

# Satisfaction of Patient with Stud, Bar and Magnet Attachment Systems for Mandibular Two-Implant Over Dentures

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## الخلاصة

**الأهداف:** تهدف الدراسة الى تقييم رضا المرضى الذين تم علاجهم بأطقم أسنان جديدة استخدم فيه رابط دقيق (ball-socket, bar with and without cantilever, and magnetic) بزرتان سنوية للفك السفلي وعلاقته بالطقم الاعتيادي ولمدة سنتين باستخدام استبيان (Al-Makki). **المواد وطرائق العمل:** اثنين وعشرين مريضاً أدرجتم اختيارهم لتقييم وظيفة الفم، شاركوا في هذه الدراسة لمدة عامين. استلم المرضى طقم جديد مع زروعات عدد (٢) و رابط دقيق (ball-socket, bar (Straight and curved) with or without cantilever, and magnetic types} تم تحديد رضی المريض باستخدام استبيان وتحليل النتائج باستخدام Non-parametric. **النتائج:** أظهرت النتائج تحسناً رضا المرضى بشكل ملحوظ بين خط الأساس وطقم جديد فوقي ذو رابط دقيق مع زرع عدد(٢) مع كل أنواع المرفقات للمجالات كافة من رضا ( $P \leq 0.05$ ). **الاستنتاجات:** تحسن عالي لرضا المريض بعد العلاج لطقم الفك السفلي. تحسناً رضا المريض مع استخدام الرابط الدقيق من الناحية الاجتماعية وشكل وحجم أسنان. ولا يوجد تأثير على رضا المرضى عن وظائف المضغ للطقم ذو الرابط الدقيق الشريطي.

## ABSTRACT

**Aims:** Evaluation patient satisfaction treated with new dentures using ball-socket, bar with and without cantilever, and magnetic attachments within two implant-supported mandibular overdentures (IS-MOD) in relation to conventional denture (baseline) for 2-years by using questionnaire Al-Makki. **Materials and methods:** Twenty two edentulous patients were scheduled for evaluation of their oral function, two years they participated in this study. They received two mandibular implants and a new denture with different attachments {ball-socket, bar (Straight and curved) with or without cantilever, and magnetic types}. After 2 years of delivery of the overdentures, the oral situation was evaluated by using questionnaire. Non-parametric two-related sample analysis tests were used. **Results:** Patient satisfaction improved significantly between baseline and the new prosthesis with each attachment types for all domains of satisfaction ( $p \leq 0.05$ ) for usual wearing of prosthesis. **Conclusions:** Patients satisfaction highly improved after implant retained denture treatment for the lower jaw. The type of attachment systems highly effect patients satisfaction about wearing of denture for social occasions and shape and size of the denture. But attachment type had no effect on patients satisfaction for masticatory functions. **Key words:** Bar Attachment, Implant Over Dentures

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## INTRODUCTION

Implant over dentures provide simple, predictable, and cost-effective treatment to edentulous patients. Additionally, they provide the benefits of esthetics, phonetics, bone preservation, increased comfort, better psychosocial state, and enhanced nutrition, all resulting in an improved quality of life. No large differences in maximum bite

force and muscle activity were found among the bar, stud, and magnetic attachment types.<sup>(1,2)</sup> The most common position is situated around canines as a high bone volume is associated to a sufficient lingual prosthetic one in this area. However, when this choice is not possible, an incisor or a premolar position is adopted.<sup>(3)</sup>

When evaluated in terms of subjects, satisfaction implant-retained over dentures supported by direct ERA attachments were similar to those supported by a Hader bar<sup>(4)</sup>. Retentive properties depend on types of attachment and dislodgment. Stud attachments provide stronger retentive and stabilizing forces than magnetic attachments.<sup>(5)</sup>

An overdenture on 2 implants interconnected by a single bar might be the first treatment of choice, with high cost-effectiveness and efficacy and proven stability for a long-term period.<sup>(6)</sup> Mandibular implant-supported overdenture treatment reduced various denture complaints. Patients strongly preferred bar-clip and ball-socket attachments over magnet attachments. Patients' preferences could not be predicted on the basis of baseline observations. Although mandibular implant-retained overdentures may be more satisfying for edentulous patients than new conventional dentures, the magnitude of the effect is still uncertain.<sup>(7,8)</sup> Routine maintenance of stud attachment is required to ensure successful long-term outcomes.<sup>(9)</sup>

