Dental Sciences Journal of International
Uluslararası Diş Hekimliği Bilimleri Dergisi

Research Araştırma

Comparing the efficiency of mandibular implant-retained complete dentures and conventional complete dentures among elderly edentulous patients: Satisfaction and quality of life

Tam dişsiz hastalarda implant destekli overdenture ve konvansiyonel tam protezlerin hasta beklentileri ve yaşam kalitesine etkisinin araştırılması

ABSTRACT

Objectives: This study was conducted to compare the satisfaction and the quality of life in an elderly population using either mandibular conventional complete dentures or implant retained complete dentures.

Materials and Method: A total of 120 patients were divided into two groups: group 1 conventional denture wearers; group 2 implant retained denture wearers. The subjects were submitted to a questionnare based on Oral Health Impact Profile (OHIP-14) to evaluate their quality of life. Visual Analog Scales (VAS) were used to evaluate patients general satisfaction and retention levels of their prosthesis. Between two groups OHIP and VAS surveys were applied, their oral health and general health quality of life analyzed. To analyze the study statistically, IBM SPSS V23 (Chicago,USA), Spearman correlation analysis and Shapiro Wilk, Mann Whitney U, Chi-squared tests were used.

Results: In terms of OHIP-14 total scores between groups, differences were found ($p<0,05$). Implant retained denture group showed better quality of life than conventional denture group. Statistically significance was found between the patient age, denture experiences with the OHIP-14 and VAS scores ($p<0,05$).

Conclusion: Two implant retained dentures are successful treatment for older edentulous patients who showed improvements in their retention of prosthesis and quality of life

Key Words: Complete Denture; Dental İmplant; Edentulism; OHIP-14; Quality of Life; VAS

ÖZ

Amaç: Bu çalışmada iki farklı tip tam protez kullanan hastaların, yaşam kaliteleri ve hasta memnuniyetlerinin karşılaştırılarak değerlendirilmesi amaçlandı.

Gereç ve Yöntemler: Çalışmada konvansiyonel tam protez kullanan ve implant destekli tam protez kullanan 60'ar toplamda 120 hasta değerlendirildi. Hastaların yaşam kalitesi ölçümleri için OHIP-14 anketi, genel protez memnuniyetleri ve retansiyon ölçümleri için de Visual Analog Scale (VAS) formları kullanılarak değerlendirme yapıldı. Ayrıca olguların yaş, cinsiyet ve protez tecrübesi ile OHIP ve VAS skorları arasındaki ilişki değerlendirildi. Çalışmamızın analizinde IBM SPSS V23 (Chicago, USA), Spearman korelasyon analizi ve Shapiro Wilk, Mann Whitney U, Ki-kare testleri kullanıldı.

Bulgular: OHIP toplam değerleri açısından gruplar arasında istatistiksel olarak anlamlı sonuç bulunmuş ve implant destekli tam protez grubu daha iyi yaşam kalitesi göstermiştir ($p<0,05$). 2 grup arasında fonksiyonel kısıtlılık, psikolojik huzursuzluk ve engelilik skorları arasında istatistiksel olarak anlamlı bir ilişki bulunamamıştır. Fiziksel ağrı ve fiziksel yetersizlik skorları konvansiyonel tam protez kullanan hastalarda daha yüksek bulunmuştur. Sosyal uyumsuzluk, psikolojik yetersizlik skorları implant destekli tam protez kullanan hastalarda daha yüksek bulunmuştur. Mandibular tam protez retansiyon skorlarında implant destekli tam protez grubu daha yüksek sonuçlar vermiştir ($p<0,05$). Araştrmanın istatistiksel sonuçlarına göre, olguların cinsiyetleri ile VAS ve OHIP skorları arasında istatistiksel olarak anlamlı bir ilişki bulunamamıştır ($p>0,05$). Protez kullanım süresi ve retansiyon ile VAS ve OHIP skorları arasında istatistiksel olarak farklılıklar bulunmuştur ($p<0,05$).

Sonuç: İki implant destekli tam protez kullanımının oral sağlıkla ilişkili yaşam kalitesini ve protez tutuculuğunu artırdığı ve tam dişsiz hastalar için başarılı bir tedavi olarak uygulanabileceği söylenebilir.

