



Patient-related outcome measures and clinical evaluation of dental implant therapy in the elderly population – a cross-sectional study

Subjektivne mere ishoda i klinička evaluacija terapije dentalnim implantatima kod starije populacije – studija preseka

Svetlana Dragović*, Zoran Lazić†, Miroslav Dragović‡, Miroslav Vukadinović§, Biljana Miličić||, Aleksandra Špadijer Gostović*

University of Belgrade, Faculty of Dental Medicine, *Clinic for Prosthodontics, †Clinic for Oral Surgery, ‡Clinic for Maxillofacial Surgery, §Department of Medical Statistics and Informatics, Belgrade, Serbia; †Military Medical Academy, Clinic for Maxillofacial, Oral Surgery and Implantology, Belgrade, Serbia

Abstract

Background/Aim. Oral health disorders are crucial regarding general health and quality of life of the elders. The aim of this cross-sectional study was to evaluate the long-term clinical and patient-centered outcomes of dental implants, placed in partially and fully edentulous people older than 65 years. **Methods.** A total of 38 participants with an overall number of 168 implants were selected and underwent clinical and radiological examination. The implant survival rate, implant failure rate and other complications were recorded and analyzed. All participants agreed to respond to the Oral Health Impact Profile-14 (OHIP-14) questionnaire and another questionnaires on the Visual Analog Scale (VAS) related to their experiences and satisfaction with the overall implant treatment. Univariate and multivariate regression models were used to verify the relation between the OHIP score and the VAS questionnaires' items. **Results.** The implant survival rate was

94.3%. The number of implants without any complication was 73.2% (123), while biological and technical ones occurred in 17.3% (29) and 9.5% (16) implants, respectively. Regarding quality of life, significant difference was found only between those who wear fixed and removable restoration ($p = 0.001$). The multivariate regression model showed that the degree of satisfaction with shape and size of dentures was significantly associated with lower OHIP scores, indicating a better quality of life. **Conclusion.** According to the results obtained, it can be concluded that dental implant therapy in elderly people can be considered as predictable long-term treatment option regarding high implant survival rate, minimal complications and significantly better quality of life found in the group with fixed dentures.

Key words:

dental implants; aged; surveys and questionnaires; quality of life; patient satisfaction.

Apstrakt

Uvod/Cilj. Poremećaj oralnog zdravlja je od značaja za opšte zdravlje i kvalitet života starijih osoba. Cilj studije preseka bio je da se procene klinički parametri i subjektivne mere ocene dugogodišnje terapije dentalnim implantatima, primenjene kod bezubih i krezubih osoba starijih od 65 godina. **Metode.** Ukupno, 38 ispitanika sa 168 implantata bilo je uključeno u studiju preseka i podvrgnuto kliničkom i radiološkom pregledu. Stopa preživljavanja implantata, stopa gubitka implantata i druge komplikacije praćene su i analizirane. Svi ispitanici su popunjavali upitnik *Oral Health Impact Profile-14* (OHIP-14) i odgovarali na pitanja uz korišćenje Vizuelno analogne skale (VAS) koja su se odnosila na njihovo iskustvo i zadovoljstvo celokupnom implantološkom terapijom. Univarijantni i multivarijantni re-

gresioni modeli korišćeni su za proveru korelacije između uticaja implantološke terapije na kvalitet života i zadovoljstvo pacijenata terapijom. **Rezultati.** Stopa preživljavanja implantata bila je 94,3%. Zastupljenost implantata bez komplikacija iznosila je 73,2% (123), dok su se biološke i tehničke komplikacije dogodile kod 17,3% (29) i 9,5% (16) implantata, redom. U odnosu na kvalitet života, statistički značajna razlika pronađena je samo kod poređenja grupa sa mobilim i fiksnim zubnim nadoknadama ($p = 0,001$). Multivarijantni regresioni model pokazao je da je stepen zadovoljstva oblikom i veličinom zubnih nadoknada značajno povezan sa nižim ukupnim skorom OHIP-14 upitnika, što ukazuje na bolji kvalitet života. **Zaključak.** Na osnovu dobijenih rezultata može se zaključiti da se terapija dentalnim implantatima kod osoba starije životne dobi može smatrati predvidivim dugoročnim terapijskim izborom s ob-

zirom na visoku stopu preživljavanja implantata, minimalne komplikacije, kao i statistički značajno bolji kvalitet života ustanovljen u grupi sa fiksnim protetskim nadoknadama.

