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Comparison of magnetic attachment and ball-cap attachment for retained mandibular over-denture[★]

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Abstract

BACKGROUND: Precision attachment has been widely used in complete denture because of its strong retention, good appearance, comfort and durability. Among them, magnetic attachment and ball-cap attachment are commonly applied for mandibular complete denture.

OBJECTIVE: To compare the clinical effects of magnetic attachment, ball-cap attachment and traditional clasp retainer used in the mandibular removable partial denture.

METHODS: A total of 45 patients with dentition defects were included in this study, they were treated with magnetic attachment, ball-cap attachment and traditional clasp retention of mandibular removable partial denture. Fifteen patients received one means. The satisfaction of patients and the periodontal health of abutments were observed after 3 years.

RESULTS AND CONCLUSION: Comparison of the patient satisfaction showed that, the aesthetics, retention conditions, masticatory function and comfort in magnetic attachment group were significantly better than traditional clasp retention group ($P < 0.05$). The aesthetics and comfort in ball-cap attachment group were also better than traditional clasp retention group ($P < 0.05$). There were significant differences on the retention conditions and comfort between magnetic attachment group and ball-cap attachment group ($P < 0.05$). Gingival index was the highest in magnetic attachment group, then in ball-cap attachment group, and the lowest in traditional clasp retention group ($P < 0.05$). The abutment tooth mobility degree was the lowest in magnetic attachment group, then in ball-cap attachment group, and the highest in traditional clasp retention group ($P < 0.05$). The periodontal pocket depth in magnetic attachment group and ball-cap attachment group was lower than that in traditional clasp retention group ($P < 0.05$). The alveolar bone height was the highest in magnetic attachment group, then in ball-cap attachment group, and the lowest in traditional clasp retention group ($P < 0.05$). Experimental findings indicate that, precision attachment over-denture retention superior to traditional clasp removable partial denture in mandibular denture repairing. Magnetic attachment can provide better retention power and better protect the health of periodontal tissue compared with ball-cap attachment.

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INTRODUCTION

Over-denture repair is a common treatment means for elderly denture and denture retention is important for its normal functions. As a retention device, attachment can replace the clasp and its biting force conduction is close to abutment tooth long axis, thus effectively avoid the adverse effects of clasp lateral force and torsional forces on the abutments. The attachments have many advantages, such as good retention and stability, beautiful appearance, and small feeling of foreign body, which

contribute to meet patients aesthetic, comfort, and functional requirements, therefore it has been increasingly used in dental treatment^[1-2]. Also, retaining dental root can reduce the loss of alveolar bone, maximize the alveolar bone height and thickness, and is highly conducive to maintain the denture stability and to improve chewing efficiency.

The commonly used attachment can be divided into magnetic attachment, ball-cap attachment and ERA

attachment. Magnetic attachment and ball-cap attachment are dominant in the mandibular complete denture. SD ball-cap attachment is simple, easy to clean, convenient to use, and widely used in clinical practice. The positive part of the attachment is a spherical body, which contacts with the negative cap-like part of the attachment, through a slight rotation between the spherical surface, the attachment can buffer the lateral torsional forces caused by denture. There is a flexible soft plastic layer present between positive and negative parts, and the layer is located in the negative part, which can play a tampon role between the attachment contact surfaces. It can withstand the vertical and horizontal forces on the abutments. As the chewing forces increase, denture sink and attachment structure adheres closely to the denture base and alveolar crest. At this time, both abutment teeth and alveolar crest bear the biting force, to protect abutment teeth.

Magnetic attachment refers to adsorb the denture on the abutments using the magnets on the abutments, to stabilize and fix partial denture. It is characterized by good appearance, strong fixation and constant retention, simple operation, easy to wear, and easy to clean. Magnetic attachment has been widely used in complete denture, partial denture, denture implantation and restoration, as well as orthodontic treatment. Magfit magnetic attachment is a commonly used attachment type, due to long-term, stable retention, especially it can improve mandibular complete over-denture retention. Magnetic attachment is composed by an armature placed in the dental root residues and a closed circuit placed on the prosthesis substrate, the prosthesis can be tightly retained on the alveolar ridge by means of magnetic attraction between the two components. The closed magnetic circuit design allows to generate the four-fold retention force of opening magnet, and to ensure magnetic field leakage in a safe arrangement. This design provides the lasting constant retention, significantly improves denture retention and stability, reduces the absorption of alveolar ridge, improves chewing efficiency and repair effect. By the use of dental root retention and crown cross-sections to improve crown root ratio, magnetic attachment reduces the burden on the abutments. Magnetic attachment attraction is only the strongest in the vertical direction, and significantly decreases when the magnet and the armature laterally shift or dislocate to form an angle, thereby reducing the torsional and lateral forces on the abutments, and effectively protecting abutment teeth. At the same time, natural dental root is preserved, and periodontal proprioceptors are retained, which is conducive to health of periodontal tissue and prevention