Open-field aluminum-nickel-cobalt magnets have been used in prosthodontics for many years, but success has been limited, because these magnets are susceptible to corrosion by the saliva and because their retentive force is weak relative to the initial retention offered by mechanical attachments. More recently, magnets have been made from alloys of the rare earth elements samarium and neodymium, which provide stronger magnetic force per unit size. In addition, a new generation of laser-welded containers has improved protection from salivary corrosion. Patient satisfaction over the first year is excellent, especially for patients who had been less than satisfied with mechanical attachments. This new generation of magnetic attachment can be applied in a straightforward manner and offers the potential for long-term durability.<sup>(10)</sup>

The electromyography (EMG) values of the masseter muscle significantly increased when an implant attachments was used in the overdenture.<sup>(11)</sup>

The purpose of study was to evaluate patient satisfaction with problems of their previous dentures using ball-socket, bar

(Straight and Curved) with and without cantilever, and magnetic attachments with- in implant-supported mandibular overdentures (ISMOD) in clinic for 2 years in relation to conventional denture (baseline).

#### MATERIALS AND METHODS

Twenty two completely edentulous maxillary and mandibular ridges for 2-5 years were selected without mucosal lesions and abused tissues from University of Mousl-College of Dentistry, and Private clinic. Age range between 45-74 years. All patients wearing maxillary and mandibular conventional denture for (1 to 2 years). Most of the patients had difficulties with eating and uncomfortable prosthesis. No systemic disease contraindication to implant surgery<sup>(12,13)</sup>, and ability to fill out questionnaires and comply with follow-up visits.<sup>(14)</sup>

For each patient, two implants at the anterior canine region were done with successful Osseo-integration examination of each patient, panoramic radiographs were taken to establish eligibility for the clinical intervention, in addition to diagnostic casts. Implant cylindrical with diameter ranging (3.3 mm - 3.75 mm) and length range (10 mm-13 mm) for LEADER system, and 3.6-4.0mm in diameter and 10-12mm range of length of Dentium system, and with support used in this study according to treatment were listed as follows:

1. Twenty four implants (OVD- LEADER ITALY) of two stages surgery and Hadar plastic bar (Preci-Horix Bar) and metal housing with plastic grips (Preci-Horix Housing) system were used with yellow grip. Four bar designs were selected: curved with cantilever, curved without cantilever straight with cantilever and straight without cantilever. Length of the bar between 18 and 23 mm<sup>(15)</sup>, and the length of cantilever extension (7mm).<sup>(16)</sup>
2. Ten of one stage surgery implant with stud attachment made of titanium (OVD- LEADER ITALY).
3. Ten implants of (Dentium system) with flat magnetic attachment (Retentive force 400g, MGT 4530L, D:4.5, and L:3.0mm).

Following implant placement, and cementation of bar framework intra-orally, construction of complete maxillary and

mandibular overdenture were done in the conventional method. Each patient was instructed not to wear his previous mandibular dentures for two weeks, after which the lower dentures were relieved. Loading forces are minimized by requesting that patient eat only soft meals for the first 6 weeks.<sup>(17)</sup>

The patients were asked to give their perception to evaluate satisfaction regarding function and aesthetics with previous conventional dentures before implant therapy and after 2 years of insertion of implant retained denture and patients allude to aspects of satisfaction using a questionnaire. To standardize the treatment of all patients, instructions were given for all

after full adjustment of complete overdenture with implant.

Descriptive statistics, Kruskal Wallis, Mann-Whitney Test and Wilcoxon test were used to compare between different groups. The statistical results were considered significant at  $p \leq 0.05$ .

### RESULTS

In this study, all patients were instructed not to wear the denture at night; for that reason, there was no difference between different attachment systems and no difference between conventional denture and implant retained overdenture concerning the wearing of the denture at night (Table 1).

Table (1): Frequency distribution, Kruskal-Wallis and Wilcoxon Signed Ranks Test for all overdenture with Stud, Bar, and Magnet attachment in relation to conventional denture.