Anahtar Kelimeler: Dental İmplant, OHIP14, Tam Protez, Yaşam Kalitesi

İmran KOÇAK[1]

Göknil Ergun KUNT[2]
ORCID: 0000-0002-2925-9660

Gözlem CEYLAN[2]
ORCID: 0000-0003-1257-803X

1 Oral and Dental Health Hospital, Prosthodontist, Osmaniye, Turkey

2 University of Ondokuz Mayıs, Faculty of Dentistry Department of Prosthodontics, Samsun, Turkey

Geliş tarihi / *Received: 28.01.2021*
Kabul tarihi /*Accepted*: 24.02.2021
DOI: xx.xxxxx/jids.2019.xxx

İletişim Adresi/*Corresponding Adress:*
Göknil Ergün KUNT
Ondokuz Mayıs University
Faculty of Dentistry,
Department of Prosthodontics
Samsun, Turkey
E-posta/e-mail: gergun@omu.edu.tr

INTRODUCTION

In totally edentulism, with the treatment method of conventional complete dentures although the functional, phonatic, esthetic and physologic deficiences are corrected, the patients complaints are often encountered. The most common complete denture wearers problems are lack of retention, decreased masticatory function, unfavorable esthetics, and speech impairment. The complaints about the instability of the prosthesis is often from mandibular complete dentures.

In recent years with the increase of 65 aged individuals, the development of implant dentistry and prosthetic techniques, it also increases the patients aesthetic, and functional expectations. In addition to the conventional complete denture approach, which is the first option in the case of complete toothlessness, there are better alternative treatment options. Dental implant treatment of partial and complete toothlessness long term success has been demonstrated and has become a highly preferred prosthetic treatment alternative.

In many studies and clinical applications where the quality of life in dental implants is significantly improved compared to conventional dentures, the stabilization, retention, biting ability, chewing activity, patient satisfaction and oral health has been reported by the development of osseointegre dental implants as a treatment method for patients with complete dentures supported by two implants (Engquist et al., 1988; Feine et al., 1994; Pera et al.1998, Geertman et al., 1999).

In our country 61.36 % of the people over 65 years of age are using upper and lower complete dentures. It is important to investigate the effect of this treatment form which is widespread throughout the world and in our country, with the patient satisfaction and quality of life (Mumcu et al., 2011). Quality of life is accepted by the World Health Organization as a way of perceiving the individual's own situation within the system of Culture and Values (Slade 1997, Spherd et al. 1999). Quality of life related to health refers to the physical, social and mental fields perceived by individuals in their lives and their ability to perform life functions (Spherd et al. 1999).

The aim of this study is to investigate and compare the effects of implant supported overdentures and conventional complete dentures treatment on the quality of life and patient satisfaction with VAS (Visual Analog Scale) forms associated with oral health with OHIP-14 (Oral Health Impact Profile) survey in complete dental patients.

Our study's hypothesis is that the use of implant supported overdentures and conventional complete dentures will have an impact on patient satisfaction and quality of life in patients with complete edentulism.

MATERIAL AND METHODS

The aim of this study is to compare the effects of implant-supported overdenture and conventional denture treatments on the quality of life of patients with oral health by using OHIP- 14 and VAS.

The study is a retrospective study conducted on patients who underwent dental implant treatment at the University of Ondokuz Mayis Department of Dental Diseases and Surgery and who completed the implant-supported or conventional prostheses in the University of Ondokuz Mayis, Department of Prosthesis for at least 6 months.

The study included the patients who were 55 years of age and older with complete dentition. After clinical examinations all of the patients' sociodemographic data were recorded. The study was approved by the Ethics Committee of Ondokuz Mayis University. Informed consent form was obtained from the patients. OHIP-14 scale was used for the measurement of quality of life, and VAS forms were used for satisfaction measurement.

VAS forms were prepared on a scale of 0-10 units and patients were told to mark this scale according to the degree of satisfaction. All patients have separately labeled VAS scales for two different categories, general satisfaction and retention. A total of 120 patients, 56 of whom were women (46.7%) and 64 (53.3%) were men, aged between 52 and 86 years, were included in the study. The patients included in the study were divided into two groups:

Group 1: Patients who were treated with both maxiller and mandibular complete dentures (n=60).

Group 2: Patients who were treated with maxillary complete denture and mandibular implant retained overdenture (n=60). Mandibular overdentures were supported by ball attachments with two implants.