Ključne reči:

zubi, implantati; stare osobe; ankete i upitnici; kvalitet života; bolesnik, zadovoljstvo.

Introduction

A demographic revolution is in progress throughout the world. The proportion of elderly people (aged 65 and over) is growing faster than any other age group¹. Today, 8.5% of people worldwide belong to this group and the number is projected to double, i.e. there will be 1.6 billion people over the age of 65 by 2050². Concerning these facts, the World Health Organization (WHO) established the concept of „Active Aging – A Policy Framework“, in which amongst other health issues, oral health is emphasized as an essential. The influence of oral health disorders is crucial regarding general health and quality of life in elders². Recently published epidemiological study has revealed that patients wearing dentures, with larger number of missing or decayed teeth, as well as those with dry mouth are more prone to have poorer Oral Health Related Quality of Life (OHRQoL)³. Although incidence of edentulism has been reported to decline⁴, gradual tooth loss continues and presents influential determinant of poor OHRQoL among elderly people³. It is also known from the literature that oral health issues have the great impact not only on the well-being and social activities of people⁵, but also on chewing efficacy and nutritional intake⁶. Elderly people today demand both functionally and socially acceptable dental solution. Due to the advancement of dental implant therapy, elderly population could benefit from possibility of receiving sustainable implant supported restorations and quality dental care including replacement of single teeth, multiple teeth, or fully edentulous conditions. Numerous study have demonstrated that the age is not a risk factor for dental implant outcome⁷⁻⁹. For instance, Park et al.¹⁰ have retrospectively evaluated clinical and radiographic outcomes of 902 dental implants placed in 346 people older than 65 years. Patients were monitored for a period of 2–17 years after implant surgery and results revealed that survival rates were 95.39%. Although the survival of implants is understandable, the current state of the literature indicates that patient-related outcome measures (PROMs) may represent major aspects of the implant success for the patients¹¹. In fact, patients need to function with prosthesis, thus their final evaluation should be considered paramount. Yet, in the literature, scientific evidence regarding implants in the elderly group has mostly focused on the provision of implants and related prostheses. There is less evidence concerning complications, prosthodontic maintenance needs and patient satisfaction in those who have aged with dental implants. Also, a review article evaluating OHRQoL in subjects with implant-supported prostheses concluded that in the majority of prospective studies, OHRQoL was assessed prior to treatment and post-

treatment within 12 months of implant placement¹². As life expectancy is increased, maintenance is inevitably required and complications may develop, so the level of satisfaction will possibly decline over time.

Therefore, the aim of this cross-sectional study was to investigate the long-term clinical and PROMs of dental implants placed in partially and fully edentulous elderly people, as well as prevalence of biological and technical complications during maintaining period.

Methods

The study followed guidelines established by the Declaration of Helsinki for research involving humans¹³ and was approved by the institutional Ethics Committee.

Study population

This cross-sectional study was performed involving elderly participants aged over 65 in time of treatment with dental implants. The patients were selected using a database search and all potential participants were recalled for check-ups. Fifty-six patients with 252 implants were identified. However, 10 patients have deceased, six refused to attend check-up and two patients could not be located. The definitive study group consisted of 38 participants with an overall number of 168 implants. The patients, who accepted to participate in the study, received detailed explanations through an information session and all recruited participants signed an informed consent form. The information regarding age, sex, general health, systemic diseases, smoking habits, time of implant surgery, applied type of implantation and loading protocol, position and number of implants were retrieved either retrospectively from the patients' dental records or directly through face-to-face interview. All participants underwent a clinical and radiological (digital OPT) examination and completed questionnaires related to their experiences and satisfaction with the overall implant treatment and its impact on quality of life.