Before (Conventional denture)								After (Overdenture)							
Design	Fr. 1	Fr. 2	Fr. 3	Fr. 4	Fr. 5	Fr. 6	Fr. 7	Design	Fr. 1	Fr. 2	Fr. 3	Fr. 4	Fr. 5	Fr. 6	Fr. 7
<b>BCC</b> No	2	1	3				2	<b>CC</b> No	3		3	3	2	3	3
<b>Yes</b>	1	2		3	3	3	1	<b>Yes</b>		3			1		
<b>Total</b>	3	3					3	<b>Total</b>					3		
<b>BS</b> No	2	1	1	1		1	2	<b>S</b> No	2	2	3	2		1	
<b>Yes</b>	1	2	2	2	3	2	1	<b>Yes</b>	1	1		1	3	2	3
<b>Total</b>	3	3	3	3	3	3	3	<b>Total</b>	3	3		3	3	3	3
<b>BSC</b> No	2	3	3	3	1	3		<b>SC</b> No	2		2	2	2	3	3
<b>Yes</b>	1				2		3	<b>Yes</b>	1	3	1	1	1		
<b>Total</b>	3				3			<b>Total</b>	3	3	3	3	3		
<b>BC</b> No	3		3					<b>C</b> No	3		3	3	3	3	
<b>Yes</b>		3		3	3	3	3	<b>Yes</b>		3					3
<b>Total</b>								<b>Total</b>							
<b>B Stud</b> No	2	1	4	4	1	1		<b>Stud</b> No	1	3	1	4	4	5	4
<b>Yes</b>	3	4	1	1	4	4	5	<b>Yes</b>	4	2	4	1	1		1
<b>Total</b>	5	5	5	5	5	5	5	<b>Total</b>	5	5	5	5	5		5
<b>Mag.</b> No	5	5						<b>Mag.</b> No	5		5	4	4	5	5
<b>Yes</b>			5	5	5	5	5	<b>Yes</b>		5		1	1		
<b>Total</b>								<b>Total</b>				5	5		

Fr. : Frequency, Fr1: wearing of denture at night. Fr2: wearing the denture at social occasion.. Fr3: wearing the denture during eating, Fr4: using of denture adhesive. Fr5: feeling of Mild discomfort Fr6: Feeling sever discomfort, Fr7: complaining of difficulty during activity. CC: curved with cantilever, S: straight, SC: straight with cantilever, C:curved, B:before implant treatment

Concerning patient comfort there is a significant difference between conventional and implant retained dentures. No significant difference between different attachment systems that disagree with Naert *et al*<sup>(20)</sup> who concluded that Magnets offered patients the least comfort. For shape and size of the denture, significant difference between conventional and implant retained dentures, significant difference

between different attachment systems, and the group of patient with curved bar with cantilever were less satisfied than other groups. The color of the teeth had no effect on patient satisfaction in regard to attachment type due to the fact that teeth color were choose according to agreement between dentist and patients opinion (Table 2).

Table (2): Frequency distribution, Kruskal-Wallis and Wilcoxon Signed Ranks Test for all overdenture with Stud, Bar, and Magnet attachment in relation to conventional denture (Comfort, Shape of denture, and color).

Before (Conventional denture)				After (Overdenture)			
Design	Comf.	Shape	color	Design	Comf.	Shape	color
<b>CC satisfied</b>			3	<b>CC satisfied</b>		1	1
<b>Unsatisfied</b>	2			<b>very satisfied</b>	2		2
<b>Very satisfied</b>	1	3		<b>Very Unsatisfied</b>	1	2	
<b>Total</b>	3			<b>Total</b>	3	3	3
<b>S Satisfied</b>	3	3		<b>S very satisfied</b>	2	1	2
<b>Very satisfied</b>			3	<b>Satisfied</b>	1	2	1
				<b>Total</b>	3	3	3
<b>SC Satisfied</b>	3	1		<b>SC very satisfied</b>	3	3	3
<b>Very satisfied</b>		1	2				
<b>Unsatisfied</b>		1	1				
<b>Total</b>		3	3				
<b>C Very satisfied</b>	3			<b>C very satisfied</b>	3	3	3
<b>Unsatisfied</b>		3	3				
<b>Stud can't say</b>	1	1		<b>Stud very satisfied</b>	3	5	4
<b>Very satisfied</b>	2	2	1	<b>Satisfied</b>	2		1
<b>Satisfied</b>	1		2	<b>Total</b>	5		5
<b>Unsatisfied</b>	1	2	2				
<b>Total</b>	5	5	5				
<b>Magnet Very satisfied</b>	5	5	5	<b>Magnet very satisfied</b>	2	3	2
				<b>Satisfied</b>	1	2	3
				<b>Total</b>	3	5	5

CC: curved with cantilever; S: straight, SC: straight with cantilever; C:curved; B:before implant treatment.

The results (Tables 2, and 3) showed that there was no difference between different attachment systems concerning the usual wearing of the denture. All types of attachments improve retention and stability comparing with conventional denture for that there is a significant difference between conventional and implant retained dentures but no significant difference between different attachment systems. This agrees with Klemetti<sup>(19)</sup> who referred that in the mandibular implant retained treatment, patient satisfaction or function of the prosthesis do not seem to be dependent on type of attachment.

For wearing the denture at social occasion (Table 4) no significant difference between conventional and implant retained dentures. Level of education and patient psychological factors have important role in motivating some patient to wear their denture in spite of poor stability to withstand some social situations. For implant retained dentures, the groups of stud attachments and straight bar were less satisfied than other groups. There was no difference for wearing the denture during eating among different attachment systems (Table 4).

