

Patients' expectation of satisfaction of implant supported fixed bridge with different occlusal surface areas

Nadira A Hatim¹, Reem Hikmat Shaker Al-Bakri²

¹Professor, University of Mosul, College of Dentistry, Iraq

²Specialist, Prosthodontic, Al-Salam Hospital

Abstract

Background: Dental implants can offer the possibility of stabilizing oral prostheses, such as fixed bridges and overdentures and thus may overcome some of the functional limitations of conventional dentures.

Aim: To evaluate the satisfaction level and mastication capacity in relation to the occlusal condition following the treatment with osseointegrated implants supported fixed bridge and to compare the surface area of occlusal contact points between the satisfied and the unsatisfied patients.

Materials and Methods: Fifty patients were selected randomly according to acceptance of ethical committee, who had received fixed dental implant prostheses for >3months. For every patient Bausch metallic black/red articulating papers were used to record the surface area of the occlusal contacts in case of centric and eccentric positions and analyzed by using AutoCAD (2009). The satisfaction level of the dental implant prostheses was measured by statistical analysis for the answers of questionnaire.

Results: This study showed that the mean surface area of occlusal contact points in satisfied patients was significantly higher than unsatisfied in case of centric and eccentric occlusion at $P \leq 0.05$.

Conclusions: In comparison patient satisfaction with mean surface area of occlusal contacts, there was significant difference between satisfied and unsatisfied groups. Occlusion should be re-evaluated and adjusted periodically to prevent developing potential overloading clinical sequel.

Keys: Satisfaction, Implant, Occlusion, Surface area, Bausch metallic.

Introduction

Dental implants offer the possibility of stabilizing oral prostheses such as fixed bridges and overdentures and thus may overcome some of the functional limitations of conventional dentures⁽¹⁾. When assessing the outcomes of oral implant therapy, it is important to consider both the clinicians and the patients' appraisals. For the clinician, implant survival, prosthesis longevity, and the frequency of complications are the most significant parameters⁽²⁾. Occlusion can be critical for implant longevity because of the nature of the potential load created by tooth contacts and the impact on the attachment of the bone to the titanium implant. In the natural dentition, the periodontal ligament has the capacity to absorb stress or allow for tooth movement, but the bone-implant interface seemingly has no capacity to allow movement of the implant⁽³⁾.

From a biomechanical standpoint, several factors appear to be important in determining the success of implant placement as they relate to technique: stiffness of the tissue-implant interface, the quality of the supporting tissues, and implant diameter, particularly as it applies to short implants. Additionally, there is a tendency towards higher failure rates of machined (smooth) surface implants versus those with rough surfaces and in those placed where there was poor bone quality⁽⁴⁾. There is a general agreement that excessive stress to the bone-implant interface may result in implant overload and failure. Early failure of the implant due to excessive loading occurs shortly after uncovering the implant. Excess load on a final restoration after successful implant integration can result in physical failure of the implant structure⁽⁵⁾.

Some researchers have reported an ideal occlusion for implant prosthesis. They mentioned that the most significant factor affecting occlusal stability was occlusal loading. The key to control the loading was to achieve a sufficient

number of implants, occlusal guidance, which minimized any lateral forces on the implant prosthesis, suitable occlusal design, and passive fit of the framework^(6,7).

Materials and Methods

In University of Mosul, College of Dentistry, Postgraduate Clinic, Department of Prosthodontics, Al-Salam Hospital and Al- Jumhuri Hospital Department of Dental Implant : Seventy six patients were examined randomly and Fifty patients (28 female and 22 male) were selected according to special criteria to make a study on the effect of occlusal contacts and their relation to patient satisfaction with dental implant prostheses. The patient's medical and dental histories were evaluated with extra and intra oral examination. For every patient, two pieces of carefully cut Bausch Arti-Fol® metallic black/red articulating papers BK 28(Germany) were used to record the surface area of the occlusal contact points in case of centric occlusion, two pieces of the same articulating papers were used to record the surface area of the occlusal contact points in eccentric protrusion and lateral positions (Figure 1). The posterior end of the right dental arch of each patient was identified by making a small cut in the lateral posterior edge of each articulating paper piece; the same was done for the left side where the cut was in the lateral posterior edge of the articulating paper piece (Figure 2). photos of the three pairs of the articulating papers, pieces were taken by the use of digital camera, equal dimensions were ensured by using digital camera holder as a fixed point for all three positions, the distance between the digital camera and the articulating papers pieces was 6.5cm and at 90 degrees angle, then the photos were converted to gray images using computer program⁽⁸⁾. The surface area of the occlusal contact points was measured by the use of AutoCAD computer program (2009), which is a software application for computer-aided design (CAD).