of alveolar bone absorption. Therefore, as the socio-economic level and modern dental technology is developing, precision attachment can attract increasingly attention in the repair of removable partial denture due to great advantage in aesthetics, comfort and wide application range in clinical practice.

In this study, 45 patients subject to mandibular overdenture restoration were treated with magnetic attachments and traditional removable partial dentures were observed for 3 years in follow-up. The patient's satisfaction and periodontal tissue conditions were surveyed. The advantages and shortcomings of these three kinds of attachments were compared, to explore the difference of precision attachment and traditional clasp retainer in removable partial dentures especially in mandibular overdenture restoration.

SUBJECTS AND METHODS

Design

A retrospective case analysis.

Time and setting

Experiments were performed from May 2007 to May 2010 in the Department of Stomatology, China Meitan General Hospital and Department of Stomatology, Beijing Hospital of Health Ministry of China.

Subjects

Clinical data

A total of 45 patients with dentition defects were recruited from Department of Stomatology, China Meitan General Hospital and Department of Stomatology, Beijing Hospital of Health Ministry of China from May 2007 to May 2010. There were 25 males and 20 females, aged 61–78 years, with a mean of 68 years.

Inclusion criteria

Patients with edentulous mandible and treated with traditional complete denture; patients with bilateral mandibular canine or residual root and treated with the overdenture restoration and traditional clasp-retained removable partial dentures. One patient was treated with one kind of attachment.

All the patients were divided into three groups magnetic attachment group ($n=15$), 30 mandible abutment teeth were implanted with magnetic attachment; ball-cap attachment group ($n=15$), 30 mandible abutment teeth were implanted with ball-cap attachment; control group ($n=15$), 30 mandible abutment teeth were treated with

traditional clasp retainer.

Choice of abutment teeth

Abutment loosening \leq I degree, periodontal pocket \leq 3 mm (even after periodontal treatment), alveolar bone resorption \leq 1/3 of root length^[3]; abutment teeth maintained intact after clasp retention. All abutments underwent complete root canal treatment and X-ray examination showed a tight filling of root canal.

All 45 patients voluntarily participated in the overdenture and traditional removable partial dentures, and they abandoned implantation for restoration. According to the *Administrative Regulations on Medical Institution*, issued by State Council of China^[4], all patients were informed of experimental scheme and risk prior to the experimentation, and they gave informed consent.

Materials

Magfit EX600 type magnetic attachment was produced by Aichi Steel Corporation (Japan). (1) Magnetic retainer has a sandwich structure, with two stainless steel magnet yoke layers encased NdFeB. Magnetic retainer surface material is SUS316 stainless steel or similar materials. Armature material is SUS444 stainless steel or similar material, and the main ingredient is NdFeB rare earth; its physical and chemical properties are stable, cannot be oxidized or ionized in saliva environment. It is non-cytotoxic and not compatible to blood and tissue. The serve life is 10–15 years. (2) SD ball-cap attachment is produced by Saifu Company (Germany). Ball-cap attachment is composed of a positive component and a negative component. Positive component is mainly cobalt-chromium alloy and negative component is mainly elastic nylon. Both positive and negative components can be fixed on the denture through physical binding, to reduce the biting force attack on the abutments, and to protect the abutments. Negative components should be replaced regularly according to the retention force. Dental silicone impression material is Speedex silicone rubber (Coltene/Whaledent Dental Trade Limited Company, Switzerland). Adhesive is 3M glass ionomer cement (Japan); the remaining materials are conventional dental restorative materials.

Methods

Preparatory work before restoration

Prior to restoration, patients were determined by dental examination and X-ray film, and received periodontal basic therapy. Dental defects were treated with intraoral treatment; patients with crown-root ratio

disproportion were treated with root canal treatment.