All the questions on the OHIP 14 scale consist of five likert type scales and five answers that can be given to the questions 0-4. These answers are 0=never, 1=rarely, 2=sometimes, 3=often and 4=always. The evaluation is performed on 5 data obtained for each category, separately and total score. OHIP-14 consists of 14 items grouped into seven domains containing two questions each and named as: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. In the evaluation of the OHIP

-14 scores range from 0 to 56, the total score was high, the quality of life due to dental health of the individual is negatively affected and the low is positively affected.

OHIP scores are obtained in three ways. OHIP / SC is a very frequent and very often considered an appropriate score. OHIP/ADD is a score obtained by collecting answer scores in all areas. OHIP/WS is the weighted standardized score calculated using question weights. In our study, the total score of the OHIP-14 scale was calculated using the OHIP-14/ADD measurement method.

Data were analyzed with IBM SPSS V23 (Chicago, USA). The normal distribution fitness of the data was examined by the Shapiro Wilk test. In the comparison of quantitative data with normal distribution, T test was used for independent samples from parametric methods. Mann Whitney U test was used for the data with no normal distribution. In comparison of qualitative data, Chi-Square test was used. Spearman Correlation analysis was used to examine the relationship between variables. Quantitative data with normal distribution were presented as mean ± standard deviation and those without normal distribution as median (min-max). The presentation of qualitative data was done in frequency (percentage). Significance level was taken as $p < 0,05$.

RESULTS

In terms of total OHIP-14 values, there was a statistically significant result between implant supported overdenture and conventional denture groups, and implant supported overdenture group generally showed better quality of life (Table 1).

When the OHIP subscale scores are examined; physical pain, and physical disability were found statistically significant among the groups. Implant supported overdenture group showed higher oral health related quality of life than conventional denture group. In the field of psychological discomfort, social disability, the conventional denture group yielded statistically better results than the implant supported denture group (Table 2). In the area of functional limitation, implant supported overdenture group yielded better results than the conventional denture group.

When examined with VAS scale scores, it was found that all the prosthetic treatments had a positive effect on overall satisfaction and that the implant supported overdenture group was statistically more significant (Table 3). The level of retention satisfaction was found to be statistically lower in the conventional denture group. In the implant supported overdenture group, it was determined that female had a high level of satisfaction in the field of retention compared to male.

	Group 1 (n=60)	Group 2 (n=60)	Test Statics	p
OHIP-14 Subscale *	15.5 (5 - 25)	11.5 (4 - 26)	U=1388.0	**0.030**
Functional limitation	2 (0 - 6)	1 (0 - 4)	U=1529.5	0.143
Physical pain	4 (2 - 6)	3 (1 - 5)	U=642.5	**<0.001**
Psychological discomfort	1 (0 - 3)	1 (0 - 5)	U=1726.5	0.686
Pyhsical disability	3 (1 - 7)	2 (0 - 4)	U=612.0	**<0.001**
Psychological disability	2 (0 - 4)	2 (0 - 5)	U=1425.5	**0.043**
Social disability	1 (0 - 3)	1 (0 - 4)	U=1401.0	**0.028**
Handicap	1 (0 - 3)	1 (0 - 4)	U=1572.5	0.209

Table 1: OHIP-14 scores in the two treatment groups

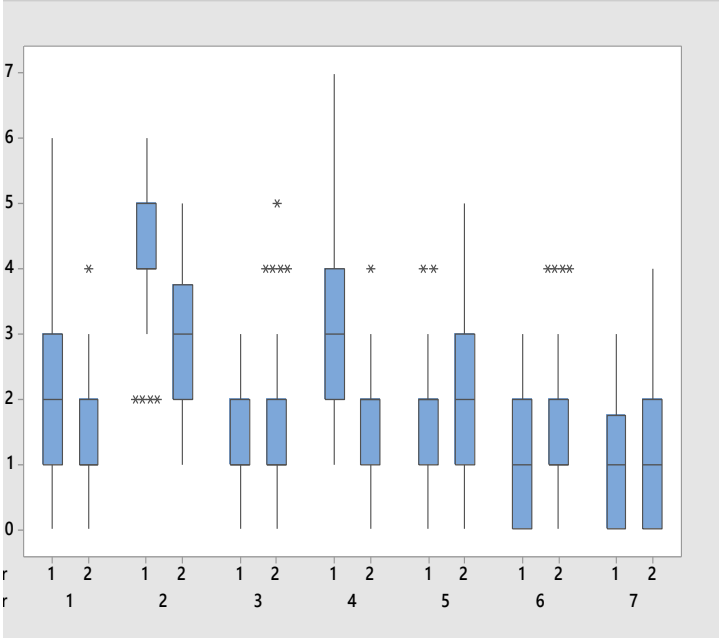

Table 2: Box table of sub-scores in 7 categories
Subgroups 1: Functional limitation, 2: Physical pain, 3: Psychological discomfort, 4: Physical disability, 5: Psychological disability, 6: Social disability, 7: Handicap

