

Removable prostheses improve oral health-related quality of life and satisfaction of elderly people with rheumatoid arthritis

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Received: September 14, 2019

Accepted: December 02, 2019

Rheumatoid arthritis (RA) is an autoimmune disease that affects joint tissues and causes severe physical and functional impairments on quality of life due to muscular and articular pain. The involvement of temporomandibular joint in RA interferes with mouth opening and masticatory process. However, no studies addressed the impact of RA on oral health-related quality of life (OHRQoL) and satisfaction with prostheses use in elderly people. **Aim:** This study assessed the impact of oral rehabilitation with conventional dentures on the OHRQoL and prostheses satisfaction in elderly patients with RA, associated or not with temporomandibular disorder (TMD). **Methods:** Forty-five elderly were enrolled and divided into three groups: (1) RA and TMD (n=15, experimental), (2) RA without TMD (n=15, experimental), and (3) without RA and without TMD (n=15, control). The OHRQoL and the prostheses satisfaction were evaluated before and after new oral rehabilitation with partial and/or complete dentures. The OHRQoL and prosthesis satisfaction were assessed and verified through OHIP-14 questionnaire and visual analogue scale, respectively. **Results:** TMD group exhibited the worst mean values ($P<0.05$) for all OHIP-14 domains before insertion of new dentures. Group 2 showed worst means ($P<0.05$) compared to controls for functional limitation and physical pain domains of the OHIP-14, but not in the general score. Patients showed better outcomes of satisfaction with prostheses use only after the new rehabilitation. **Conclusion:** The use of new and well-fitted dentures improves all domains of OHRQoL in patients with RA and TMD and all groups were satisfied with prostheses use after the new rehabilitation with conventional dentures.

Keywords: Arthritis rheumatoid. Dental prosthesis. Quality of life. Oral health. Patient satisfaction.



Introduction

Rheumatoid arthritis (RA) is a chronic auto-inflammatory disease that affects joint tissues and causes severe physical and functional impairments on quality of life (QoL) in the disease bearers¹⁻⁴. The occurrence of RA is over the middle-aged people, between the fourth and sixth decades. It is an autoimmune disease probably caused by environmental factors, such as drugs and diet, in association with regulatory genes responsible to express the immune disease^{5,6}. The American College of Rheumatology has updated the guidelines on RA, so that approaches to manage the disease can be applied to prevent pain, loss of function and joint disturbances⁷.

To diagnose RA, in most cases the synovitis is identified through clinical exam in phalangeal joints, in combination with large or other small joints, with swelling and pain episodes¹. Once temporomandibular joint (TMJ) is the unique synovial orofacial joint, it can be frequently affected in RA, including condylar and disc alterations⁸. However, literature is variable in reporting the frequency of temporomandibular disorder (TMD) due to RA⁸⁻¹⁰. Some authors found the presence of limited mouth opening¹¹, TMJ pain^{10,11}, muscular hyperactivity, and masticatory damage¹². Still, some risk factors have been associated with the involvement of TMJ in patients with RA, as being of female gender, presence of mental disorders, insomnia or stroke¹³.

Concerning facial joints involvement and the consequences of RA, few reports^{14,15} verified the impact of oral rehabilitation with conventional dentures in patients with the disease. Improvement of masticatory efficiency, bite force and mandibular movements after new prostheses use in individuals with RA has been reported^{14,15}. It is also known that RA is associated with a decreased QoL¹⁶ due to pain, ageing process¹⁷ and, functional limitation¹⁸. However, the authors are unaware of studies on RA and oral health-related quality of life (OHRQoL) in elderly patients wearing complete or partial conventional dentures. For this reason, considering completely or partially edentulous people wearing old and misadjusted prostheses, the replacement of missing teeth could bring positive results on oral and general health. Therefore, the present study aimed to evaluate the impact of oral rehabilitation with conventional dentures on the OHRQoL and satisfaction with prostheses use in elderly patients with RA, associated or not with TMD.

