Evaluation the Retention and Boneless For Three Types Super striation (Magntic,Bell, Bar) of the Lower Overdentures.

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Abstract: The purpose of this study is to evaluate the effect of three types super striation (Magntic, Bell, Bar) of The Lower overdentures on the Retention And Boneless. Thirty patients were classified into three groups. Each patient was evaluated the retention and bone loss at6 months, 1 year, 18 month, and 2 years. From the result.1-There was a statistically significant difference in retention between the three groups. Third group bar attachment showed the highest mean value. This was followed by second group ball attachment. followed by first group, showed the lowest mean value.2- The boneless in group 1(magnetic attachment) lowest significant different than the two groups while In group 3(bar attachment) significant different there was highest by times than the two groups.

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Key wards: overdenturs, retention, bone loss.

1. Introduction

When a patient is missing all of the teeth on the jaw (fully edentulous) or some of the teeth (partially edentulous) traditionally these patients have had to use dentures either full or partial. With regards the patient who is totally edentulous on an arch stability and retention of the denture may hamper the patient from enjoying eating, speaking and are divided into two categories; free-standing overdentures and bar-overdentures. Create fear when socializing that the denture may slip and cause embarrassment.(1)

Dental implants may be placed to aid in retaining the denture and provide a more stable base allowing the patient to eat, speak and socialize as if they had all of their own teeth. Additionally, those patients who would need to wear a partial denture to replace a few missing teeth may have retention issues due to the placement of the remaining natural teeth or their shape can benefit from implant retained overdentures. Implant overdentures are divided into two categories; free-standing overdentures and bar-overdentures. Free-standing overdentures refer to an overdenture that is retained by individual implants. These implants are not connected together (splinted) and they act by retaining the denture (preventing it from lifting off the gum tissue) and the gum tissue and ridge supports the denture. On each implant, an attachment is placed which engages the other half of the attachment which is embedded into the denture. When the two halves of the attachment are snapped together the denture is held securely in place.(2,3,4) An implant-supported denture is used when a person doesn't have any teeth in the jawbut has enough bone in the jaw to support implants. An implant-supported denture has special attachments that snap onto attachments on the implants.(5)

Implant-supported dentures usually are made for the lower jaw because regular dentures tend to be less stable there. Usually, a regular denture made to fit an upper jaw is quite stable on its own and doesn't need the extra support offered by implants. However, you can receive an implant-supported denture in either the upper or lower jaw. You should remove an implant-supported denture daily to clean the denture and gum area. Just as with regular dentures, you should not sleep with the implant-supported dentures at night. Some people prefer to have fixed (permanent) crown and bridgework in their mouths that can't be removed. Your dentist will consider your particular needs and preferences when suggesting fixed or removable options.(6)Magnets made from aluminum–nickle–cobalt alloys have been used in dentistry for many years. Initially, the repellent force of like magnetic poles was harnessed from open-field from aluminum–nickle–cobalt alloys embedded in the base of upper and lower dentures, so that the repellent forces would keep dentures on the residual ridges. However, this approach achieved little popularity because the force was weak, and the direction of the force was just as likely to repel the dentures out of the mouth. A more popular method was to attach a ferromagnetic metal keeper (generally made of stainless steel) to the tooth or implant for attraction by a magnet embedded in the nearby denture base; this arrangement is known as a magnet–keeper unit. Others used surgery to place a magnetic implant within the jaw, which would then attract the magnet in the denture base.[2] However, these clinical approaches

lost popularity, particularly when clinicians discovered that alloysfrom aluminum–nickle–cobalt corrode rapidly in saliva. In summary, these older open-field magnet systems corroded easily and their attractive force was weaker than that of mechanical attachments used to retain dentures, such as ball or bar attachments.[7]Magnetic attachments used to retain dentures are typically shorter than mechanical attachments, which is particularly useful for patients with restricted interocclusal space and challenging esthetic demands. Magnetic attachments can also accommodate a moderate divergence of alignment between 2 or more abutments, since they do not depend on a particular path of insertion; in this respect, magnetic attachments are unlike most mechanical attachments, which generally require minimal divergence for best function. Furthermore, patients with physical disabilities such as those experienced by frail older adults, have reported that magnet-retained dentures are relatively easy to place and remove.[8]