In terms of the duration of prosthesis use, the quality of life increased in the area of psychological discomfort and psychological insufficiency as the duration increased. Also as the duration increased, the overall satisfaction levels increased. The correlation between age and OHIP-14 total scores showed that the quality of life increased as the age increased. The correlation between age and VAS scale scores shows that as the age increases, the quality of life increases in the general satisfaction area (Table 4).

	Group 1 (n=60)	Group 2 (n=60)	Test Statics	p
General Satisfaction VAS*	7 (4 – 9)	8 (5 – 10)	U=1417,5	0,038
Retantion VAS*	4 (2 – 7)	7 (4 – 9)	U=359,5	<0,001

Table 3: VAS scores in the two treatment groups

Group 1: Conventional complete denture,

Group 2: Implant supported complete denture,

U:Mann Whitney U test *median (min-max)

	Age	Time of prosthesis usage
General Satisfaction VAS	r=0,275 : p=0,002	r=0,263: p=0,004
Retantion VAS	r=0,147 : p=0,110	r=0,219: p=0,016
OHIP-14 General Sum	r=-0,401 : p<0,001	r=-0,257: p=0,005
Functional limitation	r=-0,190: p=0,037	r=-0,133: p=0,149
Physical pain	r=-0,127: p=0,167	r=-0,112: p=0,222
Psychologicaldiscomfort	r=-0,281: p=0,002	r=-0,184: p=0,044
Physical disability	r=-0,149: p=0,104	r=-0,081: p=0,376
Psychological disability	r=-0,301: p=0,001	r=-0,303: p=0,001
Social disability	r=-0,315: p<0,001	r=-0,154: p=0,094
Handicap	r=-0,394: p<0,001	r=-0,134: p=0,144

r=Spearman correlation coefficien

Table 4: The correlation coefficient and significance levels between age and duration of prosthesis usage and VAS and OHIP subscale total scores

DISCUSSION

A large proportion of patients with totally edentulous use traditional full dentures that meet the basic requirements of the prosthesis, function, phonation and aesthetic requirements as far as possible (Marcus et al., 1996).

Silva et al (2009) reported that the traditional total prosthesis improves the quality of life and the effectiveness of chewing, but because of the disadvantages of pain, expectations, difficulty in using the prosthesis, some individuals can not use the prosthesis.

Especially in lower full dentures, problems such as insufficient stability, loss of support and retention are frequently seen in patients due to excessive bone resorption in advanced age. The main cause of these complaints is the movement of the lower full dentures by the tongue as well as the covering of less than half of the upper full dentures (Burns 2000). Implant supported complete denture is preferred due to the increase in retention and stability, the improvement in function and funding of the patient, prevention of residual cret loss, time-saving and economic advantage, and the improvement of the psychological and social condition of the patients is observed to affect the quality of life in a positive way (Raghoebar et al., 2014, Dudley 2015). However, the success rate of this alternative in 95% increases the use of it as a standard treatment today (Oetterli et al., 2001). In this study, we aimed to investigate the patients' satisfaction and quality of life with conventional complete denture and implant supported overdenture. The success (Mericske-Stern et al., 2000) of the two implant-supported mandibular overdentures and patient satisfaction (Mau et al., 2003) has been shown in studies.

In the 2009 York Joint View Declaration, McGilll's consensus is supported by the common opinion, using an implant supported removable prosthesis, according to conventional mandibular dentures, which increases the quality and satisfaction of patients has been reported (Thomason et al., 2009).

As reported in the McGill consensus report in 2002, it was concluded that the first choice in the standard treatment of patients with complete edentulous mandible is an lower complete denture supported by two implants (Feine et al. 2002; Thomason et al. ;2012).

One of the most important criteria for success in complete prostheses is patient responsibility. Measuring patient satisfaction is especially difficult in toothless patients (Wakabayashi et al., 1998). It is stated that patient satisfaction can vary, especially in total prostheses, depending on many different factors like anatomical, techniqual, esthetic, pysological and functional. None of these factors determines the satisfaction of the prosthesis alone, the harmonic effect of all of them in the front plane.