Materials and methods

Study Design

This cross-sectional study performed subjective assessments concerning the OHRQoL and prosthesis satisfaction among elderly individuals with or without RA and/or TMD, before and after a 2-month prosthetic rehabilitation with new removable dentures. The participants of this clinical research had already participated in previous study¹⁴, in which masticatory function and mandibular movements were observed. All participants were first evaluated with their old prosthesis in the mouth, and after receiving new removable dentures. OHRQoL was assessed by OHIP-14 questionnaire¹⁹⁻²¹, and prosthesis satisfaction by a visual analogue scale (VAS)²².

Subjects

According to sample size calculation (test power of 80% and a value of 0.05.), a total of 45 participants were considered to be enrolled in the study (Figure 1). Subjects were selected without restriction of gender and race and were divided into 3 groups: (1) elderly with RA and TMD (n = 15, experimental), (2) elderly with RA without TMD (n = 15, experimental), and (3) elderly without RA and without TMD (n = 15, control). Following the inclusion criteria, elderly volunteers must present: 60 years or older; be partially or completely edentulous, and using inadequate removable partial and/or complete dentures, according to the criteria of Vigild²³; and present diagnosis of RA. Besides these criteria, group 1 participants must present TMD. All volunteers agreed with voluntary participation and signed the Informed Consent Form, approved by the Ethics Committee of Piracicaba Dental School, University of Campinas (#068/2012). This study was also registered in the Brazilian Registry of Clinical Trials (ReBEC #RBR-6 qkzy). Volunteers with RA were selected from those attended in the Medical Specialties Ambulatory, Department of Rheumatology (Limeira, São Paulo, Brazil), managed by University of Campinas. Controls were selected from patients who sought prosthetic treatment at the Piracicaba Dental School, University of Campinas and also met the same inclusion criteria described above, but with absence of both RA and TMD. Patients with the presence of severe malocclusions, craniofacial injuries or recent orofacial surgeries, intake of muscle-related medication, or with degenerative diseases, including Parkinson's or Alzheimer's disease, were excluded of this study.

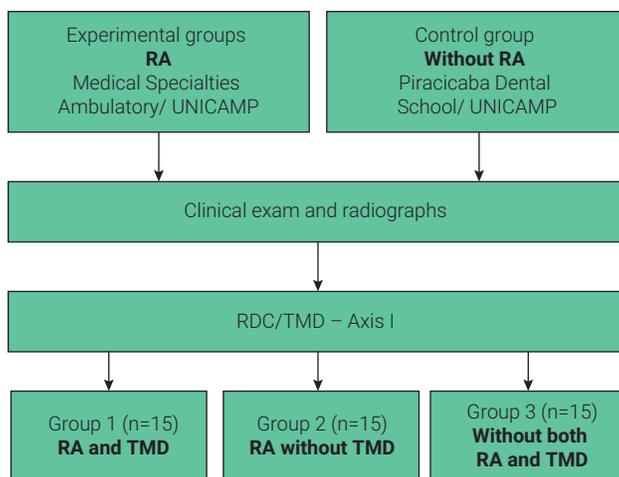


Figure 1. Flowchart for selection of volunteers.

The diagnosis of RA was performed by a rheumatologist, according to clinical and laboratory criteria, based on the American College of Rheumatology classification: (1) morning joint stiffness (up to 1 hour); (2) arthritis in three or more joints with soft tissue edema or joint effusion; (3) arthritis in the hand joints (wrist, proximal interphalangeal and metacarpophalangeal joints); (4) symmetric arthritis; (5) rheu-

matoid nodules; (6) high levels of serum rheumatoid factor (destructive antibodies); and (7) radiographic changes (erosions or decalcification located in hands and wrists). In the presence of four of the seven criteria, for at least 6 weeks, (American College of Rheumatology Subcommittee on Rheumatoid Arthritis Guidelines) it is confirmed the RA diagnosis.

Meanwhile, for the TMD diagnosis, all volunteers underwent a clinical examination by means of the axis I of Research Diagnostic Criteria (RDC/TMD)²⁴. In the axis I, clinical aspects of TMDs are involved and divided into three aspects: (1) muscle disorders, (2) joint disorders and (3) arthralgia, arthrosis, and arthritis. The last one was used to characterize and select volunteers of groups 1 and 2, in the presence of TMD or not, respectively.