Figure (1) Occlusal Contact in: Protrusive position (a), Centric position (b), and Lateral movement (c).



Figure (2) Articulating Papers Photos Showing Occlusal Contact Area and its Identification.

The patients were instructed to answer questionnaire taken from the Brazilian and South Korean models of patient satisfaction questionnaire with modifications done specially for this study, the questions about satisfaction level with the prostheses and about masticatory capacity were taken from the Brazilian model of patient satisfaction questionnaire. The questions about implants were taken from the South Korean model of patient satisfaction questionnaire filled by face to face interview with the patients^(2,9). The questionnaire started with socio-demographic questions about age, sex, residence, occupation, educational level and marital status.

The responses were scaled using 5.likert scale from totally disagree to totally agree giving a total range of 0-124 with scores above or equal to 60% considered as satisfied and below 60% as dissatisfied. Data were entered and analyzed using minitab (13.20) program descriptive statistics including percentage, mean and standard deviation were calculated for patient characteristics, independent t-test for two means was used for differences between satisfaction scores, p-value less than 0.05 was considered significant throughout the data analysis.

Results

The results of this study (Table 1) showed that the occlusal type for (48) of the participants (96%) was type one (Bilateral Balanced Occlusion), while only two of participants (4%) had type three (Group Function or Unilateral Balanced Occlusion).

Table 1: Types of natural occlusion

Type of Occlusion	No.	%
Type one (Bilateral Balanced Occlusion)	48	96%
Type three (Group Function or Unilateral Balanced Occlusion)	2	4%
Total	50	100%

Figure (3) demonstrates that in case of centric position, the mean surface area of occlusal contact points in satisfied patients was significantly higher than those of the unsatisfied (P value < 0.05), while in case of both protrusive and lateral movements the association was just significant with mean surface area of occlusal contact points of the satisfied patients higher than those of the unsatisfied (P value < 0.05).

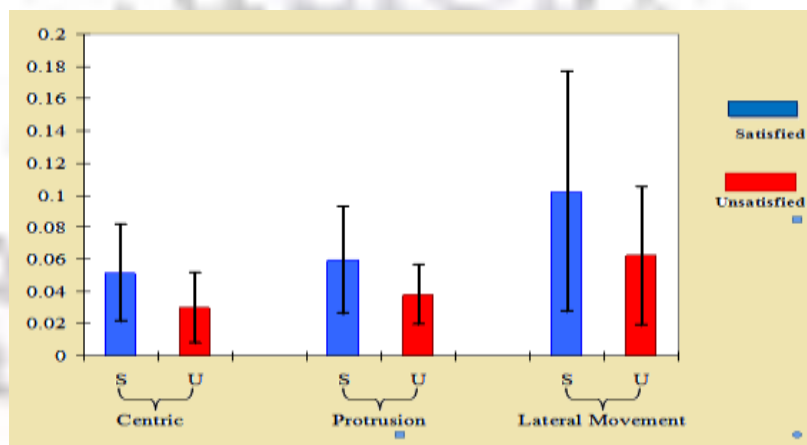


Figure (3) Surface Area of Occlusal Contact Points in Three Different Positions.

The results for Socio-demographic Characteristics of the Study Sample showed that the mean age of participants was 41.36±12.44 years with range of 20-70 years. The highest age group was being from 30-39 years (32%). The patients were 22 males (44%) and 28 females (56%) and only 4% living in rural areas. Almost 10% of respondents were from the first social class, 26% from the second and 58% belonged to the third social class. Sixteen percent of respondents had primary education, 54% had secondary education and 30% with high education. Majority of patients were married (82%). The results for dental characteristics of the study sample revealed that the majority of patients (86%) wore the dental implant prosthesis for ≥ 1 year.

The most common implant system for patients was Leader system (42%) followed by Dentium system (32%) then Easy system (20%) while only 6% of patients had Frialit system. Most of respondents (70%) had multiple implants; those implants were located posteriorly in 66% of patients, anteriorly in 20% of patients and antero-posteriorly in 14% of patients. More than half of patients (58%) received the implants at Al-Salaam Hospital, 38% of them at the Educational Hospital of College of Dentistry and only 4% at Al-Jumhori Hospital. Half of patients (50%) had their teeth extracted without replacement for less than 5 years and the rest for 5 years and more. Table (2) demonstrates patient satisfaction regarding the prosthesis. More than half of patients (54%) were satisfied with the pleasure of eating (Q1). With respect to chewing, patients were equally satisfied with their prosthesis in both right and left sides (38%) (Q2).