Abutment preparation

In magnetic attachment group: after root canal treatment and periodontal non-surgical treatment, abutment teeth was truncated at 1 mm away from gingival margin, to form a concave at the root surface center, a 0.5-mm shoulder was prepared at cervical margin, with blunt edges parallel to cervical margin, the root canal was prepared in accordance with the crown. Ball-cap attachment group: after root canal treatment and periodontal non-surgical treatment, abutment teeth was truncated at 1 mm away from gingival margin, to prepare a conical cap, with smooth axial plane and edge, a 1.0-mm shoulder was prepared at cervical margin, with the edges parallel to cervical margin, the root canal was prepared in accordance with the crown. Traditional clasp retention group: abutment teeth were prepared according to standards of conventional removable partial denture, external outline was adjusted and abutment high points were removed.

Impression

The impression materials for all precision attachments were silicone rubber to ensure the accuracy of impression. Traditional clasp retention of removable partial dentures used alginate as the impression material.

Clinical examination

Clinical examination and patient's satisfaction surveys were conducted 2 years after treatment. Periodontal examination was performed using the Löe-Silness method and according to Clinical Examination Standards (2000) formulated by the Ministry of Health^[5]. In clinical examination of gingival index, only the probe tip reached gingival margin and slightly touched gum tissue, the gingival index is recorded as the following four levels: level 0, normal gingiva; level 1, a slight swelling of the gingiva, with no bleeding; level 2, gingival bleeding upon the probe; level 3, spontaneous bleeding tendency or ulcer formation. In clinical examination of abutment teeth mobility, the forceps were closed, the occlusal fossa was blocked with tweezers tip, vibrating towards buccal and lingual direction^[5]. Satisfaction surveys include aesthetics, fixation, chewing function, and comfort^[6], each item is evaluated as very satisfied, satisfied, dissatisfied, and very dissatisfied. Satisfaction is the percentage of very satisfied patients and satisfied patients to total patients.

Statistical analysis

All data were statistically analyzed using SPSS 13.0 software. Satisfaction results were compared using the

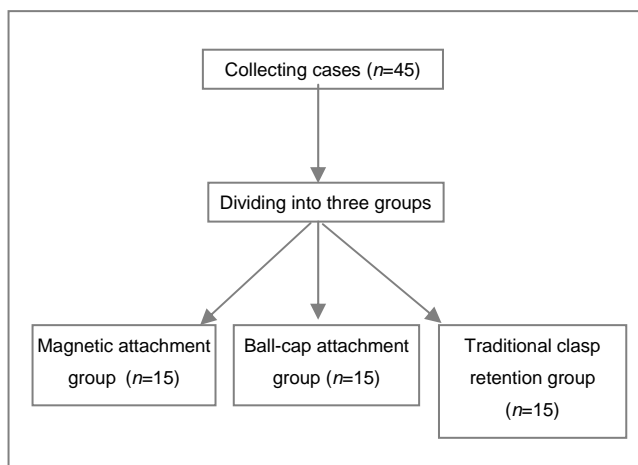
chi-square test, and gingival index and teeth mobility were compared using rank sum test. Periodontal pocket depth and alveolar bone height comparison was performed using the *t*-test.

RESULTS

Quantitative analysis of participants

All 45 patients underwent mandibular removable partial denture were followed up for 10–36 months, with average 26 months. According to intention-treat analysis, 45 patients entered the final analysis.

Grouping flowchart



Baseline data

In comparison of baseline data among three groups of patients, we found that there were no significant difference in gender and age, which are comparable (Table 1).

Table 1 Comparison of baseline data in 45 patients with dentition defect in three groups

Item	Magnetic attachment group	Ball-cap attachment group	Traditional clasp retention group	<i>t/χ²</i>	<i>P</i>
Male/female	9/6	8/7	8/7	0.313	0.799
Age (yr)	69	70	72	1.268	0.409
Follow-up time ($\bar{x}\pm s$, mon)	26.0 \pm 3.11	27.0 \pm 2.41	25.0 \pm 1.32	1.107	0.345

Baseline data showed no significant difference among the three groups ($P > 0.05$), which were comparable.