After clinical examination of muscle insertions, mucosa-bearing area and remaining teeth, Vigild's criteria²³ were applied to assess prosthesis conditions with regards to stability, retention, occlusion, vertical dimension and defects. To participate in this study, at least one of these criteria should be unsatisfactory.

Prosthesis

New prosthetic rehabilitation with removable complete and/or partial dentures had been provided to the volunteers. The prosthetic devices were made following conventional techniques^{25,26}. Firstly, dental impressions were taken from both arches (Hydrogum, Zhermack, Rovigo, Italy) so that stone casts were made for all the volunteers. After that, elderly who received complete dentures had custom trays manufactured with acrylic resin (Vipiflash, VIPI, São Paulo, Brazil), while those in need for a removable partial denture had their metallic framework made by a dental technician, following the previous surveying analysis of the casts. For the completely edentulous elderly, functional impressions of both arches were taken. In the partially edentulous arches, the frameworks were proved in the mouth. Following these steps, maxillomandibular relationships of all patients were obtained through the occlusal vertical dimension, and dental casts were positioned in a semi-adjustable articulator (A7 Plus, Bio-art, São Paulo, Brazil), with the help of the facial bow. Artificial teeth (Biotone, Dentsply, NY, USA) were mounted over the wax rims, following the bilateral balanced occlusion. After the prostheses being clinically evaluated by means of aesthetic features, they were finished, polished and delivered to patients. All patients were instructed to keep hygiene and care of the prostheses. Prosthetic adjustments on occlusion and acrylic base of the dentures were performed for 2 months to allow patient's adaptation with no complaints.

Oral-health related quality of life (OHRQoL)

To evaluate the OHRQoL, the simplified Portuguese version of the Oral Health Impact Profile (OHIP-14) was used^{20,21}. This is a questionnaire comprised of 14 questions, in seven conceptual dimensions of oral health: (1) functional limitation, (2) physical pain, (3) psychological discomfort, (4) physical incapacity, (5) psychological incapacity, (6) social incapacity, and (7) social disadvantages. For each of the domains, volunteers could answer "often", "sometimes", "rarely", "never" and "do not know"; whose weights/ scores were 4, 3, 2, 1 and 0, respectively. The final index could

vary between 0 and 28 points for each volunteer and it was classified as weak (0-9 points), average (10-18 points) and strong (19-28 points). Thus, the lower the score, the better the OHRQoL.

Patient satisfaction with the prosthetic treatment

Volunteer's satisfaction with their prostheses was measured by a visual analogue scale (VAS)²². It consists on a 10 cm ruler, whose extremities indicate the minimum (zero or no satisfaction) and the maximum value (10 or the highest satisfaction), concerning domains of retention, comfort, mastication, speaking, hygiene, aesthetics, and general satisfaction, of both old and new, upper and lower prostheses. The volunteers were instructed to indicate, with a vertical mark over the ruler, the level of satisfaction with prosthesis use before and after the rehabilitation treatment. The greater the score (ranging from 0 to 10), the better the subjective perception with the prosthetic treatment.

Statistical Analysis

Data were first submitted to the Shapiro-Wilk test and evaluations of asymmetry coefficient and kurtosis. ANOVA was used when the residues adhered to the Gaussian distribution; otherwise, the analysis of variance on Ranks (ANOVA-R) was adopted.

A generalized linear mixed model with repeated measures was applied to test the effect of prosthetic treatment (before versus after) in each group and for the effect of group (experimental groups versus control) at each time point. Tukey-Kramer for multiple comparisons was applied as a post-hoc test. All statistical analyses were performed on SAS system (Release 9.3; SAS Institute Inc., Cary, USA) with a significance level of 5%.

Results

Sociodemographic data were published in previous studies¹⁴. Volunteers were aged 60 to 80 years old. A total of 21 subjects received complete dentures in both jaws, while 12 were rehabilitated by upper and lower removable partial dentures. The remaining participants received upper complete dentures and lower removable partial dentures. Most of them were married, lived in the urban area, had completed the elementary school and were retired. Groups 1 and 2 were diagnosed with RA for, approximately, 10.9 years¹⁴.