Regarding appearance, 72% of the study samples were satisfied or totally satisfied compared to 16% who were dissatisfied or totally dissatisfied (Q3). Half of patients (50%) were comfortable with their prosthesis (Q4). About 24% of participants were border line satisfied regarding social confidence (Q6) and the same percentage were border line satisfied with their professional performances (Q7). Patients were satisfied regarding eating (Q8) and esthetic (Q9) (54% and 58% respectively).

Table (2) Patient Satisfaction with the Prosthesis

Question no.	The scores									
	Totally (0)dissatisfied		Dissatisfied (1)		Borderline(2)		Satisfied(3)		Totally satisfied(4)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Q1	2	4%	6	12%	7	14%	27	54%	8	16%
Q2(R)	0	0%	4	8%	5	10%	19	38%	5	10%
Q2(L)	2	4%	3	6%	6	12%	19	38%	6	12%
Q3	2	4%	6	12%	6	12%	29	58%	7	14%
Q4	1	2%	6	12%	13	26%	25	50%	5	10%
Q5	2	4%	7	14%	5	10%	31	62%	5	10%
Q6	1	2%	5	10%	12	24%	29	58%	3	6%
Q7	1	2%	7	14%	12	24%	28	56%	2	4%
Q8	1	2%	7	14%	10	20%	27	54%	5	10%
Q9	2	4%	6	12%	6	12%	29	58%	7	14%

Masticatory capacity satisfaction is shown in Table (3); patients were mostly satisfied as the percentage of patients who were totally dissatisfied was zero compared with up to 8% totally satisfied patients. The highest percentage of satisfied patients was regarding food preparation before chewing (Q3), the need for forceful swallowing (Q5) and lack of proper fragmentation (Q6). The highest percentage of dissatisfied patients (18%) was regarding meals interruption (Q1), chewing difficulties (Q2) and comfortable chewing using prosthesis (Q7). Concerning stability of the prosthesis, 62% of the study samples were satisfied compared to 16% who were dissatisfied (Q4). When participants were having meals with other people, 64% were satisfied versus 4% who were not (Q10). More than half of patients (54%) were able to function well using their prosthesis (Q12).

Table (3) Patient Satisfaction with the Masticatory Capacity

Question no.	The scores									
	Totally (0)dissatisfied		Dissatisfied (1)		Border line(2)		Satisfied(3)		Totally satisfied(4)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Q1	0	0%	9	18%	12	24%	25	50%	4	8%
Q2	0	0%	9	18%	12	24%	26	52%	3	6%
Q3	0	0%	2	4%	9	18%	35	70%	4	8%
Q4	0	0%	8	16%	8	16%	31	62%	3	6%
Q5	0	0%	5	10%	8	16%	35	70%	3	6%
Q6	0	0%	5	10%	7	14%	35	70%	3	6%
Q7	0	0%	9	18%	11	22%	28	56%	2	4%
Q8	0	0%	6	12%	10	20%	31	62%	3	6%
Q9	0	0%	8	16%	6	12%	33	66%	3	6%
Q10	0	0%	2	4%	13	26%	32	64%	3	6%
Q11	0	0%	4	8%	13	26%	30	60%	3	6%
Q12	0	0%	8	16%	12	24%	27	54%	3	6%

Table (4) portrays patient satisfaction percentage regarding dental implants where 58% of the study samples were satisfied with the cost of the treatment (Q1) which is higher than the percentage of patient satisfied regarding comfortable chewing (54%) (Q2). Concerning esthetic results 4% of the study samples were totally dissatisfied compared to 8% who were totally satisfied (Q3). About 18% of respondents were dissatisfied with chewing experience on their crowns (Q4). The highest percentage of patients (26%) who were border line satisfied, was regarding tissue bleeding (Q5). Regarding food packing during chewing, 8% were totally satisfied (Q6). The highest percentage of satisfied patients (74%) was with speaking using the dental implant crown or bridge (Q7) while the highest percentage of totally satisfied patients (26%) was regarding the implant prosthesis (Q9).