Edentulous is a common clinical oral, although the prevalence of edentulous overall downward trend, but the prevalence of patients at home and abroad edentulous rate remained at 8% to 33%. Edentulous for quality of life (physical health and function, socioeconomic status, life satisfaction, self-esteem) will have serious implications for clinical practice often see patients complain of traditional overdenture retention is poor, inefficient chewing. In recent years, implant in the edentulous restoration achieve satisfactory results. Edentulous implants can be divided into fixed prosthesis and removable repair, repair of the removable, implant dentures are connected with a ball attachment, bar card, magnetic attachments, telescopic and so on. because of the clinical operation is simple, relatively low cost, convenience and other reasons in patients with self-care, dental magnetic attachment gradually being welcomed by clinicians and patients.[9] The overdentures used with magnetic attachments for implant denture edentulous patients or Bar Retained Over Denture.[10]This implant treatment involves placement of 2-4 implants and the attachment of a customised bar. This bar provides rigid support through and series of clips to the denture that fits over the top of the bar. The bar retained overdenture treatment can be used in both the upper and lower jaws. It still allow for the denture to be removed from the mouth for cleaning. Patients also have to brush the bar which remains attached to the implants in the mouth.[11]

Bone tissue alterations that occurred around implant at which the marginal level of bone support at fixture installation was different at buccal and lingual surfaces. was to analyze bone tissue alterations that occur during function of implants at which the marginal level of bone support at fixture installation was different at buccal and lingual surfaces.implant installation in the socket. The marginal gap that was present between theimplant and the walls of the socket at implantation disappeared as a result of bonefill and resorption of the bone crest. The modeling in the marginal defect region wasaccompanied by marked attenuation of the dimensions of both the delicate buccal hard tissue alterations occurred during healing following. [12,13] Bone resorption around the implant neck is frequently observed after loading and appears to depend on both biological and mechanical factors, such as biological width, bacterial microleakage, location of the inflammatory conjunctival tissue area, cervical area stress concentration, location of the implant/abutment joint, and micromovement. Some clinical, histological, and retrospective studies have shown that crestal bone loss around dental implants can be prevented by applying platform switching. In a standard protocol, implants are rehabilitated with abutments of the same diameter. The platform switching technique uses prosthetic components that are undersized relative to the diameter of the implant platform. Mechanical and biological principles of platform switching have been theorized for how bone loss can be minimized. First, with the increased surface area created by the exposed implant seating surface, the amount of crestal bone resorption necessary to expose a minimum amount of implant surface to which the soft tissue can attach is reduced. Second, and perhaps more important, by repositioning the implant-abutment junction inward and away from the outer edge of the implant and adjacent bone, the overall effect of the abutment inflammatory cell infiltrate on surrounding tissue may be reduced, thus decreasing the resorptive effect of the abutment inflammatory cell infiltrate on crestal bone. As a consequence, the reduced exposure and confinement of the platform-switched abutment may result in a reduced inflammatory effect within surrounding soft tissue and crestal bone.[14,15]

2.Materials and Methods

Thirty patients with complete implant-supported overdentures in the mandible who were attending a dental clinic. Thepatients were selected according to the following citeria: 1) the age range from 45 to 60 years. 2) The patients were selected free from any systemic diseases.3) All The patients were selected All had been edentulous for many years. 4) The patients that can be motivated for good oral hygiene and 5) The patients havingangles class1ridge relationship with sufficient inter ridge space to receive or constriction the over denture. Thirty patients were classified into three groups.for the all patients were