Table 1 shows the ANOVA F and P values for main effects of group and time point, and the interaction. The following OHIP-14 domains: psychological discomfort, physical incapacity, psychological incapacity, social incapacity, and social disadvantages showed significant group-time point interaction. In contrast, functional limitation and physical pain domains, as well as the general score of the OHIP-14 showed significant main effects for both, group and time point factors, while the patient satisfaction with prosthesis revealed significant effect only of time point.

Table 1. F and P values from ANOVA to test OHIP-14 domains and prosthesis satisfaction scores.

Variable	Group		Time point		Group × TP interaction	
	F	P	F	P	F	P
<i>OHIP-14</i>						
General score	7.87	0.0013	74.93	0.0001	2.07	0.1392
Functional limitation	8.64	0.0007	18.78	0.0001	1.52	0.2298
Physical pain	12.06	0.0001	31.71	0.0001	2.31	0.1117
Psychological discomfort	9.17	0.0005	59.66	0.0001	5.39	0.0082
Physical incapacity	3.66	0.0342	51.23	0.0001	4.29	0.0202
Psychological incapacity		0.0004		0.0001		0.0172
Social incapacity	4.50	0.0170	28.27	0.0001	4.50	0.0170
Social disadvantages		0.0043		0.0001		0.0043
<i>Prostheses satisfaction</i>		0.3713		0.0001		0.2989

P values < 0.05 indicate significant evidence of the main effects (group and time point) and interaction.

Mean comparisons between before and after prosthetic treatment showed that RA and TMD group exhibited the highest means values ($P < 0.05$) for psychological discomfort, physical incapacity, psychological incapacity, social incapacity, and social disadvantages domains scores on the OHIP-14 before insertion of new dentures (Table 2). A similar trend was observed for the patients with RA without TMD, however only for psychological discomfort, physical incapacity, and psychological incapacity domains.

Table 2. Mean (standard deviation) of OHIP-14 domains with significant interaction between group and time points.

OHIP-14 domain	Groups	Time point			
		Before PT		After PT	
Psychological discomfort	RA + TMD	1.92	(1.12) A	0.27	(0.69) B
	RA – TMD	1.49	(1.21) A	0.23	(0.41) B
	Control	0.29	(0.44) B	0.00	(0.00) B
Physical incapacity	RA + TMD	1.74	(1.10) A	0.20	(0.56) C
	RA – TMD	1.05	(1.10) A	0.07	(0.18) C
	Control	0.50	(0.70) BC	0.10	(0.20) C
Psychological incapacity	RA + TMD	1.71	(0.97) A	0.31	(1.03) BC
	RA – TMD	0.89	(1.37) B	0.00	(0.00) C
	Control	0.33	(0.64) BC	0.00	(0.00) C
Social incapacity	RA + TMD	1.04	(0.99) A	0.00	(0.00) B
	RA – TMD	0.28	(0.75) B	0.00	(0.00) B
	Control	0.39	(0.86) AB	0.00	(0.00) B
Social disadvantages	RA + TMD	0.95	(0.90) A	0.00	(0.00) B
	RA – TMD	0.39	(0.73) B	0.00	(0.00) B
	Control	0.21	(0.58) B	0.00	(0.00) B

Mean values followed by the same letter do not differ significantly from each other by the Tukey-Kramer test, with a significance level of 5%. PT, Prosthesis treatment.

Prior to prosthetic treatment, the control group showed significantly lower mean values ($P < 0.05$) than the AR + TMD group for all the OHIP-14 domains, except for social incapacity. Besides, controls also presented significantly lower means ($P < 0.05$) than the AR-TMD group in the psychological discomfort and physical incapacity domains. After the insertion of the new prostheses, no significant differences among the groups were detected (Table 2).

Concerning those OHIP-14 domains which showed significant main effects for group and time point (but not for the interaction), their mean values (SD) are shown in Table 3. There was a significant reduction in the mean values ($P < 0.05$) for the general OHIP-14 score, as well as for the functional limitation and physical pain domains after the prosthetic treatment for all studied groups, which means that OHRQoL was greatly improved after rehabilitation with new dentures. In addition, irrespectively of the prosthetic treatment, patients with RA and TMD presented significant ($P < 0.05$) higher values than control group. In addition, patients with RA without TMD group showed increased means ($P < 0.05$) compared to controls for functional limitation and physical pain domains of the OHIP-14, but not in the general score.

