and help to establish clear concepts toward evidence-based dentistry.⁵

Contemporary dentistry presents several systems for fixing removable prostheses to dental implants, and prosthetic stability is directly related to these systems. The connection between prosthesis and implant can be provided by bar structures rigidly attached to the implants to secure the overdenture with a clip (bar-clip system) or by systems individually attached to the prosthetic structure, such as the locator, ERA, O-ring, or magnetic systems. The main objective of choosing between the different types of fixation is to provide a more favorable force distribution to implants, guaranteeing fewer maintenance interventions.^{10,11} Besides the biological effects of the interfacial tension transfer, it should also be considered that implant installation increases treatment costs, highlighting the importance of assessing the minimum number required to support the prosthesis and achieve an optimal costbenefit relationship.⁹

Hence, methods of investigating the oral health-related quality of life are used, mainly in the form of questionnaires. The standardized instrument most commonly documented in the literature is the Oral Health Impact Profile-14 (OHIP-14) survey, which consists of several questions about functional limitations; physical pain; psychological discomfort; and physical, psychological, or social disabilities.¹² The OHIP-14 questionnaire has acceptability, reliability, and validity, and it is a valuable tool to assess the perception of oral health impacts on the well-being of edentulous patients. Other methodological approaches used as ad hoc instruments include the visual analog scale (VAS) and Satisfaction and Denture Complaint questionnaires.⁴

Considering the above, the present study aimed to evaluate the epidemiological profile, oral health self-perception index, and level of satisfaction of users of complete implant-supported overdentures that had been used for at least 1 year and were manufactured in the School of Dentistry of the University of Passo Fundo, Rio Grande do Sul, Brazil (FO/UPF), between 2014 and 2019. The study considered the influence of essential factors for treatment success with the OHIP-14 and the VAS questionnaires.

MATERIALS AND METHODS

Study Design and Ethical Aspects

This pilot study on oral health and satisfaction with implant prostheses was performed at the School of Dentistry of the University of Passo Fundo (FO/UPF), in Passo Fundo, Rio Grande do Sul, Brazil, after the approval by the Ethics Committee in Research of the referred institution (N° 2.877.046).

The database of the institution provided the medical records of all patients subjected to oral rehabilitations between 2014 and 2019, with lower and/or upper implant-supported overdentures that had been used for at least 1 year.

Sample

The sample consisted of 30 patients of both sexes, rehabilitated in the clinics and internships of the FO/UPF. Epidemiological data and information about prostheses and respective implants were collected from the dental records of the patients. Thus, the following items were evaluated: Sex and age-group of the patients, commercial brand, type of implant (external hexagon, internal hexagon, or Morse taper), number of implants used, and the overdenture retention system (O-ring or bar-clip).

Additionally, to assess oral health self-perception and patient satisfaction with their respective rehabilitation treatments, the OHIP-14 and VAS questionnaires were applied. Given the limitations of social isolation or distance imposed by the coronavirus disease 2019 pandemic, such instruments were applied to patients via telephone calls, and only 15 out of the 30 patients included in the study could be contacted. Thus, the epidemiological study involved 30 patients, and the survey of satisfaction and self-perception in oral health involved 15 patients.

The epidemiological study of the medical records included all patients rehabilitated with complete overdentures made and installed at the School of Dentistry of the University of Passo Fundo between 2014 and 2019, that is, prostheses in use for more than 12 months (30 patients). As for the OHIP-14 and VAS questionnaires, all patients who managed to answer the questions via telephone were included (15 patients). Patients who were not located via telephone were excluded from the study.

It is known that the duration of edentulism before prosthetic treatment can also have an impact on patients' satisfaction and self-perception of oral health. However, the methodology of the present study was based on the OHIP-14 questionnaire, which seeks to collect information from patients based on experiences in the last 12 months.¹³ Thus, the inclusion in the study of patients rehabilitated with overdentures for at least 12 months is justified.

Statistical Analysis

After collecting data from medical records and questionnaires, the results were tabulated in Microsoft Excel 2010™ spreadsheets and evaluated with descriptive statistics and the Mann-Whitney test ($p \leq 0.05$).

RESULTS

Table 1 presents the epidemiological data of the 30 patients analyzed in the epidemiological study and their respective implants and overdentures. The average age was 70.53 years, ranging between 48 and 77 years (Table 1).

The results presented in Tables 2 to 5 refer to the OHIP-14 and VAS questionnaires and include the data from only 15 patients who could be contacted via telephone due to the pandemic, as explained in the methodology session.