taken Preliminary Impressions Utilizing a stock tray, take a preliminary impression, This impression should be made at the implant level, as it will be used to fabricate an implant verification and a custom tray for an open-tray impression technique. Take an impression of the opposing dentition as well as the denture to be replaced. Send in the impressions with your lab. If abutments are going to be utilized due to the implant angle or thickness of the soft tissue, an abutment level impression should be taken, a diagnostic set-up may be required. Jaw Relation Records and Shade Selection. To ensure a passive fit of your custom-milled for the all cases it is vital to obtain an accurate final impression. You will receive a bite block. Jaw Relation Records Remove the healing abutments. Seat the bite block on the implants and tighten With the patient sitting up, use conventional denture technique to achieve accurate jaw relation records. Determine centric relation and vertical dimension of occlusion (record passively) (VDO). Note: The patient's existing denture should be evaluated and can be utilized as a benchmark in determining the new VDO. Please see wax rim checklist enclosed with case. Place a dot with an indelible marker on the tip of the patient's nose and chin. Have the patient lick their lips, swallow, then relax their jaw. Measure the distance between the two dots. Repeat this procedure 3-4 times until you obtain a consistent vertical dimension of rest measurement (VDR). Have the patient bite together gently. The measurement should be approximately 3 mm less than the vertical measurement at rest. Adjust the rims, if necessary so they meet evenly. There should be a 2-4 mm speaking space between the rims when the patient pronounces "s" sounds (e.g., Mississippi, sixty, sixty-one, etc.). The incisal edges of the maxillary central incisors should lightly touch the lower lip during "f" sounds (e.g., forty, forty-one, etc.) Once the vertical dimensional and a verifiable, repeatable centric relation are established, inject bite registration material onto the top of the wax rim and into the notches on the bite block. Use an excess amount on the anterior labial area. Have the patient bite together gently, but completely. A) First groupreceive or constriction the over dentureEach patient included in the study had 2 separate magnetic attachments associated with 2 implants serving to retain a mandibular complete denture. Magnet keepers were screwed into place on the implants and were tightened to about 30 N/cm. The height of the keepers was selected to remain above the mucosa. The opposing surfaces of the keeper component and the magnetic capsule are domed to allow them to rotate and pivot on one another as the denture moves on the mucosa of the residual ridge. The magnetic capsules were placed on the keepers and attached to the denture base intraoral with auto polymerizingmethylmethacrylate (Orthodontic Resin, Dentsply Caulk, Milford, DE). Each patient was asked to rate overall using a standardized visual analogue scale (VAS) at baselinewith level of satisfaction being indicated as a crossed mark on a scale from 1 mm (very unsatisfied) to 100 mm (very satisfied). Each patients were evaluated the retention and bone loss at6 months, 1 year, 18month, and 2year. B) secondgroupreceive or constriction the over denture Each patient included in the study had 2 separatemechanical ballattachments associated with 2 implants serving to retain a mandibular complete denture. Ball keepersby Nobel Biocare (Nobel Biocare Canada Inc., Richmond Hill, ON) were screwed into place on the implants and were tightened to about 30 N/cm. The height of the keepers was selected to remain above the mucosa. The opposing surfaces of the keeper component and the socket to allow them to rotate and pivot on one another as the denture moves on the mucosa of the residual ridge. The socket were placed on the grove and attached to the denture base intraoral with auto polymerizing methylmethacrylate (Orthodontic Resin, Dentsply Caulk, Milford, DE).. Each patient was asked to rate overall using a standardized visual analogue scale (VAS) at baselinewith level of satisfaction being indicated as a crossed mark on a scale from 1 mm (very unsatisfied) to 100 mm (very satisfied).Each patients were evaluated the retention and bone loss at6 months, 1 year, 18 month, and 2year. C) third groupreceive or constriction the over denture Each patient included in the study had abarby Nobel Biocare (Nobel Biocare Canada Inc., Richmond Hill, ON) attachments associated with 2 implants serving to retain a mandibular complete denture. Steps to contraction milled bar on the model with a trial denture incorporating Locator® caps. Remove the healing abutments.Seat and evaluate the fit of bar.a. Tighten one screw and verify a passive fit on all implants (no lifting of the bar).Repeat this procedure for each implant. Once a passive fit is verified, tighten the remainder of the screws.Seat the trial denture onto the bar.Evaluate VDO, CR, occlusion, esthetics/shade, tooth arrangement, phonetics and midline.Remove the trial denture and bar. Replace the healing abutments. Return the case including the model with the bar and trial denture to the lab for processing. Delivery of Final Prosthesis You will receive an overdenture with Locator processing caps and a milled titanium bar with Locator abutments on the master model. Remove healing abutments. Seat the bar on the implants (or abutments).Hand-tighten the prosthetic screws, alternating from one side to the other. Tighten the screws to the appropriate torque. Clips to the denture that fits over the top of the bar.Each patients were