Clinical evaluation

The survival rate was assessed according to the success criteria of Albrektsson et al.¹⁴. Implant failure was considered based on implant loss, presence of mobility, pain, discomfort, neuropathy or removal due to severe peri-implant infection or implant fracture. Also, the clinical examination included a basic periodontal examination with the use of manual periodontal probe. Outcomes measured were the presence or absence of peri-implant suppuration, the modified plaque and sulcus bleeding indexes¹⁵ and the

probing depth. Furthermore, the prevalence of complications, regardless of its type (technical or biological), was followed for all participants.

Patient-related outcome measures (PROMs)

For the quality of life analysis the Oral Health Impact Profile-14 (OHIP-14) test, developed by Gary D. Slade¹⁶ in 1997 and later adapted to native language¹⁷, was used. All participants completed the OHIP-14 giving answers in relation to the period after the prosthetic rehabilitation on dental implants were completed. Every item has five possible answers: never, occasionally, often, very often and always. The categories are marked gradually on a five-point scale, where 0 means never and 5 mean always. The final score was obtained by summing all the points awarded, with the lower score indicating a better result (improved quality of life). Also, patients' satisfaction regarding comfort, esthetics, ability to maintain hygiene, chewing ability and implant therapy in general, was evaluated using Visual Analog Scale (VAS)¹⁸. Participants expressed a subjective impression on the given question, marking the response to 100-millimeter scale, with the most negative impression at the zero point and the most positive at the point 100.

Statistical analysis

All statistical analyses were done using Statistical Package for Social Science (SPSS software package, version 24.0; SPSS Inc., Chicago, IL, USA). Mean, median, standard deviation (SD) and range were used for description of nu-

meric data. Descriptive data were expressed as a percentage for discrete measures. Categorical variables were compared using chi square test (χ^2). Numeric data were analyzed using Kruska-Wallis test and Mann-Whitney *U* test according to sample distribution detected with One-sample Kolmogorov-Smirnov test. Univariate and multivariate regression models were used to assess the relationship between parameters. Differences were considered significant when the *p* value was less than 0.05.

Results

The 38 participants who received 168 dental implants were examined in this study. There were 20 males and 18 females. The mean patient age at the time of implant placement was 68.4 years (range 65–84 years) and at the control appointments 72.34 years (range 67–87 years). The follow-up duration was 54.06 ± 48.072 months. Eight implants in 4 participants were removed due to the failure during the follow-up period. Four failures were caused by peri-implantitis, three because of technical complication and one implant was lost in the first six months, before loading. The overall survival rate of implants was 94.3% (Figure 1). During examination, it has been established that 73.2% (123) implants were without any complication while biological and technical ones occurred in 17.3% (29) and 9.5% (16) implants, respectively. Table 1 displays the overall OHIP score according to baseline characteristics of study participants, denture status and implant surgery. Statistical significant difference was observed only between those who wear fixed and removable dentures. In Table 2, results are depicted of non-