Satisfaction survey

After precision attachment of overdenture restoration, patients were highly satisfied in the aesthetics, denture

retention, chewing function and comfort compared with traditional clasp retention of removable partial denture. (1) Aesthetics: There were significant differences between magnetic attachment group and control group ($\chi^2=14.892$, $P=0$), and between ball-cap attachment group and control group ($\chi^2=13.871$, $P=0$). This evidence suggested that, the appearance of two precision attachments was better than clasp retainer. No difference was significant between magnetic attachment group and ball-cap attachment group ($\chi^2=2.069$, $P=0.246$). (2) Retention: There were significant differences between magnetic attachment group and control group ($\chi^2=12.273$, $P=0$), which indicated that magnetic attachment was better than traditional clasp retainer in the denture retention. There was no significant difference between ball-cap attachment group and control group ($\chi^2=2.584$, $P=0.180$), and between magnetic attachment group and ball-cap attachment group ($\chi^2=4.320$, $P=0.040$). This evidence suggested that patients in magnetic attachment group and ball-cap attachment group were satisfied in the retention. (3) Chewing function: There were significant differences between magnetic attachment group and control group ($\chi^2=12.273$, $P=0$), which indicated that magnetic attachment was better than traditional clasp retainer in the chewing function. There was no significant difference between ball-cap attachment group and control group ($\chi^2=3.590$, $P=0.103$), and between magnetic attachment group and ball-cap attachment group ($\chi^2=3.268$, $P=0.073$). The traditional clasp retention group and magnetic attachment group showed no significant difference compared with ball-cap attachment group. (4) Comfort: There were significant differences between magnetic attachment group and control group ($\chi^2=21.818$, $P=0$), and between ball-cap attachment group and control group ($\chi^2=8.864$, $P=0.006$), suggesting that two precision attachments were more comfortable than clasp retainer. No difference was significant between magnetic attachment group and ball-cap attachment group ($\chi^2=5.455$, $P=0.026$), suggesting that the comfort was more apparent in magnetic attachment and ball-cap attachment group (Table 2).

Periodontal health

Gingival index and teeth mobility

The gingival health in magnetic attachment group was better than ball-cap attachment group ($P=0.006$); and two attachment groups were better than control group ($P=0$). The abutment tooth mobility in magnetic attachment group was lower than ball-cap attachment group ($P=0$); two attachment groups were both lower than control group ($P=0$; Table 3).

Table 2 Comparison of comfort in 45 patients with dentition defect in three groups (n/%)

Group	Aesthetics	Retention	Chewing function	Comfort
Magnetic attachment group	30/100	28/90	28/90	30/100
Ball-cap attachment group	28/90	22/73	23/71	25/83
Traditional clasp retention group	15/50	16/53	16/53	14/47

The magnetic attachment group is better than traditional clasp retention group in aesthetics, retention, chewing function and comfort ($P < 0.05$), ball-cap attachment group is better than traditional clasp retention group in aesthetics and comfort ($P < 0.05$), and magnetic attachment group is better than ball-cap attachment group in retention and comfort ($P < 0.05$).

Table 3 Comparison of gingival index and teeth mobility in 45 patients with dentition defect in three groups (n)

Level	Gingival index		
	Magnetic attachment group (n=30)	Ball-cap attachment group (n=30)	Traditional clasp retention group (n=30)
0	10	5	1
1	15	10	3
2	5	10	15
3	0	5	11

Level	Teeth mobility		
	Magnetic attachment group (n=30)	Ball-cap attachment group (n=30)	Traditional clasp retention group (n=30)
0	10	5	0
1	15	10	0
2	5	10	20
3	0	5	10

The gingival index was magnetic attachment group > ball-cap attachment group > traditional clasp retention group ($P < 0.05$); tooth mobility was magnetic attachment group < ball-cap attachment group < traditional clasp retention group ($P < 0.05$).

Periodontal pocket depth and alveolar bone height

Periodontal pocket depth was measured by clinical probing methods. In brief, each tooth surface was detected using a periodontal probe along the tooth long axis, the probing depth in each tooth was measured at six locations, including the cheek (lip) and tongue levels at the distant, central, and proximal side respectively, then the average value was obtained^[5]. At 3 years after treatment, the periodontal pocket depth

of all patients was statistically analyzed and the results showed that the depth was slightly increased in two attachment groups without significant differences ($P=0.126$). The increment in magnetic attachment group and ball-cap attachment group was lower than the control group ($P=0.007$, $P=0.040$; Table 4).

Alveolar bone height was detected using panoramic X-ray by measuring the distance from mandibular alveolar ridge to mandibular inferior margin^[5]. Statistical analysis of clinical measurement results showed that alveolar bone height in magnetic attachment group was higher than ball-cap attachment group and control group ($P=0$), and ball-cap attachment group was higher than control group ($P=0$; Table 4).