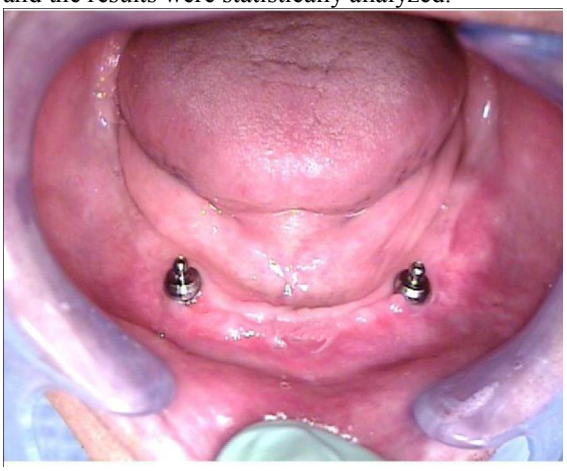
evaluated the retention and bone loss at6 months, 1 year,18 months,and2years.

Measuring the retention of the lower overdenture in three groups.

Force gauge was used to record the retention of the lower overdenture in three groups it has range about 5000gm.The device was prepared first units of measure were chosen to be grams. The desired adapter tension hook was attached to sensing head but it was painted first by pressure indicating paste for every measurement. These using head with adaptor were placed in line with the denture being measured. Rotation of the sensing head was avoided the patient was sitting in an upright position with the occlusal plane parallel to the floor and the overdenture in three groups were inserted and allowed to remain for a settling time of 3minutes before the hook of the overdenture in three groups were engaged. Three readings were recorded and the average was calculated. the collected data was tabulated and statistically analyzed force meter held in the palm of the hand. Readings were recorded and the collected data was tabulated and statistically analyzed.

Bone height evaluation

By preiapicalradiograph was taking to evaluated the bone loss the mesial and distal marginal bone height around the implant. Two points were marked one at the apex of the implant and the other at the highest tip of the implant. A line (a) was drawn connecting the two points and was considered the reference landmark for standardization of further measurements. The tangent (b) to the highest tip of the implant was drawn on each radiograph perpendicular to line (a).Marginal bone height was measured from the mesial and distal alveolar crest to line(b). Finally, measurements on serial radiographs were compared and the results were statistically analyzed.



Fig(1) Ball keepers by Nobel Biocare (Nobel Biocare Canada Inc., Richmond Hill, ON) were screwed into place on the implants.

Fig(2) The opposing surfaces of the keeper component and the socket to allow them to rotate and pivot on one another as the denture.

Fig(3) magnetic attachment. The magnet capsules are positioned on the keepers.

Fig(4) magnets are attached to the denture base

Fig(5) customised bar is fabricated and screw retained to the lower implants.

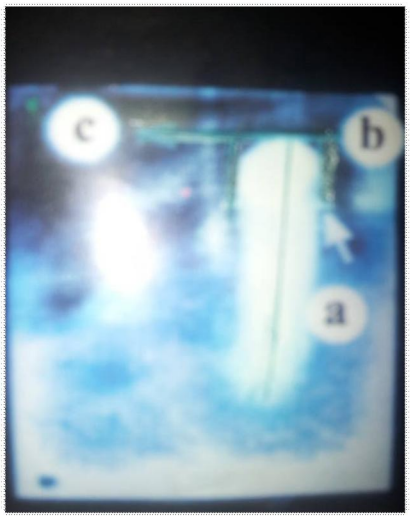
Fig(6) the fitting surface of the lower denture contain clips which clip onto the bar in the mouth.