Table (4) Patient Satisfaction with the Dental Implant

Question no.	The scores									
	Totally (0)dissatisfied		Dissatisfied (1)		Border line(2)		Satisfied(3)		Totally satisfied(4)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Q1	3	6%	8	16%	7	14%	29	58%	3	6%
Q2	0	0%	8	16%	12	24%	27	54%	3	6%
Q3	2	4%	5	10%	6	12%	33	66%	4	8%
Q4	0	0%	9	18%	11	22%	27	54%	3	6%
Q5	0	0%	8	16%	13	26%	27	54%	2	4%
Q6	0	0%	13	26%	7	14%	26	52%	4	8%
Q7	0	0%	2	4%	7	14%	37	74%	4	8%
Q8	0	0%	7	14%	6	12%	35	70%	2	4%
Q9	3	6%	4	8%	8	16%	22	44%	13	26%

Concerning patient satisfaction, Table (5) portrays that 36 participants (72%) were satisfied with their implant prosthesis. The level of satisfaction was nearly the same for all measures (prosthesis satisfaction and masticatory satisfaction 76% and implant satisfaction 78%).

Table (5) Distribution of the Study Sample According to their Satisfaction Levels for Satisfaction Measures (N=50)

Satisfaction measures	Unsatisfied		Satisfied	
	No.	(%)	No.	(%)
Prosthesis satisfaction	12	24%	38	76%
Masticatory capacity	12	24%	38	76%
Implants satisfaction	11	22%	39	78%
Overall satisfaction	14	28%	36	72%

N: Number of Study Sample.

Discussion

Relation between surface area of occlusal contact points and patient satisfaction with dental implants:

The results of this study illustrates that in case of centric position, the mean surface area of occlusal contact points in the satisfied patients with their dental implants was significantly higher than those of the unsatisfied ($p=0.008$) while in case of both protrusive and lateral movements the association was just significant with mean surface area of occlusal contact points of the satisfied patients higher than those of the unsatisfied ($p=0.012$, $p=0.037$ respectively). The results of this study are consistent with the finding that the stress forces to the prosthesis may be decreased by increasing the implant number, increasing the implant diameter, altering implant design to increase surface area, and splinting the implants together⁽¹⁰⁾. These results are in accordance with a study which described a harmonious occlusion in implant-supported restorations, it was concluded that the occlusal contacts must be analyzed carefully to achieve the proper contacts between different foundations, which resulted in restorations exhibiting esthetically pleasing, congruent occlusion in implant-supported restorations⁽¹¹⁾. In accordance with these results, the number and size of occlusal contacts are primary determinants of masticatory function and patient satisfaction because contacts between occluding teeth determine the area available for shearing and grinding food during each chewing cycle, larger occlusal contacts may be associated with fewer interferences that permitting a greater range of lateral excursion⁽¹²⁾.

In agreement with these results it was determined that the act of mastication is one of the most important physiological determinants governing food intake and patient satisfaction. The most important proposed variable influencing masticatory function is surface area. A larger occlusal area may increase the chance of improved comminution or grinding of food. The occlusal contact area is possible to be predictable of masticatory performance with relative certainty⁽¹³⁾. In accordance with these results a study which revealed that, given the importance of tooth contact during mastication, it is possible that a more lateral path of closure leads to more efficient chewing produced by increasing the time of gliding occlusal contacts⁽¹⁴⁾. In agreement with these results a significant correlation was found between

contacts on anterior teeth and patient assessment of chewing ability indicates that anterior occlusal contacts may be of importance for masticatory function⁽¹⁵⁾. In agreement with these results a study which showed that the more important factor controlling the masticatory performance of people proved to be the amount of occlusal contact area of molar and premolar teeth, which is on average one fifth of the total occlusal surface⁽¹⁶⁾.

Patient satisfaction with dental implants:

The results show that the mean age of participants was 41.36 ± 12.44 years with range of 20-70 years. The highest age group found from 30-39 years (32%). In agreement with these results, middle aged patients treated with implants have shown better satisfaction than patients with conventional dentures both in short- and long-term use⁽¹⁷⁾. The patients were 22 males (44%) and 28 females (56%), the sex distribution in the study sample was in association with a study to compare chewing cycle with masticatory performance in dental implant patients, the males and females did not differ significantly in terms of patient satisfaction⁽¹⁴⁾. Almost 10% of respondents were from the first social class, 26% from the second and 58% belonged to the third social class, these results are in association with a study on patient satisfaction following dental implant treatment in the edentulous atrophic maxilla, which demonstrated that patients with social disability showed the least satisfaction scores compared to the others during implant treatment⁽¹⁸⁾.