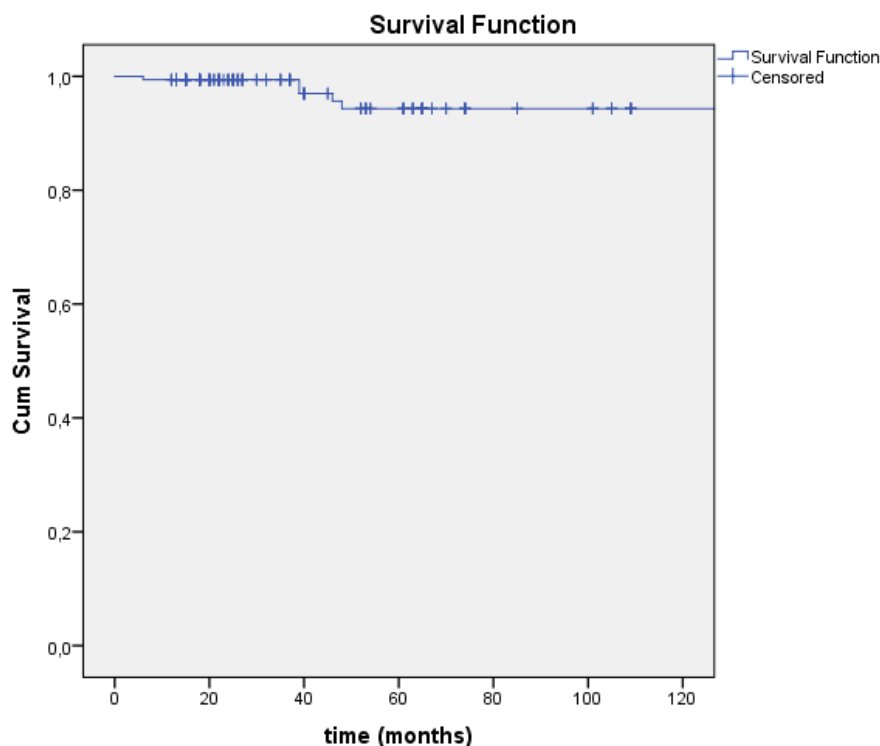


Fig. 1 – Kaplan-Meier implants survival estimate.

parametric correlations between the overall OHIP score and VAS questions from the query form. Further, the linear regression analysis was carried out to determine the contributions of the explanatory variables [age, gender, the American Society of Anesthesiologists (ASA) classification, type of denture and antagonist teeth, complication, failure, additional surgery and satisfaction evaluated with Visual Analog Scale regarding comfort, aesthetics, speaking ability, ability to maintain hygiene, chewing ability and implant therapy in

general] on overall OHIP scores as a dependent variable. In the univariate linear regression model baseline participants' characteristics, denture status and implant surgery did not show significant association with the overall OHIP score. On the other hand, 7 out of 8 VAS questions were found to have a significant impact on the overall OHIP score. In the multivariate regression model, however, only the VAS 4 question proved to be an independent predictor of the overall OHIP score.

Table 1
Overall the OHIP-14 score according to participants' characteristics, denture status and implant surgery

Parameter	OHIP-14 score mean \pm SD (min–max)	Significance
Gender		
male	2.30 \pm 5.53 (0–25)	^a <i>p</i> = 0.150
female	3.11 \pm 3.86 (0–13)	
Age group (years)		
65–74	2.81 \pm 5.37 (0–25)	^b <i>p</i> = 0.569
75–84	1.70 \pm 2.00 (0–5)	
\geq 85	6 \pm 7.07 (1–11)	
ASA classification		
1	2.25 \pm 3.62 (0–13)	^b <i>p</i> = 0.973
2	3.80 \pm 6.73 (0–25)	
3	1.80 \pm 1.84 (0–5)	
4	1.40 \pm 1.67 (0–4)	
Type of denture		
fixed denture	1.77 \pm 4.87 (0–25)	^a <i>p</i> = 0.001
removable denture	4.67 \pm 4.05 (0–13)	
Type of antagonist teeth		
natural teeth	4.38 \pm 8.47 (0–25)	^b <i>p</i> = 0.068
metal – ceramic teeth	1.31 \pm 2.75 (0–11)	
acrylic teeth	3.29 \pm 3.58 (0–13)	
complications		
yes	3.93 \pm 6.77 (0–25)	^a <i>p</i> = 0.433
no	1.96 \pm 3.03 (0–13)	
failure		
yes	4.00 \pm 6.08 (0–11)	^a <i>p</i> = 0.822
no	2.57 \pm 4.73 (0–25)	
additional surgery		
yes	2.58 \pm 2.43 (0–8)	^a <i>p</i> = 0.182
no	2.73 \pm 5.57 (0–25)	

OHIP – Oral Health Impact Profile; ASA – American Society of Anesthesiologists; SD – standard deviation.

^aMann-Whitney U test, ^bKruskal – Wallis test.