When relating the data from the OHIP-14 scale for patients' sex, women presented disadvantages in overall score ($p = 0.047$) and functional domain ($p = 0.042$). Individuals with overdentures in the upper arch had a disadvantage relative to the overall OHIP-14 score ($p = 0.037$), functional domain ($p = 0.041$), and psychological disability ($p = 0.034$) (Table 2).

The individuals with Morse taper implants had a disadvantage relative to physical pain when compared to individuals with external hexagon implants ($p = 0.044$). Patients with prostheses retained by the O-ring had worse results than patients with the bar-clip retention system ($p = 0.039$) (Table 3).

Table 1: Characteristics of patients, implants, and prostheses

Variables	n	%
Age		
41–50 years	1	3.33
51–60 years	5	16.66
61–70 years	11	36.66
71–80 years	13	43.33
Sex		
Male	17	56.66
Female	13	43.33
Installation arch		
Upper	8	26.66
Lower	22	73.33
Number of implants		
2	16	53.33
4	14	46.66
Year of implant installation		
2014	7	23.33
2015	7	23.33
2016	5	16.66
2017	8	26.66
2018	3	10
Year of prosthesis installation		
2014	5	16.66
2015	5	16.66
2016	5	16.66
2017	3	10
2018	7	23.33
2019	5	16.66
Implant brand		
Neodent™	7	23.33
Conexão™ prosthesis system	10	33.33
Signo vinces™	10	33.33
SIN™ implant system	3	10
Implant type		
External hexagon	14	46.66
Morse taper	16	53.33
Prosthesis retention system		
Bar-clip	10	33.33
O-ring	20	66.66
Overdenture antagonist		
Complete denture	17	56.66
Removable partial denture	4	13.33
Overdenture	1	3.33
Fixed complete prosthesis	1	3.33
Natural dentition	7	23.33

There was no statistically significant relationship when comparing the antagonistic arcade type of the overdentures. Patients with four implants had worse results for overall score results ($p=0.048$), functional domain ($p=0.019$), and psychological disability ($p=0.047$) when compared to individuals with two implants (Table 4).

Female patients had greater esthetic satisfaction ($p=0.048$) with the prostheses than male patients. Additionally, the prostheses

with the bar-clip retention system showed greater patient satisfaction than prostheses equipped with the O-ring system ($p=0.017$) (Table 5).

DISCUSSION

The high incidence of tooth loss is a reality for the Brazilian population. Cardoso et al.,¹⁴ when performing projections of edentulism in Brazil, observed that by 2040 the number of edentulous arches will decrease, approaching 616,000, while the number of elderly people will increase alarmingly, reaching more than 64 million. Given the data aforementioned, implant-supported prostheses are increasingly becoming a viable alternative. Thus, the present study aimed to assess the self-perception of oral health conditions and the satisfaction index of a series of patients rehabilitated with implant-supported dental prostheses installed at the FO/UPF between 2014 and 2019, considering variables such as sex, age, type of retention system, number of implants, time, and installation arch.

The 2010 National Oral Health Survey performed in Brazil revealed that more than 50% of the elderly population aged between 65 and 74 years was edentulous and that edentulism was more prevalent among women, especially those with lower income and level of education.¹ Regarding sex, however, men represented the majority of the sample of the present study (56.66%). The prevalent age of individuals was over 60 years, which corroborates the study by Rignon-Breg et al.,¹⁵ who evaluated 80 overdenture users and found the highest percentage of patients in the age-group of 65 to 80 years. This result can be explained by the increase in edentulism with age, as the elderly population experiences more tooth extractions throughout their lives.¹⁴

The results obtained with the application of the VAS showed that female patients had greater esthetic satisfaction than male patients. Other significant results obtained with the application of the OHIP-14 questionnaire in the present study showed that female patients had lower functional domain than male patients. Kaufmann et al.¹⁶ correlated this to the natural tendency of physiological resorption of female maxillaries relative to male ones, which would cause more complex cases of prosthetic rehabilitation in women and promote greater dissatisfaction, mainly in the stability and function of prostheses.

Regarding the prosthesis installation arch, most (73.33%) were installed in the mandible. A study by Preciado et al.¹⁷ obtained similar results to the present study, with the majority (64.85%) of overdentures installed in the lower arch. According to Kronström et al.,¹⁸ it is agreed that mandibular overdentures provide a significant improvement in stability and retention, oral function, and psychological well-being. However, the rehabilitation treatment for maxillary overdentures is more complex and challenging because it involves several factors such as bone quantity and quality suitable for implants, which obtain higher failure rates in this arch, as well as esthetic considerations, phonetics, and oral comfort.