Dental characteristics of the study sample:

The results of this study reveal that the majority of patients (86%) wore the dental implant prosthesis for ≥ 1 year, in association with these results, in a study on patient satisfaction of dental implant treatment in Kerman by Hashemi⁽¹⁹⁾, a significant relation was found between time elapsed after implantation and patient satisfaction.

Most of respondents (70%) had multiple implants, those implants were located posteriorly in 66% of patients, anteriorly in 20% of patients and antero-posteriorly in 14% of patients, in a study about patients' expectations of and satisfaction with implant supported fixed partial dentures and single crowns, negative correlations were found between satisfaction and number of implants⁽²⁰⁾. Significant implant-related improvements in aesthetic and function were observed in patients with at least one implant in the front dental area⁽²¹⁾. The occlusal type for the majority of participant (96%) was type one (Bilateral Balanced Occlusion) while only (4%) of them had type three (Group Function or Unilateral Balanced Occlusion). In a study regarding strain of implants depending on occlusal types, the mean strain value for the working side of participants with unilaterally balanced (group function) occlusion was significantly larger than that of participants with bilaterally balanced occlusion⁽³⁾.

Satisfaction level with the prosthesis:

More than half of patients (54%) were satisfied with the pleasure of eating. With respect to chewing, patients were equally satisfied with their prosthesis in both right and left sides (38%). Regarding appearance, (72%) of the study sample were satisfied or totally satisfied compared to 16% who were dissatisfied or totally dissatisfied. Half of patients (50%) were comfortable with their prosthesis, in accordance with these results, patients were more satisfied with appearance, pain, oral comfort, general performance and eating after they received the implant-supported prostheses⁽²²⁾. About 24% of participants were border line satisfied regarding social confidence and the same percentage were border line satisfied with their professional performances, these results are in association with a study by Tomasi et al.⁽²³⁾, concerning patient satisfaction with implant stabilized full dentures, which concluded that placement of implants as retentive elements for dentures with poor stability has a marked impact on patient satisfaction and security in social life.

Masticatory capacity satisfaction:

The highest percentage of satisfied patients was regarding food preparation before chewing, the need for forceful swallowing and lack of proper fragmentation. The improved masticatory function following implant treatment resulted in food that was better-chewed when it was swallowed. Concerning stability of the prosthesis, 62% of the study samples were satisfied compared to 16% who were dissatisfied. The present study disagree with a study which concluded that maximum bite force and masticatory capacity are not associated with the satisfaction or quality of life of implant-supported mandibular overdenture wearers⁽²⁴⁾.

Implant satisfaction:

About 58% of the study samples were satisfied with the cost of the treatment. In agreement with this result, dental implants were generally either cost saving or cost-effective in comparison with tooth replacement using traditional fixed dental prostheses⁽²⁵⁾. The highest percentage of satisfied patients (74%) was with speaking using the dental implant crown or bridge while the highest percentage of totally satisfied patients (26%) was regarding the implant prosthesis. In agreement with these results, overall satisfaction, chewing and speaking comfort were all markedly improved after treatment with dental implants at the final examination⁽²³⁾.

Conclusions

The conclusion of this study showed a significant difference in comparing patient satisfaction with mean surface area of occlusal contacts between satisfied and unsatisfied groups. Most patients indicated that they were highly satisfied with the final results of the replacements for their natural teeth that were retained or supported by implants. For optimal implant occlusion, a follow up plan is mandatory.

Acknowledgement

A special word of thanks goes to all members of Ethical committee in the Nineveh/Iraq for their help and supporting this study.