Table 2
Nonparametric correlations between VAS questions and the overall OHIP-14 score for each participant

VAS question	(ρ)	<i>p</i>
1 (How do you rate your satisfaction with your denture?)	-0.372	0.022*
2 (How long did it take you to get used to your denture?)	-0.249	0.131
3 (Do you like the esthetical appearance of your denture?)	-0.474	0.003*
4 (Do you like shape and size of your denture?)	-0.339	0.037*
5 (Do you like the color of your teeth?)	-0.260	0.115
6 (How do you rate your chewing ability?)	-0.497	0.002*
7 (How do you rate cleanliness of your denture?)	-0.159	0.340
8 (How do you rate the overall treatment experience?)	-0.542	0.000*

VAS – Visual Analog Scale; OHIP – Oral Health Impact Profile;
 ρ – Spearman's rank correlation coefficient.

Discussion

An obvious trend of accelerated aging in the world's population has gained considerable interest in dental implant rehabilitation of elderly group by the scientific community. As osseointegration is strongly governed by the patients' wound healing response, successful outcomes for dental implants could be expected to be less favourable in elderly patients due to age-related circumstances with slowed bone metabolism, weaken immune defence and chronic diseases. On the other hand, nowadays, elderly patients do not only expect optimal function and comfort, but are also interested in esthetics and other psychosocial parameters related to their perception of implant treatment. The present study investigated the long-term clinical and patient-related outcome measures of dental implants placed in elderly people using a cross-sectional study model.

Consequently, there are usual limitations of this study design. A prospective, long-term observational study would have provided results with a higher level of scientific evidence but one of the leading problems when investigating an elderly population with dental implants is accounting for all patients initially included in the study.

Results of this study revealed that the survival rate of implants placed in people older than 65 years was 94.3% which is in accordance with values found in previous studies^{10, 19}. The great deal of failed implants (5 out of 8) were lost due to biological complications and the most common reason for implant failure was peri-implantitis (4 out of 8). Peri-implantitis is generally considered to be strongly connected with plaque retention and poor oral hygiene. In our study dental plaque was found in 100% of implants with registered peri-implantitis ($p = 0.000$). These findings are in accordance with the study of Serino and Ström²⁰, who found peri-implantitis in a greater percentage at implant sites with poor oral hygiene compared to sites with proper oral hygiene. Oral hygiene maintenance amongst the elders is compromised as a result of both limited motoric skills and required complex technique, therefore more simplified solutions should be considered for elderly people. Another interesting finding was that both implant failure rate and the incidence of other types of complications, were not found to be the parameters that significantly influenced patient's quality of everyday life. As it has been well demonstrated that subjects who requested implants had the poorest oral health related quality of life prior to treatment²¹, it seems that those two important parameters did not contribute to the decreasing of satisfaction with overall treatment. Besides, the majority of complications were solved and patients usually accepted it as normal service during maintenance period. Equally important was the finding that necessity for additional surgery did not have the significant impact on participants' quality of life. It is in contrast with findings of De Bruyn et al.²² who found that patients prefer straightforward over complex implant surgery that includes bone grafting procedures. The authors of this article share opinion, that in case of proper approach and detailed explanation of additional surgery inevitability, it can be expected that patient consent

will be obtained without disturbing their judgement of the overall treatment and altering the quality of life.

Further analysis of the OHIP data distributed by gender showed no significant difference between men and women, although it was found slightly higher overall score for OHIP in the female group. It coincides with generally accepted way of thinking that women are more motivated, detail orientated and more inclined to express their dissatisfaction. This was confirmed in the study of other authors who found that women rated satisfaction with their dentures much lower than men^{18, 23}. Regarding age groups, our study revealed no significant difference concerning OHRQoL. Nevertheless, it is obvious that middle-old participants reported the best implant treatment related quality of life. It can be assumed that those participants accepted implant-supported restorations as an option to improve their quality of life after becoming fully aware of their ages, medical issues and general health conditions. On the other hand, people in the early-old ages, compared their previous quality of life when they were younger with better general and oral health status, so they had higher expectations. On the third level, as people getting old, the ability for objective evaluation of their own life status constantly decreases, which makes it difficult for them to evoke emotional and sociological memories of previous life period. High demanding criteria are probably the most influential factor, why in the group of very old participants (over 85) the highest score for the overall OHIP was registered. It is important to highlight that there was no significant difference between overall scores for the OHIP of various medical patient groups, according to the ASA classification. This information is very important because the majority of people older than 65 have one or more chronic health disorders and still those people have the oral health issues, that have to be addressed adequately. The most contributing parameter for OHRQoL was the type of denture. Participants with fixed implant restorations showed significantly greater satisfaction and improvement of quality of life, compared to those with removable prostheses. It can be concluded that people regardless of their age, prefer more fixed prosthodontic solutions than mobile ones. Possible reasons are superior functional, esthetic and phonetic features of fixed over mobile dentures. To the best of our knowledge, there are no clinical studies which compared elders' quality of life with reference to the type of denture.