As for the number of implants installed, most patients had two. This result adds to that of Karabach et al.,¹⁹ who evaluated the quality of life of 30 patients rehabilitated with mandibular overdentures, noting that most of them had two implants. Turker and Buyukkapan¹¹ compared stress distributions in implants, abutments, and bone caused by different types of overdenture fixations under functional masticatory forces, verifying that the loads on overdentures supported by two implants are transmitted to the bone tissue through the implants and soft tissues, where

Table 2: Sex of patients and prosthesis installation arch X OHIP-14 results

		<i>Variables</i>								
<i>Sex</i>	<i>n</i>		<i>Overall score</i>	<i>Functional domain</i>	<i>Physical pain</i>	<i>Psychological discomfort</i>	<i>Physical disability</i>	<i>Psychological disability</i>	<i>Social disability</i>	<i>Social disadvantage</i>
Male	8	Mean	3.75	1.75	0.75	0.37	0.50	1.37	0.25	0.50
		Standard deviation	2.12	0.70	0.70	0.51	0.92	0.91	0.46	0.53
		<i>p</i> -value								
Female	7	Mean	6.14	2.57	1.14	1.14	0.71	0.71	0.42	0.71
		Standard deviation	6.59	0.97	1.46	1.86	1.49	1.49	0.78	0.75
		<i>p</i> -value	0.047	0.042	0.510	0.282	0.740	0.229	0.595	0.533
<i>Arch</i>	<i>n</i>		<i>Overall score</i>	<i>Functional domain</i>	<i>Physical pain</i>	<i>Psychological discomfort</i>	<i>Physical disability</i>	<i>Psychological disability</i>	<i>Social disability</i>	<i>Social disadvantage</i>
Upper	5	Mean	7.6	2.80	1.20	1.40	1.00	2.40	0.60	1.00
		Standard deviation	7.5	1.60	1.64	2.07	1.73	0.89	0.89	0.70
		<i>p</i> -value								
Lower	10	Mean	3.5	1.80	0.80	0.40	0.40	1.30	0.20	0.40
		Standard deviation	1.9	0.63	0.78	0.69	0.84	0.82	0.42	0.51
		<i>p</i> -value	0.037	0.041	0.527	0.180	0.374	0.034	0.251	0.082

Table 3: Implant platform type and prosthesis retention system X OHIP-14 results

		<i>Variables</i>								
<i>Implant platform</i>	<i>n</i>		<i>Overall score</i>	<i>Functional domain</i>	<i>Physical pain</i>	<i>Psychological discomfort</i>	<i>Physical disability</i>	<i>Psychological disability</i>	<i>Social disability</i>	<i>Social disadvantage</i>
External hexagon	6	Mean	3.33	2.00	0.33	0.50	0.50	1.16	0.33	0.50
		Standard deviation	1.36	1.09	0.51	0.54	0.83	0.98	0.51	0.54
		<i>p</i> -value								
Morse taper	9	Mean	5.88	2.22	1.33	0.88	0.66	2.00	0.33	0.66
		Standard deviation	5.92	0.83	1.22	1.69	1.41	0.86	0.70	0.70
		<i>p</i> -value	0.224	0.662	0.044	0.599	0.800	0.107	1.000	0.635
<i>Retention system</i>	<i>n</i>		<i>Overall score</i>	<i>Functional domain</i>	<i>Physical pain</i>	<i>Psychological discomfort</i>	<i>Physical disability</i>	<i>Psychological disability</i>	<i>Social disability</i>	<i>Social disadvantage</i>
Bar-clip	6	Mean	5.66	2.44	0.88	0.88	0.77	1.88	0.44	0.77
		Standard deviation	5.78	1.01	1.26	1.61	1.39	1.05	0.72	0.66
		<i>p</i> -value								
O-ring	9	Mean	3.66	1.66	1.00	0.50	0.33	1.33	0.16	0.33
		Standard deviation	2.50	0.51	0.89	0.83	0.81	0.81	0.41	0.51
		<i>p</i> -value	0.443	0.039	0.856	0.599	0.497	0.297	0.413	0.192

the prosthetic base is located. Although much higher loads are applied to these implants, usually the reason for the formation of lower stresses in the parts is that most of these loads are transferred to the supporting tissues (fibro mucosal) through the base of the prosthesis. The evaluation of the tensions transmitted to the implant and bone showed that these values were much lower than the resistance limit of both. This may explain the reason why patients with overdentures retained by four implants obtained worse results

for functional domain and psychological incapacity than individuals with only two implants.