References

- [1]. Allen PF, McMillan AS. A longitudinal study of quality of life outcomes in older adults requesting implant prostheses and complete J Dent Sci. 2003; 2(3) : 65 -74.
- [2]. Heo Y, Heo S, Chang M, Park J. The Patients' Satisfaction Following Implant Treatment. J Korean Acad Prosthodont.2008; 6(46):569-575
- [3]. Sohn B, Heo S, Koak J, Kim S, Lee S. Strain of implants depending on occlusion types in mandibular implant-supported fixed prostheses. J Adv Prosthodont.2011; 3(1): 1-9
- [4]. Meyer U, Joos U, Mythili J, Stamm T, Hohoff A. Ultra structural characterization of the implant/bone interface of immediately loaded dental implants. Biomaterials.2004;25:1959-67.
- [5]. Komiyama O, Lobbezoo F, Laat AD, Lida T, Kitagawa T, Murakami H, Kato T, Kawara M. Clinical Management of implant prosthesis in patients with bruxism. Int J Biomaterials.2012; ID 369063, 6 pages
- [6]. Morikawa O. Influence of Occlusal contact of implant on adjacent teeth and antagonists displacement. J Stomatol Soc.2003; 70: 224-233.
- [7]. Hoshino K, Miura H, Morikawa O, Kato H, Okada D, Shinki T. Influence of occlusal height for an implant prosthesis on the periodontal tissues of the antagonist. J Med Dent Sci.2004;51:187-196.
- [8]. Al Niaini A. The effect of laser welding on the tensile strength and radiographic analysis of co-cr repaired joints. M.sc, Thesis, 2008, University of mosul collage of dentistry.
- [9]. Pocztaruk RDL, Frasca LCDP, Rivaldo EG, Mattia PRC, et al. Satisfaction level and masticatory capacity in edentulous patients with conventional dentures and implant-retained overdentures. Braz J Oral Sci.2006; 19(5): 1232-1238
- [10]. Froum S. An alternative to conventional dental implants: short implants. RDH Mag.2012; 10(10): 70-73.
- [11]. Chaitanuvong C, Serichetaphongse P, Pimkhaokham A. The use of a custom anterior guide table for anterior guidance fabrication in single implant-supported anterior and tooth-supported restorations. CU Dent J.2012; 35: 259-272.
- [12]. English JD, Buschang PH, Throckmorton GS. Does Malocclusion Affect Masticatory Performance?. The Angle Orthodontist.2002; 1(72): 21-27.
- [13]. Mazurat NM, Mazurat RD. Communicating the Realities of Partial Denture Therapy. J Can Dent Assoc.2003; 69(2):90-94.
- [14]. Lepley C, Throckmorton G, Parker S, Buschang PH. Masticatory Performance and Chewing Cycle Kinematics—Are They Related. Angle Orthod.2010; 80(2):295-301.
- [15]. Wennerberg A, Carlsson GE, Jemt T. Influence of Occlusal Factors on Treatment Outcome. Int J Prosthodont.2001; 6(14): 550-555.
- [16]. Bilt AV. Human oral function. Braz J Oral Sci.2002; 1(1): 7-18.
- [17]. Rismanchian M, Bajoghli F, Mostajeran Z, Fazel A, Eshkevari P. Effect of Implants on Maximum Bite Force in Edentulous Patients. J Oral Implantology.2009; 4(35): 196-200.
- [18]. Erkapers M, Ekstrand K, Baer RA, Toljanic JA, Thor A. Patient satisfaction following dental implant treatment with immediate loading in the edentulous atrophic maxilla. Int J Oral Maxillofac Implants.2011; 26(2): 356-364.
- [19]. Hashemi Z. Patients' Satisfaction of Dental Implant Treatment in Kerman. Thesis,2007, MSc.
- [20]. de Lima EA, dos Santos MB, Marchini L. Patients' expectations of and satisfaction with implant-supported fixed partial dentures and single crowns. Int J Prosthodont. 2012; 25(5): 484-490.
- [21]. Kriz P, Seydlova M, Dostalova T, Valenta Z, Chleborad K, Zvarova J, Feberova J, Hippmann R. Oral health-related quality of life and dental implants — preliminary study. Cent Europ J Med.2012; 7(2): 209-215.
- [22]. Al-Omiri MK, Abu Hammad O, Lynch E, Lamey PJ, Clifford TJ. Impact of implant treatment on daily living. Int J Oral Maxillofac Implants.2011; 26:877-886.
- [23]. Tomasi C, Idmyr BO, Wennstrom JL. Patient satisfaction with mini implants stabilized full dentures. J Oral Rehabil. 2013;40(7):526-534.
- [24]. Geckili O, Bilhan H, Mumcu E, Tuncer N. The Influence of Maximum Bite Force on Patient Satisfaction and Quality of Life of Patients Wearing Mandibular Implant Overdentures. JOI.2012; 38(3): 271-277.
- [25]. Vogel R, Palmer JS, Valentine PW. Evaluating the Health Economic Implications and Cost-Effectiveness of Dental Implants. Int J Oral Maxillofac Implants.2013; 28(2):343-356.