3. Results

1-Retention

The results of this study are shown to compare the retention of the lower overdenture in three groups (magnetic, ball, and bar attachment). The results showed that there was statistically significant difference in retention between the in three groups. In tables I, and figure 9. Data was presented as means and standard deviation (SD) values. The significance level was set at $P \leq 0.05$. Statistical analysis was performed with SPSS 15.0® (Statistical Package for Scientific Studies) for Windows The mean force required to dislodge the lower over dentures in three groups was shown in table I from this table it was obvious that the mean force required to dislodge the lower over dentures was 2020 g for First group receive or constriction the over denture Each patient included in the study had 2 separate magnetic attachments associated with 2 implants serving to retain a mandibular complete denture and 2300g for second group receive or constriction the over denture Each patient included in the study had 2 separatemechanical ballattachments associated with 2 implants serving to retain a mandibular complete denture and 2500g forthird groupreceive or constriction the over denture Each patient included in the study had a barby Nobel Biocare (Nobel Biocare Canada Inc., Richmond Hill, ON) attachments associated with 2 implants serving to retain a mandibular complete denture. There was a statistically significant difference in retention between the three groups. Third group bar attachment showed the highest mean value. This was followed by second group ball attachment. followed by first group, showed the lowest mean value. However, on clinical evaluation the retention received by the lower overdentures were acceptable.

Fig (7) Force gauge was used to record the retention.



Fig(8) Digital radiograph measuring themesial and distal bone height.

Table (I) The means (gm), standard deviation values and results for the comparison between the lower overdenture in three groups (magntic,ball, and bar attachment).

First group (magnetic attachment)		Secand) group(ball attachment		Third group(bar attachment)		*P*_VALUE
MEAN	±S.D	MEAN	±S.D	MEAN	±S.D	
2020	1150	2300	1220	2500	1400	**<0.001***

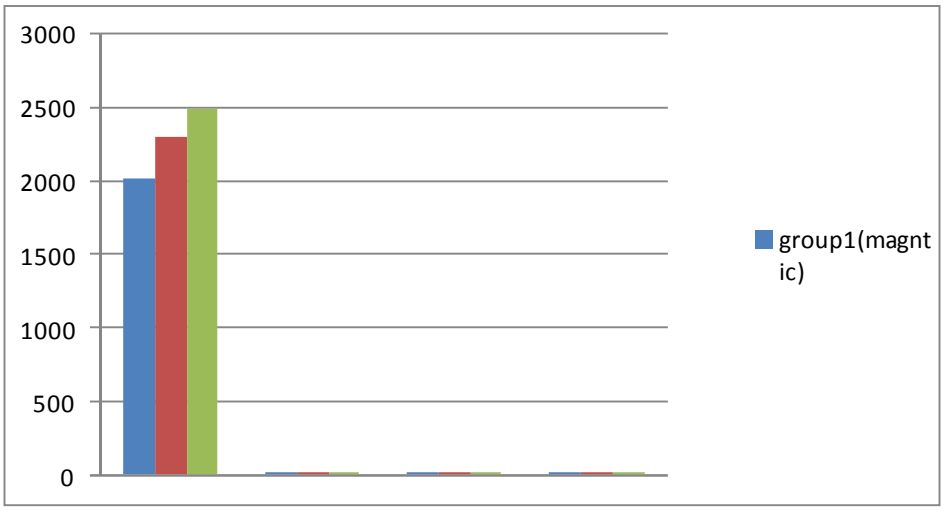


Fig (9) The means (gm), values for the comparison retention between the three groups(magnetic, ball, bar) attachment. *: Significant at $P \leq 0.05$