VAS forms have proven reliability in satisfaction measurement of prosthetic treatments (Lamb and Ellis, 1995). Quality of life measurement method accepted in dentistry is called OHIP. Because of the fact that the OHIP scale deals with the problems experienced by the patients, high values show that the quality of life is negative and low values are positive (Slade and Spencer, 1994). In our study, the OHIP-14 questionnaires and VAS scales were used to evaluate the quality of life and the dental health of the implant treatment in patients with complete dentition. With the VAS scale, general satisfaction and retantion were evaluated in two groups. In our study, VAS scale was calculated from 1 to 10 (1=I am not satisfied at all, 10= very pleased) using a 10-unit scale.

In the studies where complete dentures are compared with the implant retained overdentures in terms of chewing performance and patient satisfaction, there has been a significant increase in chewing performance and patient satisfaction in the implant retained overdentures (Watson et al.,1997; Morais et al., 2003; Naert, Alsaadi and Quirynen 2004; Fueki et al., 2007, Thomason et al., 2010).

In a comparative study of Rashid et al. (2011) patients

using complete dentures and implant supported overdentures reported that implant supported overdenture causes less bone resorption, provides more conservative and stability, and gives patients better chewing function. Karabuda et al. (2008).. reported that the use of implant-supported overdentures reduces the residual cret resorption rate in the mandible and the chewing activity increased by 20% compared to the complete dentures.

Kapur et al. (1997). reported that patient satisfaction was the most important factor in total edentulism and patient satisfaction could be increased within 2 months following the delivery of new prostheses. Thomason et al. (2003) found no significant difference in satisfaction levels between groups in implant supported overdentures and complete dentures based studies comparing patients' expectancies at 2 and 6 months after treatment.

Veyrune et al. (2005) reported that patients need at least 3 months to determine their standard of living due to increased quality of life after 3 months of prosthesis delivery.

We included the patient group who used removable prosthesis for at least 6 months while evaluating the quality of life of patients by referencing the studies performed. In our study, there was a statistically significant difference between the OHIP-14 total and sub-scales and the physical pain, the physical insufficiency, and the complete dentures and implant supported overdentures groups in total OHIP areas ($p<0,05$).

In our study, when OHIP-14 total and subscale values were examined, statistically significant difference was found between implant supported and conventional complete denture groups in physical pain, physical disability and total OHIP areas ($p <0,05$).

The quality of life of the implant supported overdenture group has given better results in these areas. There was no statistically significant difference in functional limitation scores, but the implant supported overdenture group gave better results. There was no statistically significant difference in psychological disability and handicop scores, and both groups yielded similar results, but the score range of the implant-supported overdenture group was found to be wider. The quality of life of the complete denture group was significantly better in psychological disability and social incompatibility scores.

In the study of Heydecke et al. (2004) examining the quality of life of patients using upper and lower complete dentures with OHIP 14 scale, it was found that the highest score was taken in the field of physical pain, the majority of the patients using upper and lower complete dentures had lower levels of life quality and 37% it is necessary.

In our study, there was a statistically significant difference between the implant-supported overdenture and conventional denture groups in general satisfaction and retension scores, which we examined using vas scale ($p<0.05$). When we examine the overall satisfaction scores, it was observed that implant supported complete denture group gave high results compared to the conventional complete denture groups ,but there is no statistically difference between them.

There was a significant correlation between prosthetic functions and patient expectations in different studies where full prosthesis satisfaction was evaluated (Magnusson, 1986; Kalk and Baat, 1990; Vervoorn et al., 1988)

According to our findings, we believe that the general prosthetic expectations of the patients in both groups were met with high satisfaction levels. In the study of the overall prosthesis satisfaction levels of Misch and Misch (1991), 79% of patients gave positive answers, but the treatment of chewing, speech, stabilization, comfort and aesthetics is more negative when a separate assessment results were obtained. This situation has been explained by researchers that patients respond more positively to common questions, but these patients may tend to respond negatively when asked more specific questions about prostheses (Awad and Feine, 1998).

According to the results of our study, retantion satisfaction levels have yielded a higher result in the implant supported overdenture group. The retention satisfaction scores of the conventional complete denture group were significantly lower. As a result of our findings, the overall satisfaction and retantion satisfaction levels in the implant supported overdenture group are high, explaining the idea that the implant application in the lower jaw improves the quality of the patient's prosthesis stabilization and life.