Table (3): Frequency distribution, Kruskal-Wallis and Wilcoxon Signed Ranks Test for all overdenture with Stud, Bar, and Magnet attachment in relation to conventional denture (Wearing denture, Bite, Chew, Swallow, and Difficulty daily life)

Usual wearing of the denture		Before (Conventional denture)					After (Overdenture)								
		Bite	Chew	Swallow	Effect of difficulty in daily life	Usual wearing of the denture	Bite	Chew	Swallow	Effect of difficulty in daily life					
CC part of time	3	CC little difficulty Very Difficult Total	2 1 3	2 1 3	2 1 3	CC All Time	3	2 1 3	2 1 3	CC No difficulty Little difficulty Total	2 1 3	2 1 3	2 1 3	CC No Effect	3
S All time Part of time Total	2 1 3	S Little difficulty	3 2 3	3 2 3	S Can't Say Very Effect Total	S All time Part of time Total	2 1 3	2 1 3	2 1 3	S No difficulty Little difficulty Total	1 2 3	2 1 3	2 1 3	S Effect Very Effect Total	1 2 3
SC All time Part of time Total	1 2 3	SC No Difficulty Little Difficulty Very Difficult Total	1 1 3	1 2 3	SC Effect Very Effect Total	SC All Time	3	2 1 3	2 1 3	SC No difficulty Little difficulty Total	1 2 3	1 2 3	1 2 3	Sc No Effect	3
C part of Time	3	C Little Difficulty	3	3	C Little Effect	C All time	3	3	3	C No Difficulty	3	3	3	C Little Effect	3
Stud All time Part of time Total	2 3 5	Stud no difficulty Little Difficulty Very Difficult Total	1 2 5	2 3 5	Stud Little effect Effect Very Effect Total	Stud all time Part of Time Total	4 1 5	1 1 3	1 1 3	Stud No Difficulty Little Difficulty Total	4 1 5	4 1 5	4 1 5	Stud no effect Effect Little effect Total	3 1 1 5
Magnet part of time	5	Magnet Very Difficult	5	5	Magnet Effect	Magnet all time	5	5	5	Magnet no difficulty Little Difficulty total	4 5	5	5	Magnet no effect Little effect Total	2 3 5

CC: curved with cantilever; S: straight, SC: straight with cantilever; C:curved; B:before implant treatment

Table (4): Significances of Kruskal-Wallis and Wilcoxon Signed Ranks Test for all overdenture with Stud, Bar, and Magnet attachment in relation to conventional denture