Table 3. Mean (standard deviation) of OHIP-14 domains with significant main

OHIP-14 domains	Time Point				Group					
	Before PT		After PT		RA+TMD		RA-TMD		Control	
General	6.65	(6.04) A	1.23	(2.23) B	6.34	(6.17) a	3.81	(5.15) ab	1.67	(3.12) b
Functional limitation	0.85	(0.99) A	0.31	(0.58) B	0.91	(0.91) a	0.71	(0.98) a	0.12	(0.26) b
Physical pain	1.21	(1.06) A	0.44	(0.65) B	1.34	(1.09) a	0.88	(0.89) a	0.27	(0.45) b

Effects for group and time points. Mean values followed by the same letter do not differ significantly from each other by the Tukey-Kramer test, with a significance level of 5%. PT, Prosthesis treatment

Finally, Figure 2 illustrates the analysis of patient satisfaction with prostheses use, showing a significant main effect exclusively for the time point factor. Thus, regardless of the RA and/or TMD, all patients were greatly satisfied with the new dentures.

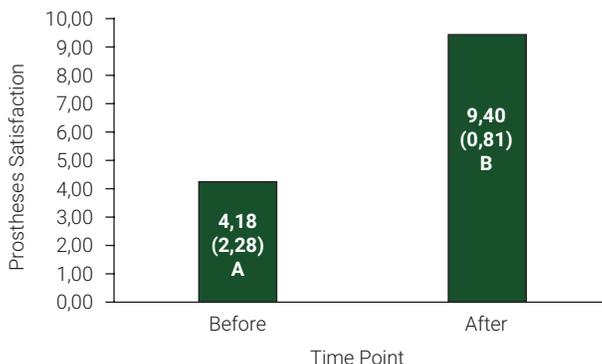


Figure 2. Mean values (SD) of patient satisfaction with the prosthetic treatment.

Discussion

This clinical trial assessed the OHRQoL and satisfaction with prosthetic treatment between patients with RA and TMD or not, before and after 2 months of new removable dentures (CD or RPD) insertion. Most of OHIP-14 domains exhibited significant interactions among groups and time points with increased values in elderly with RA and TMD before new dentures installation, meaning that such elderly had worse OHRQoL. The use of old and worn out dentures contributes to the worse perception that elderly may have about their QoL²⁷. A recent report showed a correlation between denture wearing and better outcomes of OHRQoL⁴. Even though the last authors⁴ did not mention whether prostheses conditions were satisfactory or not, other reports showed that the use of well-fitted dentures improves masticatory performance, bite force and mandibular movements of patients with RA and TMD^{14,15}. Thus, it can be suggested that improvements in such objective variables, could positively influence the subjective measurements, like those of OHIP-14 questionnaire.

Still on groups comparisons before new dentures insertion, the oral implications of TMD in RA¹¹, such as pronounced muscular symptoms, soreness, pain during movement of masticatory muscles, arthralgia of TMJ and tinnitus, associated with the absence of teeth and use of misfit dentures may impact the subjective perception of elderly OHRQoL. Thus, we can suppose that prosthetic problems, resembling the use of misfit dentures, negatively influence OHRQoL when TMJ are affected by the RA. Similarly, patients with RA but without TMD showed worse outcomes of QoL before prosthetic treatment, apart from social incapacity and social disadvantages domains, standing for impaired OHRQoL in this group. Hence, these outcomes possibly indicate that RA does not influence the social life aspects of elderly, but uniquely the presence of TMD and the use of misfit dentures. In this sense, a systematic review exhibited that the use of new and comfortable dentures provided better masticatory efficiency and fitting over the soft tissues, contributing to the higher values of OHIP functional and physical domains²⁸. Indeed, given the worries concerning the old prostheses conditions, the lack of retention, support, and stability, may bring a psychological discomfort to make social contacts, keep interpersonal interaction, rather than strictly because of an autoimmune disease.