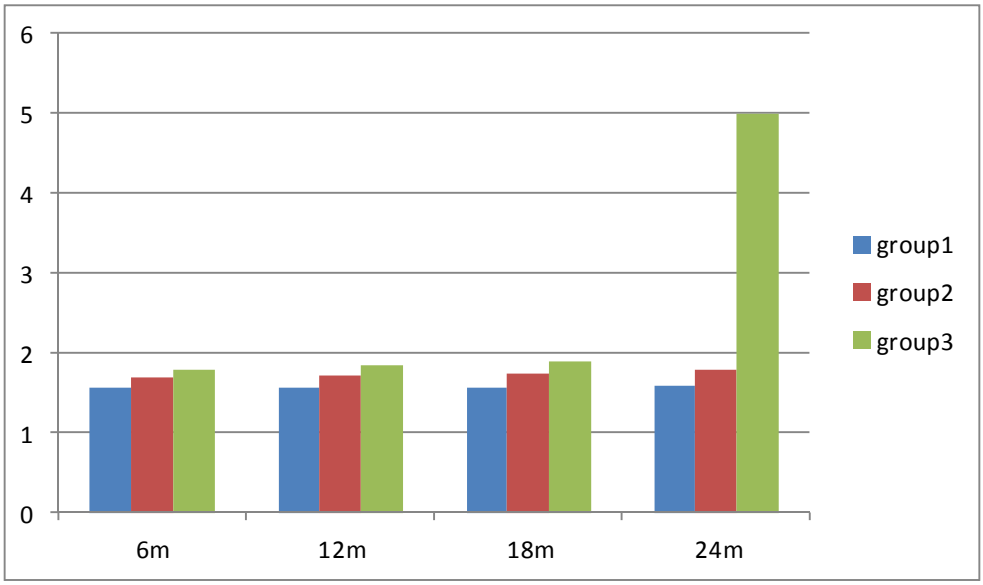
2-Bone height evaluation.

From the above table (2), fig (10) no significant different in group 1 (magnetic attachment) in 6m, 12m, and 18m but lowest significant different at 24m. In group 2 (ball attachment) significant different was increased by the time after 6m,12m, 18m, and 24m. In group 3 (barattachment) significant different there was highest by times 6m, 12m, 18m, and 24m than the two groups. significant different.

Table (2) clinical evaluation of the bone level for the three groups of the supers traction of the overdenture (magnetic, ball, bar) at the different times.

Bone height	Group1(magnetic attachment)								*p*-value
	6M Mean ±SD		12M Mean ±SD		18M Mean ±SD		24M Mean ±SD		0.01
	1.57	0.40	1.57	0.40	1.57	0.40	1.59	0.41	
	Group2(ball attachment)								
	6M Mean ±SD		12M Mean ±SD		18M Mean ±SD		24M Mean ±SD		0.03
	1.70	0.50	1.72	0.51	1.75	0.53	1.79	o.55	
	Group3(bar attachment)								
	6M Mean ±SD		12M Mean ±SD		18M Mean ±SD		24M Mean ±SD		0.05
	1.80	0.60	1.85	0.64	1.90	0.68	1.97	o.72	

High significantly different at p<o.o1



Fig(10) The mean of theclinical evaluation of the bone level for the three groups of the supers traction of the overdenture(magnetic, ball, bar) at the different times.

4. Discussion

Hiroshi I. evaluated the magnetic attachment overdenture restoration of edentulous clinical effects. Methods 15 patients with edentulous patients with magnetic attachment overdenture restoration, using a total of 39 implants, the line after 3 to 4 months magnetic attachment overdenture restoration, return visit every six months to observe the use of dentures, the use of clinical examination with assessment of effects of X-ray examination. Results 39 implants did not occur during and after surgery complications such as infection and nerve injury, before restoration reached the bone; 1 case Replace implant overdenture wear off after 1.5 years, the rest of bone in stable condition; denture retention and good effect on the appearance and function to patients requirements; base stations around the denture cleanliness and good results were satisfactory. Conclusion The magnetic attachment overdenture restoration of edentulous can effectively restore chewing function and improve patient appearance, clinical results and reliable, making simple, easy to keep clean, is a worthy non-dental restorative. From this small clinical study, we can infer that the patients were very satisfied in the short-term with use of a magnet system to retain complete dentures on implants in the mandible. Notably, most of the patients had experienced mechanical attachments for several years before placement of the magnet system and had been relatively satisfied with the result.[5] Cune *et al.,* tested implant-supported dentures (68 out of 100), was lower than the mean satisfaction scores after 3 years in a recent comparison of different mechanical attachments (ball or bar designs) for mandibular implant-supported overdentures.[22] In that study, mean satisfaction scores exceeded 90 out of 100, despite a relatively high incidence of abrasion or breakage of the mechanical components in the group with ball attachments. Rare-earth alloys provide considerably more magnetic force per unit size than their predecessors, and new laser-welding techniques contribute to the construction of strong and durable containers for protecting the magnets from salivary corrosion. However, no clinical data are yet available for this newer magnet system, other than what the manufacturer has provided. Because the durability of magnetic attachments remains unknown beyond 1 year, we will continue to monitor these patients and others for several years. These 1-year results show excellent patient satisfaction with magnet-retained mandibular overdentures – certainly no less than the satisfaction of the same patients with mechanical attachments over several years (as indicated by baseline VAS scores). Furthermore, there were no unusual technical difficulties in rendering the treatment or maintaining the implants. As in our previous study with mechanical attachments, there was one patient in whom the magnet separated from the denture base during the first year, for which reattachment using autopolymerizing methylmethacrylate was required. By the end of the first year, no corrosion of magnets was observed