Assunçou et al. evaluated the effects of complete dentures and implant-supported overdentures treatment on patient satisfaction and quality of life with OHIP and VAS scales and concluded that the overall satisfaction, aesthetic, comfort, pain and chewing efficiency levels of patients were similar (Assunção et al., 2007). They said that the implant is better in terms of stability than conventional complete dentures. In a similar study conducted by Allen, McMillan and Walshaw (2001), the scores obtained from the measurements were similar after both treatments. In their study, it shows that implant-supported overdentures are not more effective than conventional dentures in improving the quality of health related life. While clinicians confirm that implant-supported overdentures usually give better results than conventional prostheses, there are also some patients who continue to have problems with implant-supported prostheses or who have less

problems with conventional prostheses.

Older patients are more difficult to adapt to prostheses than young patients, while Frank et al. (2000) have stated that patients under the age of 60 are less satisfied than older patients. Similar to Awad and Feine studies' (1998), patients are less satisfied with their prosthesis as they get older. This condition is associated with age, general health, previous experience of prosthetic use and the type of prosthetic in the opposing jaw.

In the present study, we found that age and quality of life were correlated with satisfaction ($p<0.05$). There was a statistically significant correlation between age and overall satisfaction scores of prosthetic, but there was no correlation between retention satisfaction and age.

There was a statistically significant correlation between the overall score of OHIP-14 and the mean age. As a result of the findings, it can be said that the patients have a positive effect on overall prosthesis satisfaction and quality of life as the age increases. We believe that this result was caused by the development of prosthetic adaptation in elderly patients due to the long-term use of prosthetic. Our results are paralel to Frank et al. (2000).

Celebic et al. (2003), observed that patients with more prosthesis experience were more satisfied with retention than patients who had less experience with chewing, speaking, aesthetics and general issues, and with less quality of life. In addition, the increase in chewing activity of the prosthesis results in the use of 3-9 months positively affected patient satisfaction.

In accordance with the findings obtained in our study, when examined with the VAS scale, there is a statistically positive-level relationship between the prosthesis usage period and the overall satisfaction retention scores ($p<0.05$). It was found that there was a weak level negative correlation between the duration of prosthesis use and the OHIP-14 overall total scores. According to our study, prosthetic experience has increased the satisfaction and quality of life of patients. It can be said that patients' use of their prosthesis for a long time makes it easier for them to get used to their prosthesis.

In our study, there was a statistically significant correlation between the psychological unrest and psychological inadequacy calculated by OHIP-14 method and the duration of the prosthesis used ($p<0.05$). As a result of the findings, the experience of the prosthesis can be said to have a positive effect on the quality of life in the field of psychological unrest and psychological disability. There was no significant relationship in other areas.

Among the conservative systems used in the lower complete dentures, it is stated in the literature that the ball attachments over two implants is the most reliable (Oetterli et al., 2001; Celebic et al., 2003; Heckman et al., 2001). In addition to this, Bilhan et al. (1998) reported that the type of attachment had no effect on patient satisfaction. Fueki et al. (2007) reported that the attachment type used in implant supported overdenture prostheses had no effect on chewing activity in the current studies.

In our study, the effects of two different prosthetic approaches on oral health and overall quality of life were compared and optimal treatment options were determined to meet the expectations of the patients. The hypothesis of our study was accepted in light of the data obtained. It is thought that the conventional complete denture and implant supported overdenture treatments performed in patients with complete dentition within the limits of the research affect the quality of life of the patients and that the implant supported dentures improve the quality of life related to oral health better than the conventional dentures. However, it should be noted that subjective values that individuals give to the questionnaires can change and the responses can be affected by the socio-cultural level. In order to improve the quality of life and to ensure successful treatment of prosthetic patients, it should be taken into account that quality of life studies should include the period from the beginning of the treatment process to the end of treatment and later. Although the findings can help determine the treatment approach, we think that implant supported prosthetic treatments should be carried out more research in terms of oral health, quality of life and patient satisfaction.

CONCLUSION

It has been shown that in edentulous patients implant supported complete dentures has a significant effect on quality of life and prosthesis retention. As stated in McGill and York Consensus, we believe that the option of prosthetic treatment in totally edentulous patients is the first to be recommended should be an implant supported complete dentures.

ACKNOWLEDGEMENTS

On behalf of all the contributors, I will act and guarantor and will correspond with the journal.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Allen PF, McMillan AS, Walshaw D. A patient based assessment of implant-stabilized and conventional complete dentures. J Prosthet Dent 2001;85(2):141-47.