Table 4 Comparison of periodontal pocket depth and alveolar bone height in 45 patients with dentition defect in three groups ($\bar{x}\pm s$, mm)

Group	n	Periodontal pocket depth	Alveolar bone height
Magnetic attachment group	30	2.66±1.00 ^a	4.97±0.19 ^b
Ball-cap attachment group	30	3.05±0.92	4.41±0.42
Traditional clasp retention group	30	4.11±0.81	3.80±0.23

^a $P < 0.05$, vs. the other two groups. The increment of periodontal pocket depth in magnetic attachment and ball-cap attachment groups was lighter than traditional clasp retention group ($P < 0.05$); the alveolar bone height was magnetic attachment group > ball-cap attachment group > traditional clasp retention group ($P < 0.05$).

DISCUSSION

How to achieve good retention effects of the denture in abutments and to make patients satisfied with the denture aesthetics and comfort are puzzling the clinicians^[7]. The denture retention is very important for the elderly patients with complete denture patients and with flat alveolar crest^[6]. Precision attachments are characterized by strong retention, good appearance, comfort and durability, thus being widely used in complete denture restoration^[8-11]. Some scholars believe that complete over-dentures are more aesthetic than conventional dentures, it can improve chewing efficiency and effectively prevent alveolar bone resorption^[12-15]. In this study, patients were highly satisfied in denture aesthetics, retention, chewing function, and comfort after two precision attachments, which was consistent with previous studies^[16-17]. In terms of aesthetics, two precision attachment groups were better than traditional clasp retention group,

because there is no buccal and lingual exposure on precision attachments. In terms of retention, precision attachment also shows some advantages because closed magnetic circuit can significantly increase denture retention, and the cathode-anode padlock capacity in ball-cap attachment also increased denture retention. These designs make the precision attachments are more balanced and stable than clasp retainer. It is reported that the initial retention force of magnetic attachments is lower than that of ball-cap attachment, but small retention forces allows good stability and long-term efficacy^[18]. In addition, magnetic attachment is more suitable for one or two abutment teeth^[7]. Among patients underwent ball-cap attachment, two cases appeared negative component detachment and three cases showed a decline of binding force between positive and negative components, resulting in a decreased subjective feeling of retention. These phenomena cannot be observed in magnetic attachment group, which further illustrate the superiority of magnetic attachment in the retention and long-term efficacy. In traditional clasp retention group, four patients had a decrease in retention between the clasp and the abutment, and two cases appeared clasp breakage. This is possibly explained that, traditional clasp retainer functions through friction between the clasp and natural tooth, as well as the clasp arm. Once the metal clasp tends to be broken as the repeated wearing number of removable dentures, there is a gap formed between clasp arm and abutment teeth, thus decreasing retention force. Traditional removable partial dentures are often poorly stable, inefficient in chewing, less comfortable and aesthetic. For the patients with only one or two abutment teeth, the abutments may be eradicated due to loosening at 2–3 years after restorative treatment^[19].

Our findings showed that, chewing function in magnetic attachment group was higher than in the conventional clasp retention group, but was not different from ball-cap attachment group, suggesting that precision attachment overdenture restoration can improve chewing efficiency. When the denture functions, the patients can feel the force direction and size, even distinguish food shape and hardness through force stimulation transferred into the central nervous system *via* periodontal proprioceptors, thus improving chewing efficiency.

Periodontal health is a contributing factor for the removable partial denture restorative effects, periodontal disease-caused tooth mobility can easily

lead to overdenture failure. In this study, gingival health was the best in magnetic attachment group and the worst in traditional clasp retention group. Screw cap-shaped magnetic attachment is tightly casted on the dental root and the surface is polishing, which is difficult to produce plaque accumulation, in addition the material is good compatible to gingival tissue and produce less periodontal inflammation. We used MagfitEX magnetic attachment which can provide lasting retention and reduce plaque accumulation, as well as easy to clean; in addition, the armature materials are biocompatible to gingival tissue, thus minimizing marginal gingivitis and further maintaining periodontal health. In clinical test of gingival index, we also noted that all patients presented varying degrees of gingival inflammation, with gingival bleeding on probing as the main clinical manifestation. This phenomenon is related with personal oral hygiene care. Although magnetic attachment has many advantages, there is still a risk for abutment periodontal disease. The gingivitis is the contributing factor affecting the service life of magnetic attachment. The oral health maintenance and periodic check after the restoration can maintain abutment health and sustain long-term treatment effects. In clinical practice, the denture should not directly press gingival margin. Before the crown with an armature is fixed, tissue surface must be highly polished to avoid plaque adhesion^[20]. Abutment tooth mobility in two precision attachment groups was lower than the control group, suggesting that the abutment health was poor in traditional clasp retention group. Clasp retainers have some friction forces on abutments, and the clasp-caused torsional force on abutments when chewing food also damages periodontal tissue. The advantages of magnetic attachment is its low requirement on the crown root ratio^[21] and protective effect on the abutments, mandibular overdenture with magnetic attachment can shift for a short distance along the root plane when subjected to lateral forces, thus reducing lateral forces. Ball-cap attachment is extracoronal stud attachment, with its power distribution perpendicular to the tooth long axis, and has some stress-buffering effects. It fits mucosal support or hybrid supported denture and its elastic cap can be adjusted according to different retention forces, thus avoiding damage to the abutment and protecting the abutment. However, ball-cap attachment indications are not wide as magnetic attachments, it requires high crown root ratio, mandibular overdenture with cap attachment cannot produce adjustable movement when subjected to lateral forces, and may produce torsional force on the abutment teeth, and the protection effect for abutment