clinically. Also, no patients required repair or relining of their implant dentures during the year, and all reported ease in maintaining their mouth and denture hygiene..[8]

Eduardo *et al.,* Used that The platform switching technique is a simple and viable technique that does not increase implant treatment costs. This technique is an effective way to control circumferential bone loss around dental implants, although it has been tested by few biomechanical studies. The present study verified the favorable biomechanical behavior of the platform switching implants with respect to the magnitude of stress. [16].

Szmukler *et al.,* examined whether this no-load healing period is validated by the experimental literature. *In vivo* histological data was scrutinized to identify the effect of early loading protocols on the bone-implant interface. Several loading modes were identified. They were categorized into groups according to implant design and the type of prosthetic reconstruction, and by their ability to introduce a distinct magnitude of motion at the interface. Specific histologic responses of early loaded implants (i.e., fibrous repair or osseointegration) were suggested to be directly related to the specific combinations of the above parameters. Early loading per se was not found to be detrimental to osseointegration. Specifically, only excessive micromotion was directly implicated in the formation of fibrous encapsulation. The literature suggests that there is a critical threshold of micromotion above which fibrous encapsulation prevails over osseointegration. This critical level, however, was not zero micromotion as generally interpreted. Instead, the tolerated micromotion threshold was found to lie somewhere between 50 and 150 μm. Suggestions are made for the earliest loading time that achieves osseointegration. [17]

Sergio etal studied that Finite element analysis (FEA) has been proven to be a precise and applicable method for evaluating dental implant systems. By means of FEA, a parasaggital model was digitized from a computed tomography (CT)-generated patient data set, and various single-tooth, osseointegrated, two-dimensional dental implant models were simulated. The specific aims of the study were to: (1) examine the effect of implant diameter variation (3.8 mm–6.5 mm) of both a press-fit, stepped cylindrical implant type and a press-fit, straight cylindrical implant type as osseointegrated in the posterior mandible; (2) compare the stress-dissipating characteristics of the stepped implant versus the straight implant design; and (3) analyze the significance of bite force direction (vertical, horizontal, and oblique 45°) on both implant types. The results of the FEA suggested that (1) using the widest diameter implant is not necessarily the best choice when considering stress distribution to surrounding bone, but within certain morphological limits, for both implant types, an optimum dental implant exists for decreasing the stress magnitudes at the bone-implant interface; (2) stress is more evenly dissipated throughout the stepped cylindrical implant when compared to the straight implant type; and (3) it is important in FEA of dental implants to consider not only axial forces (vertical loading) and horizontal forces (moment-causing loads), but also to consider a combined load (oblique bite force), since these are more realistic bite directions and for a given force will cause the highest localized stress in cortical bone. The theoretical analysis performed implies that clinically, whenever possible, an optimum, not necessarily larger, dental implant should be used based on the specific morphological limitations of the mandible and that a stepped cylindrical design for press-fit situations is most desirable from the standpoint of stress distribution to surrounding bone.[18]

Conclusion

1-Overdenture was supported by implant better than the conventional denture in retention and comfortable by patient.

2-Magnetic attachments can be used to retain mandibular implant overdentures. In a small case series, patient satisfaction over the first year was 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.