2. Assunção WG, Zardo GG, Delben JA, Barão VA. Comparing the efficacy of mandibular implant-retained overdentures and conventional dentures among elderly edentulous patients: satisfaction and quality of life. Gerodontology 2007;24(4):235-38.

3. Awad MA, Feine JS. Measuring patient satisfaction with mandibular prostheses. Communit Dent Oral Epidemiol 1998;26(6):400-5.

4. Bilhan H, Erdogan O, Ergin S, Celik M, Ates G, Geckili O. Complication rates and patient satisfaction with removable dentures. The Journal of Advanced Prosthodont 2012;4(2):109-15.

5. Burns Dr. Mandibular implant overdenture treatment: consensus and controversy. J Prosthodont 2000;9(1):37-46.

6. Celebić A, Knezović-Zlatarić D, Papić M, Carek V, Baucić I, Stipetić J. Factors related to patient satisfaction with complete denture therapy. J Gerontol A Biol Sci Med Sci 2003;58(10):M948-53.

7. De Souza e Silva ME, de Magalhaes CS, e Ferreira EF. Complete removable prostheses: from expectation to (dis)satisfaction. Gerodontology 2009;26:143-49.

8. Dudley J. Implants for the ageing population. Aust Dent J 2015;60(1):28-43.

9. Engquist BO, Bergendal T, Kallus T, Linden U. A retrospective multicenter evaluation of osseointegrated implants supporting overdentures. Int J Oral Maxillofac Implants 1988;(3):129-34.

10. Feine JS, Maskawi K, De Grandmont P, Donohue WB, Tanguay R, Lund JP. Within-subject comparisons of implant -supported mandibular prostheses: evaluation of masticatory function. J Dent Res 1994;73(10):1646-56.

11. Feine JS, Carlsson GE, Awad MA, Chehade A, Duncan WJ, Gizani S et al. The McGill consensus statement on overdentures. Mandibular two-implant overdentures as first choice standard of care for edentulous patients. Int J Oral Maxillofac Implants 2002;17(4):601-2.

12. Frank RP, Milgrom P, Leroux BG, Hawkins NR. Relationship between the standards of removable partial denture construction, clinical acceptability, and patient satisfaction. J Prosthet Dent 2000;83:521-27.

13. Fueki K, Kimoto K, Ogawa T, Garrett NR. Effect of implant-supported or retained dentures on masticatory performance: a systematic review. J Prosthetic Dent 2007;98(6):470-77.

14. Geertman, ME, Slagter, AP, van't Hof MA, van Waas, MA, Kalk W. Masticatory performance and chewing experience with implant-retained mandibular overdentures. J Oral Rehabil 1999;26(1):7-13.

15. Heckmann SM, Winter W, Meyer M, Weber HP, Wichman G. Overdenture attachment selection and the loading of implant and denture-bearing area. Part 1. In vivo verification of stereolithographic model. Clin Oral Impl Res 2001;12(6):617-623.

16. Heydecke G, Tedesco LA, Kowalski C, Inglehart MR. Complete dentures and oral health-related quality of life-do coping styles matter? Community Dent Oral Epidemiol 2004;32(4):297-306.

17. Kapur KK, Garrett NR, Dent RJ, Hasse AL. A randomized clinical trial of two basic removable partial denture designs. Part II: Comparisons of masticatory scores. J Prosthet Dent 1997;78(1):15-21.

18. Karabuda C, Yaltırık M, Bayraktar M. A clinical comparison of prosthetic complications of implant-supported overdentures with different attachment systems. Implant Dent 2008;17(1):74-9.

19. Kalk W and de Baat C. Patients' complaints and satisfaction 5 years after complete denture treatment. Community Dent Oral Epidemiol 1990;18(1):27-31.

20. Lamb DJ, Ellis B. Patient-assessed security changes when replacing mandibular complete dentures. Int J Prosthodont 1995;8(2):135-42.

21. Marcus PA, Joshi A, Jones JA, Morgano SM. Complete Edentulism and Denture use for Elders in New England. J Prosthet Dent 1996;76(3):260-6.

22. Mau J, Behneke A, Behneke N, Fritzemeier CU, Gomez-Roman G, d'Hoedt B, Spiekermann H, Strunz V, Yong M. Randomized Multicenter Comparison of 2 IMZ and 4 TPS Screw Implants Supporting Bar-Retained Overdentures in 425 Edentulous Mandibles Int J Oral Maxıllofac Implant 2003;18(6):835-47.