Before (Conventional denture)	After (Overdenture)	Wilcoxon Signed Ranks Test	Before (Conventional denture)	After (Overdenture)	Wilcoxon Signed Ranks Test
<b>wearing of denture at night</b>			<b>Usual wearing of the denture (Lower Jaw)</b>		
Kruskal-Wallis Test X <sup>2</sup> =6.920, df=5, P =.227	Kruskal-Wallis Test X <sup>2</sup> =10.733, df=5, P=.057	Z=-.577, P =.564	Kruskal-Wallis Test X <sup>2</sup> =6.231, df=5, P=.240	Kruskal-Wallis Test X <sup>2</sup> =4.060, df=5, P=.541	Z=-3.873, P=.000
<b>wearing the denture during eating (Lower Jaw)</b>			<b>Patient comfort.</b>		
Kruskal-Wallis Test X <sup>2</sup> =9.112, df=5, P=.105	Kruskal-Wallis Test X <sup>2</sup> =9.112, df=5, P=.105	Z=-4.000, P=.000	Kruskal-Wallis Test X <sup>2</sup> =10.450, df=5, P=.015	Kruskal-Wallis Test X <sup>2</sup> =2.212, df=5, P=.530	Z=-3.507, P =.000
<b>wearing the denture at social occasion (Lower Jaw)</b>			<b>Color of Teeth</b>		
Kruskal-Wallis Test X <sup>2</sup> =10.997, df=5, P=.051	Kruskal-Wallis Test X <sup>2</sup> =13.924, df=5, P=.016	Z=1.000, P=.317	Kruskal-Wallis Test X <sup>2</sup> =10.629, df=5, P =.059	Kruskal-Wallis Test X <sup>2</sup> =7.300, df=5, P=.199	Z=-1.813, P=.070
<b>Shape and size of the denture.</b>			<b>Feeling of Discomfort (Mild Discomfort)</b>		
Kruskal-Wallis Test X <sup>2</sup> =9.195, df=5, P =.027	Kruskal-Wallis Test X <sup>2</sup> =8.963, df=5, P=.030	Z=-3.600, P =.000	Kruskal-Wallis Test X <sup>2</sup> =4.060, df=5, P =.541	Kruskal-Wallis Test X <sup>2</sup> =8.093, df=5, P =.151	Z=-3.357, P =.001
<b>Using of Denture Adhesive</b>			<b>Feeling of Discomfort (Sever Discomfort)</b>		
Kruskal-Wallis Test X <sup>2</sup> =14.950, df=5, P =.011	Kruskal-Wallis Test X <sup>2</sup> =2.178, df=5, P =.824	Z=-2.673, P =.008	Kruskal-Wallis Test X <sup>2</sup> =13.28, df=5, P =.0023	Kruskal-Wallis Test X <sup>2</sup> =13.300, df=5, P =.021	Z=-3.873, P =.000
<b>Complaining of difficulty during activity</b>			<b>Effect of difficulty in daily life</b>		
Kruskal-Wallis Test X <sup>2</sup> =121.444, df=5, P =.029	Kruskal-Wallis Test X <sup>2</sup> =17.480, df=5, P=.004	Z=-2.840, P=.005	Kruskal-Wallis Test X <sup>2</sup> =7.066, df=5, P =.216	Kruskal-Wallis Test X <sup>2</sup> =13.633, df=5, P =.018	Z=-2.318, P =.020
<b>Ability of the patients to bite daily food</b>			<b>Ability of the patients to chew the daily food</b>		
Kruskal-Wallis Test X <sup>2</sup> =8.939, df=5, P=.112	Kruskal-Wallis Test X <sup>2</sup> =7.140, df=5, P=.210	Z=-3.945, P=.000	Kruskal-Wallis Test X <sup>2</sup> =13.863, df=5, P=.017	Kruskal-Wallis Test X <sup>2</sup> =8.093, df=3, P =.151	Z=-4.119, P =.000
<b>Ability of the patients to swallow the daily food</b>					
Kruskal-Wallis Test X <sup>2</sup> =13.521, df=5, P=.012	Kruskal-Wallis Test X <sup>2</sup> =14.547, df=5, P=.392	Z=-3.398, P=.001			

CC: curved with cantilever, S: straight, SC: straight with cantilever, C:curved, B:before implant treatment

For wearing the denture at social occasion (Table 4) no significant difference between conventional and implant retained

dentures. Level of education and patient psychological factors have important role in motivating some patient to wear their

denture in spite of poor stability to withstand some social situations. For implant retained dentures, the groups of stud attachments and straight bar were less satisfied than other groups.

There was no difference for wearing the denture during eating among different attachment systems (Table 4). Improvement in denture stability and retention encourages the patient to wear the denture during eating in contrast to conventional denture where loose denture make the patient to remove his set of teeth during eating. Significant difference between conventional and implant retained dentures. The stability and retention of an implant retained prosthesis is greatly improved over conventional dentures<sup>(21,22)</sup>. so there is a significant difference between conventional and implant retained dentures for using of denture adhesive. No significant difference between different attachment systems.

The other questions concerning the feeling of the discomfort and complaining of difficulty during activity significant difference between conventional and implant retained dentures. No significant difference between different attachment systems for mild discomfort but there is a significant difference for sever discomfort the group of straight bar were less satisfied. Significant difference for difficulty during activity the groups of curved and straight bar were less satisfied. Significant difference for effect of difficulty in daily life the groups of curved with cantilever and straight with cantilever were highly satisfied. Many factors may modify or effect the patients adaptation and withstanding the above feelings and its effects during activity some of this factors are the gender, social status and psychology. Level of education, self-perception of affective and economic status, and quality of life are all related to patient satisfaction<sup>(23,24,25,26)</sup>.

In agreement with Van Der Bilt *et al*<sup>(27)</sup>, our study demonstrated that all patients were satisfied with the ability to bite chew and swallowing the daily food in comparison with conventional denture. No significant difference between different attachment systems.

## CONCLUSION

Patients satisfaction highly improved after implant retained denture treatment for the lower jaw. The type of attachment systems highly effect patients satisfaction about wearing of denture for social occasions, complaining of difficulty during activity, denture adhesive, bite, chew, swallow daily food, and shape and size of the denture. But straight bar and stud attachments type showed less patients satisfaction in-relation to the other types of attachments. Patients satisfaction highly improved after implant retained denture treatment for the lower jaw. The groups of straight bar and stud shows less satisfaction in relation to wearing of denture at social occasion, and the groups of curved and straight bar with cantilever were highly satisfied for effect of difficulty in daily life.

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