3-The boneless in group 1(magnetic attachment) lowest significant different than the two groups (ball and bar attachment)

4-The retention in third group bar attachment showed the highest mean value. This was followed by second group ball attachment, followed by first group.

References:

1. Riley MA, Walmsley AD, Harris IR. Magnets in prosthetic dentistry. *J Prosthet Dent.* 2001;86(2):137-42.
2. Riley MA, Williams AJ, Speight JD, Walmsley AD, Harris IR. Investigations into the failure of dental magnets. *Int J Prosthodont.* 1999;12(3):249-54.
3. Akaltan F, Can G. Retentive characteristics of different dental magnetic systems. *J Prosthet Dent.* 1995;74(4):422-7.
4. 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.
5. Hiroshi I. Clinical analysis on the reliability of the magnetic attachment over an 8 year period. In: Ai M, Shiau YY, editors. *New magnetic applications in clinical dentistry*. Tokyo: Quintessence International; 2004. p. 93-6.
6. Honkura Y. The new generation of dental magnetic attachment. In: Ai M, Shiau YY, editors. *New magnetic applications in clinical dentistry*. Tokyo: Quintessence International; 2004. p. 51-56.
7. 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.
8. Cune M, van Kampen F, van der Bilt A, Bosman F. Patient satisfaction and preference with magnet, bar-clip, and ball-socket retained mandibular implant overdentures: a cross-over clinical trial. *Int J Prosthodont.* 2005;18(2):99-105.
9. Naert I, Alsaadi G, van Steenberghe D, Quirynen M. A 10-year randomized clinical trial on the influence of splinted and unsplinted oral implants retaining mandibular overdentures: peri-implant outcome. *Int J Oral Maxillofac Implants.* 2004;19(5):695-702.
10. Assad AS, Abd El-Dayem MA, Badawy MM. Comparison between mainly mucosa-supported and combined mucosa-implant supported mandibular overdentures. *Implant Dent.* 2004;13(4):386-94.
11. Allen PF, Ulhuq A, Kearney J. Strategic use of a new dental magnet system to retain partial and complete overdentures. *Eur J Prosthodont Restor Dent.* 2005;13(2).
12. MacEntee MI, Walton JN, Glick N. A clinical trial of patient satisfaction and prosthodontic needs with ball and bar attachments for implant-supported complete overdentures: three-year results. *J Prosthet Dent.* 2005;93(1):28-37.
13. von Arx T, Buser D. Horizontal ridge augmentation using autogenous block grafts and the guided bone regeneration technique with collagen membranes: a clinical study with 42 patients. Clin Oral Implants Res. 2006;17(4):359-366.
14. Elian N, Cho SC, Froum S, et al. A simplified socket classification and repair technique. Pract Proced Aesthet Dent. 2007;19(2):99-106.
15. Schwartz-Arad D, Laviv A, Levin L. Survival of immediately provisionalized dental implants placed immediately into fresh extraction sockets. J Periodontol. 2007;78(2):219-223.
16. Eduardo Piza Pellizzer, Rosse Mary Falcón-Antenucci, Paulo Sérgio Perri de Carvalho, Joel Ferreira Santiago Jr, Sandra Lúcia Dantas de Moraes, and Bruno Machado de Carvalho (2010) Photoelastic Analysis of the Influence of Platform Switching on Stress Distribution in Implants. Journal of Oral Implantology: December 2010, Vol. 36, No. 6, pp. 419-424.
17. Szmukler S, Moncler, H. Salama, and Reingewirtz Y. Reingewirtz4 Timing of loading and effect of micromotion on bone–dental implant interface: Review of experimental literature J Biomed Mater Res (Appl Biomater) 43: 192–203, 1998
18. Sergio Olate, Henrique Duque de Miranda Chaves Netto, Leandro Eduardo Klüppel, Renato Mazzonetto and Jose Ricardo de Albergaria-Barbosa. (2011) Mineralized Tissue Formation Associated With 2 Different Dental Implant Designs: Histomorphometric Analyses Performed in Dogs. Journal of Oral Implantology 37:3, 319-324 Online publication date: 1-Jun-2011.

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