23. Mumcu E, Geçkili O, Bilhan H. The evaluation of the effect of age, gender and experience of patient with dentures on life quality and patient satisfaction of edentulous patients. JIUFD 2011;45(2):57-63.

24. Magnusson T. Clinical judgment and patients' evaluation of complete dentures five years after treatment.A follow up study. Swed Dent J 1986;10:29-35.

25. Mericske-Stern R, Taylor TD, Belser U. Management of the edentulous patient. Clin Oral Implants Res 2000;11(1):108-125.

26. Misch LS, Misch CE. Denture satisfaction: a patient perspective. Int J Oral Implant 1991;7:43-48.

27. Morais JA, Heydecke G, Pawliuk J, Lund JP, Feine JS. The effects of mandibular two-implant overdentures on nutrition in elderly edentulous individuals. J Dental Res 2003;82(1):53-8.

28. Naert I, Alsaadi G, Quirynen M. Prosthetic aspects and patient satisfaction with two-implant-retained mandibular overdentures: a 10-year randomized clinical study. Int J Prosthodont 2004;17(4):401-10.

29. Oetterli M, Kiener P, Mericske-Stern R. A longitudinal study on mandibular implants supporting an overdenture: the influence of retention mechanism and anatomic-prosthetic variables on peri-implant parameters. Int J Prosthodont 2001;14(6):536-42.

30. Pera P, Bassi, F, Schierano G, Appendino P, Preti G. Implant anchored complete mandibular denture: evaluation of masticatory efficiency, oral function and degree of satisfaction. J Oral Rehabil 1998;25:462-67.

31. Raghoebar GM, Meijer HJ, Slot W, Slater JJ, Vissink A. A Systematic Review of ImplantSupported Overdentures in the Edentulous Maxilla, Compared To The Mandible: How Many Implants? Eur J Oral Implantol 2014;7(2):191-201.

32. Rashid F and Awad 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.

33. Shepherd MA, Nadanovsky P, Sheiham A. The prevalence and impact of dental pain in 8 year-old school children in Harrow, England. Br Dent J 1999;187(1):38-41.

34. Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. Community Dent Health 1994;11(1):3-11.

35. Slade GD. Derivation and validation of a shortform oral health impact profile. Community Dent Oral Epidemiol 1997;25(4):284-90.

36. Thomason JM, Lund, JP, Chehade A, Feine JS. Patient satisfaction with mandibular implant overdentures and conventional dentures 6 months after delivery. Int J Prosthodont 2003;16(5):467-73.

37. Thomason JM, Feine J, Exley C, Moynihan P, Müller F, Naert I, et al. Mandibular two implant-supported overdentures as the first choice standard of care for edentulous patients-the York Consensus Statement. Br Dent J 2009;207(4):185-86.

38. Thomason JM. The use of mandibular implant-retained overdentures improve patient satisfaction and quality of life. J Evidence Based Dental Practice 2010;10(1): 61-3.

39. Thomason JM, Kelly SA, Bendkowski A, Ellis JS. Two Implant Retained Overdentures--A Review of the Literature Supporting the Mcgill and York Consensus Statements. J Dent 2012;40(1):22-34.

40. Tokuhisa M, Matsushita Y, Koyano K. In vitro study of a mandibular implant overdenture retained with ball, magnet, or bar attachments: comparison of load transfer and denture stability. Int J Prosthodont 2003;16(2):128-34.

41. Vervoorn JM, Duninkerke ASH, Luteijn F, van de Poel ACM. Assessment of denture satisfaction. Community Dent Oral Epidemiol 1988;16(6):364-67.

42. Veyrune JL, Tubert-Jeannin S, Dutheil C, Riordan PJ. Impact of new prostheses on the oral health related quality of life of edentulous patients. Gerodontol 2005;22(1):3-9.

43. Wakabayashi N, Yatabe M, Ai M, Sato M, Nakamura K. The influence of some demographic and clinical variables on psychosomatic traits of patients requesting replacement removable partial dentures. J Oral Rehabil 1998;25(7):507-513.

44. Watson RM, Jemt T, Chai J, Harnett J, Heath MR, Hutton JE et al.. Prosthodontic treatment, patient response, and the need for maintenance of complete implant supported overdentures: an appraisal of 5 years of prospective study. Int J Prosthodont 1997;10(4):345-54.