Non-parametric correlation was done in order to determine whether there is a mutual relation between participants' perception of the psychosocial impact of delivered restorations on their well-being and psychometric evaluation of their satisfaction with implant therapy. It can be stated that the elders are mostly concerned about aesthetical appearance as well as shape and size of their implant restorations. Furthermore, moderate correlation was found between the overall OHIP score and elders' rates of chewing ability with their new prostheses (the VAS 6 question). Therefore, the functional component of implant supported dentures can also be regarded as the factor of the immense importance which significantly contributed to the enhancement of the elders' quality of life. In addition to those questions specifically related to denture, strong

negative correlation was found between the elders' rate of overall treatment experience (the VAS 8 question) and overall score for OHIP. In other words, the greater the elders' satisfaction with treatment approach and protocol, the better perception about quality of life improvement was found. The overall score for the OHIP regarding the type of antagonist teeth, did not differ significantly amongst natural dentition, metal-ceramic and acrylic teeth. Yet, those elders with natural teeth with the highest score in this group were the least satisfied. These findings follow the logical pathway as they compared mobile or fixed dentures to their own teeth. On the contrary, other factors such as teeth colour or cleanability of dentures were not found to correlate significantly with the overall score for the OHIP. Although professionals may think that these two factors are dominant ones, from the participants' point of view, they are irrelevant with regard to their experience of quality of life improvement. Presumably, the elders are not as objective as doctors in relation to teeth colour, thus being unable to differentiate minor distinctions between numerous shades. Similarly, the elders are less interested about dentures cleanability, while from the doctor's standpoint it is tremendously important prerequisite for the long-term success of implant therapy.

According to the results of univariate and multivariate regression model analysis, it can be suggested that the degree

of satisfaction with shape and size of dentures could describe almost 50% of variabilities amongst population in terms of general attitude about quality of life improvement after implant-prosthetic therapy in the elderly group. Due to this fact, in conjunction with significantly better quality of life found in the group with fixed dentures, it can be postulated with great level of certainty, that the elderly people, above all, appreciate the comfort obtained by well-shaped and size-limited fixed restorations in comparison with bulky removable dentures.

Conclusion

Within the limitations of the study, it can be concluded that dental implant therapy in the elderly people can be considered as predictable long-term treatment option regarding high implant survival rate, minimal complications and improved quality of life. Also, main approach to implant-prosthetic rehabilitation of the elderly people and making decision about type of implant restorations should be based on thorough examination and treatment planning, concerning general and intraoral health status, minimal surgical invasiveness, with understanding the participant's preferences regarding function, esthetics and oral hygiene maintenance.