In this study, most patients (66.66%) used the O-ring prosthetic fixation system. However, this retention system obtained the worst functional domain in the OHIP-14 questionnaire and the lowest satisfaction in the VAS. This result adds to that of Cune et al.,²⁰ who evaluated 18 users of mandibular and maxillary overdentures and noticed greater stability, retention, and

Table 4: Overdenture antagonists and number of implants X OHIP-14 results

		Variables								
Antagonist	n		Overall score	Functional domain	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Social disadvantage
Natural teeth	5	Mean	3.80	2.22	1.00	0.40	0.40	1.20	0.20	0.60
		Standard deviation	2.58	1.09	1.00	0.54	0.89	0.83	0.44	0.54
		p-value								
Conventional dentures	10	Mean	5.40	2.10	0.90	0.90	0.70	1.90	0.40	0.60
		Standard deviation	5.56	0.87	1.19	1.59	1.33	0.99	0.69	0.69
		p-value	0.557	0.850	0.875	0.514	0.660	0.201	0.574	1.000
Number of implants	n		Overall score	Functional domain	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Social disadvantage
Two implants	7	Mean	2.85	1.57	0.42	0.42	0.28	1.14	0.14	0.42
		Standard deviation	1.21	0.53	0.53	0.78	0.75	0.89	0.37	0.53
		p-value								
Four implants	8	Mean	6.62	2.62	1.37	1.00	0.87	2.12	0.50	0.75
		Standard deviation	5.99	0.92	1.30	1.69	1.45	0.83	0.75	0.70
		p-value	0.048	0.019	0.097	0.428	0.355	0.047	0.279	0.345

Table 5: Relationships between patient sex and esthetic satisfaction and between the retention system and patient satisfaction according to the VAS results

Sex	Esthetic satisfaction	
	Mean (SD)	P
Male	8.25 (0.46)	0.048
Female	7.71 (0.48)	
Retention system	Satisfaction with the prosthesis	
	Mean (SD)	P
O-ring	0.77 (2.33)	0.017
Bar-clip	5.33 (4.17)	

satisfaction reported by users of the bar-clip system (10/18), followed by the spherical system (7/18), and the magnetic system (1/10). One of the disadvantages of the O-ring system is that the sealing rings require maintenance more often than other types of systems, such as the bar-clip, due to the wear of the polymeric O-ring component, which needs to be replaced to maintain prosthesis retention.²¹

It was also noted a statistically significant relationship between the prosthesis installation arch and functional domain and the psychological disability of patients. Users of maxillary overdentures showed lower functional domain and greater psychological disability than patients with mandibular overdentures. According to Dudley,²² the treatment with maxillary implants is more challenging than with mandibular ones due to factors such as esthetic considerations, phonetics, and oral comfort. The results found in the OHIP-14 questionnaire regarding overdenture antagonists did not show statistically significant differences between “natural dentition” and “conventional prostheses” in any of the items evaluated.

However, the complete prosthesis was the antagonist most found, which can be explained by the fact that these prostheses are mostly used among the population over 60 years old.

As for the type of implant, individuals with Morse taper implants had disadvantages relative to physical pain when compared to individuals with external hexagon implants. Although the literature states that the Morse taper system transfers force more adequately to the peri-implant bone, the present investigation suggests that users of overdentures retained by this type of implant have felt a higher pain index in the OHIP-14 questionnaire than users of external hexagon implants, due to the deeper positioning of Morse taper implants in the peri-implant tissues. This deeper position, despite being beneficial in the biomechanical sense, may hinder the installation of prosthetic abutments, mainly O-ring ones, and produce exacerbated symptoms.

As can be seen in the results of the present study, the patients evaluated regarding the satisfaction of the prostheses and self-perception in oral health did not have the same number of implants. In addition, the brand of the implants, their platform, and the type of retention system used were different, as well as there was a diversity of patient sex and prosthesis installation arch. Such variables may explain the differences obtained in the responses to the OHIP-14 and VAS questionnaires. The duration of edentulism before prosthetic treatment can also have an impact on the satisfaction index. This study does not have access to this data, but care has been taken to include only edentulous individuals in the research who have used the same overdentures for at least 1 year.

The sample size for the OHIP-14 and VAS questionnaires of only 15 patients should be considered a limitation of the present study, which does not invalidate the results obtained because the inclusion and exclusion criteria were strictly followed. Thus, further studies on oral health self-perception and the satisfaction of overdenture users are suggested.



CONCLUSION

The results obtained with the sample studied allow concluding that female patients had a lower functional domain and greater esthetic satisfaction with the prostheses. Mandibular overdentures retained by the bar-clip system and coupled to only two implants showed better results of oral health self-perception or patient satisfaction. Both tests used (OHIP-14 and VAS) showed the same sensitivity, allowing the achievement of convergent results. Thus, despite the limitations of overdentures, it was noted that, when properly indicated, they are a viable option for oral rehabilitation on implants.

CLINICAL SIGNIFICANCE

Oral rehabilitation well-indicated with overdentures, especially those retained by the bar-clip system, results in an improvement in the patients' quality of life.

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