Preceding prosthetic treatment, controls also presented better values of OHIP-14 domains than those with AR and TMD, except for social incapacity. It is reported that personal behavior concerning the social disability present a low impact on OHRQoL, once patients with absence of teeth do not avoid social interaction²⁹. Thus, our outcome is confirmed by previous data²⁹, which emphasizes that the presence of old dentures does not avoid the social welfare of patients, even in the presence of RA. Furthermore, even with the use of old dentures, elderly volunteers without the autoimmune disease (control group) showed better perception of OHRQoL in psychological discomfort and physical incapacity domains, compared to patients without TMD. Previous studies reported that both domains are of greater impact over elderly patients QoL^{29,30}. For this reason, regardless of TMD, RA is a chronic and limiting health condition, due to the severe functional disability on body joints, affecting individuals QoL^{1,2,4}. Therefore, the psychological concern about teeth, mouth or dentures are mainly related to damage

on masticatory function and changes in diet habits³⁰. A systematic review showed a greater commitment of RA on physical domain than mental health¹⁶, since bodily pain and decreased physical functioning is commonly found in RA patients. Accordingly, our findings possibly reinforce the idea of a physical-limited life, as well as the psychological processes to identify and deal with daily pain, signs, and symptoms of the disease, which do not occur in a patient without the RA diagnosis.

Following prosthetic rehabilitation with new conventional dentures, no differences were noticed among the three groups, with respect to the OHIP-14 domains. The multidimensional concept of QoL involves the individual perception of social, physical, psychological, environmental, spiritual and level of independence³¹. Thereby, since elderly wearing dental prostheses presented prominent expectations regarding the study treatment, our experimental groups reached the same QoL values of control group.

Irrespective of RA and TMD presence, insertion of new dentures improved OHIP-14 general, functional limitation and physical pain domains. Our outcomes corroborate with those from Alves et al.³² (2018), which also showed enhancement of OHIP-Edent domains after complete dentures rehabilitation. Contrastingly, Bonnet et al.³ (2016) assessed the QoL of patients in need of new prosthetic rehabilitation, however, regardless of prostheses type, whether complete or partial removable dentures, there was not a considerable impact on OHRQoL before and after rehabilitation³. Despite the fact that implant prostheses were freely offered in the study, these authors adopted GOHAI questionnaire to assess the QoL and, either, did not evaluate elderly with an autoimmune disease³.

In addition, irrespective of the prosthetic treatment, controls exhibited greater OHIP-14 scores with regards to functional limitation and physical pain. Again, this finding confirms the limitations of RA, which causes polyarticular inflammatory alterations, damaging and limiting the physical integrity and the performance of daily activities^{16-18,33}.

Our results also showed that regardless of groups, patient satisfaction was greater after the installation of the new dentures. These results corroborate with Medeiros et al. (2019)²⁸, who also reported the recovery of functional and aesthetic parameters with new RPD and/or CD. In the presence of a damaged health condition, it is reasonable to think that after a deficient dental prostheses use, delivery new prosthetic devices may increase the level of satisfaction of the autoimmune disease bearers' patients. Moreover, all prosthetic devices were made following the conventional technique by experienced professionals, which might have contributed to the positive results.

Although the literature contains a distinct tool to evaluate the consequences of RA in QoL³⁴, the use of the OHIP-14 in the present study can figure as a limitation. However, different from a specific instrument to detect the impact of an autoimmune disease on QoL, the OHIP-14 allowed the perception of questions concerning the mouth, dentures, and teeth deterioration. In addition, a two-month follow-up period is limited and might not reflect the long-term OHRQoL or satisfaction with prostheses use of RA patients, thus longer periods can be further assessed. Finally, the diagnosis of an autoimmune disease is of great relevance to clinicians and associated professionals.

This way, identifying the patient's perception about their QoL is extremely important to define clinical strategies and organize treatment proposals according to their needs.

In conclusion, the use of new and well-fitted dentures improves all domains of OHRQoL in patients with RA and TMD. Meanwhile, better results of QoL after prosthetic rehabilitation were observed for the psychological discomfort, psychological incapacity, and physical incapacity domains in patients with RA without TMD group. All groups were satisfied with prostheses use after the new rehabilitation with conventional dentures.

Acknowledgments

The authors acknowledge the support of the São Paulo Research Foundation (grant number 12/08374-4).

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