R E F E R E N C E S

1. *World Health Organization (WHO)*. Active Ageing: A Policy Framework. A Contribution of the World Health Organization to the Second United Nations World Assembly on Ageing. Madrid, Spain: World Health Organization (WHO); 2002.
2. *Kowal P, Goodkind D, He W*. An Aging World: 2015. International Population Reports. Washington DC: U.S. Government Printing Office; 2016. Available from: <http://www.census.gov/library/publications/2016/demo/P95-16-1.html>
3. *Murray Thomson W*. Epidemiology of oral health conditions in older people. *Gerodontology* 2014; 31 Suppl 1: 9–16.
4. *Muller F, Nabarro M, Carlsson GE*. What are the prevalence and incidence of tooth loss in the adult and elderly population in Europe? *Clin Oral Implants Res* 2007; 18 Suppl 3: 2–14.
5. *Heydecke G, Thomason JM, Lund JP, Feine JS*. The impact of conventional and implant supported prostheses on social and sexual activities in edentulous adults: Results from a randomized trial 2 months after treatment. *J Dent* 2005; 33(8): 649–57.
6. *Geissler CA, Bates JF*. The nutritional effects of tooth loss. *Am J Clin Nutr* 1984; 39(3): 478–89.
7. *Jemt T*. Implant treatment in elderly patients. *Int J Prosthodont* 1993; 6(5): 456–61.
8. *Kondell PA, Nordenram A, Landt H*. Titanium implants in the treatment of edentulousness: influence of patient's age on prognosis. *Gerodontology* 1988; 4(6): 280–4.
9. *Zarb GA, Schmitt A*. Osseointegration for elderly patients: The Toronto study. *J Prosthet Dent* 1994; 72(5): 559–68.
10. *Park JC, Baek WS, Choi SH, Cho KS, Jung UW*. Long-term outcomes of dental implants placed in elderly patients: a retrospective clinical and radiographic analysis. *Clin Oral Implants Res* 2017; 28(2): 186–91.
11. *De Bruyn H, Raes S, Matthys C, Cosyn J*. The current use of patient-centered/reported outcomes in implant dentistry: a systematic review. *Clin Oral Implants Res* 2015; 26 Suppl 1: 45–56.
12. *Reissmann DR, Dard M, Lamprecht R, Struppek J, Heydecke G*. Oral health-related quality of life in subjects with implant-supported prostheses: A systematic review. *J Dent* 2017; 65: 22–40.
13. *World Medical Association*. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA* 2013; 310(20): 2191–4.
14. *Albrektsson T, Zarb G, Worthington P, Eriksson AR*. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. *Int J Oral Maxillofac Implants* 1986; 1(1): 11–25.
15. *Mombelli A, van Oosten MA, Schurch E Jr, Land NP*. The microbiota associated with successful or failing osseointegrated titanium implants. *Oral Microbiol Immunol* 1987; 2(4): 145–51.
16. *Slade GD*. Derivation and validation of a short-form oral health impact profile. *Community Dent Oral Epidemiol* 1997; 25(4): 284–90.
17. *Stancic I, Sojic LT, Jelenkovic A*. Adaptation of Oral Health Impact Profile (OHIP-14) index for measuring impact of oral health on quality of life in elderly to Serbian language. *Vojnosanit Pregl* 2009; 66(7): 511–5. (Serbian)
18. *Rashid F, Anad MA, Thomason JM, Piovano A, Spielberg GP, Scilingo E*, et al. The effectiveness of 2-implant overdentures - a pragmatic international multicentre study. *J Oral Rehabil* 2011; 38(3): 176–84.
19. *Becker W, Hujuel P, Becker BE, Wobrl P*. Dental Implants in an Aged Population: Evaluation of Periodontal Health, Bone Loss, Implant Survival, and Quality of Life. *Clin Implant Dent Relat Res* 2016; 18(3): 473–9.
20. *Serino G, Ström C*. Peri-implantitis in partially edentulous patients: Association with inadequate plaque control. *Clin Oral Implants Res* 2009; 20(2): 169–74.

21. *Allen P, McMillan A.* A longitudinal study of quality of life outcomes in older adults requesting implants prostheses and complete removable dentures. *Clin Oral Implant Res* 2003; 14(2): 173–9.
22. *De Bruyn H, Raes S, Matthys C, Cosyn J.* The current use of patient-centered/reported outcomes in implant dentistry: A systematic review. *Clin Oral Implants Res* 2015; 26(Suppl 11): 45–56.
23. *Awad MA, Feine JS.* Measuring patient satisfaction with mandibular prostheses. *Community Dent Oral Epidemiol.* 1998; 26(6): 400–5.

Received on February 28, 2019
Accepted on October 30, 2019
Online First November, 2019