periodontal tissue is not good as magnetic attachments^[22].

In this study, periodontal pocket depth in magnetic attachment and ball-cap attachment groups was increased slightly, but there was no significant difference between two groups. This evidence suggested that, in the mandibular denture restoration process, periodontal pocket formation is not related with types of attachments, it is closely associated with personal oral health. However, periodontal pocket depth in control group was higher than magnetic attachment and ball-cap attachment groups, suggesting that traditional clasp-retained mandibular removable partial denture is more susceptible to periodontal pockets. Presumably it is due to repeated wearing of clasp retainer denture, and the gap between clasp arm and the abutment teeth leads to food impaction^[23].

X-ray measurement results showed that, alveolar bone height in magnetic attachment denture group was higher than ball-cap attachment, with significant differences. This evidence suggested that magnetic attachment exhibited less influence on the alveolar bone vertical height than ball-cap attachment. Patients treated with magnetic attachment may have less alveolar bone resorption, no or less occlusal trauma in abutments, and more healthy periodontal tissues. Alveolar bone height in two precision attachment groups was higher than the control group, suggesting precision attachment is more conducive to periodontal health than traditional clasp retainer. Saito *et al*^[24] found that, the abutments provided strong supports for the attachment of removable partial denture, while alveolar ridge gave a weak support; in clasp denture, abutments provided less support forces, and the support of alveolar crest mucosa was dominant, so alveolar bone resorption is obvious. The connection between the ball-cap attachment is a kind of spherical elastic connection, the gap between elastic connection and attachment components is 0.5–1.0 mm, so that the denture allows a little vertical movement of base plate to reduce load and to make better occlusal force dispersed in abutment and alveolar ridge. The magnetic attachments may lower the crown root ratio, produce even force on the abutment roots, reduce lateral forces and torsional forces, decrease alveolar bone absorption, and ensure periodontal health. In summary, magnetic attachment shows great advantages in mandibular removable partial dentures. The denture has good retention and healthy

periodontal tissue, minimums alveolar bone absorption and makes patients satisfied. The disadvantage is high cost, which restricts clinical application. Magnetic attachment and ball-cap attachment for the overdenture is superior to traditional clasp retainer for removable partial dentures.

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磁性附着体和球帽附着体修复下颌覆盖全口义齿的对比*

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文章亮点:

下颌可摘局部义齿临床修复治疗中固位体类型的选择存在一定争议, 试验旨在比较磁性附着体、球帽附着体和传统卡环固位体在下颌可摘局部义齿修复中的临床效果。

关键词:

生物材料; 组织工程口腔材料; 磁性附着体; 球帽附着体; 卡环可摘局部义齿, 覆盖义齿; 牙周组织; 牙龈指数; 牙槽骨高度

主题词:

生物相容性材料; 义齿精密附着体; 义齿; 牙科卡环

摘要

背景: 精密附着体具有固位性强、美观性好、舒适耐用等特点, 近年来已被应用于全口义齿修复中, 球帽附着体和磁性附着体在下颌全口义齿中应用较多。

目的: 比较磁性附着体、球帽附着体和传统卡环固位体在下颌可摘局部义齿修复中的临床效果。

方法: 选择 45 例牙列缺损患者, 分别行磁性附着体、球帽附着体和传统卡环固位

的下颌可摘局部义齿修复, 每种修复方式 15 例, 3 年随访患者的满意度及基牙牙周健康情况。

结果与结论: 磁性附着体组患者满意度中美观性、固位情况、咀嚼功能及舒适程度优于传统卡环固位组($P < 0.05$), 球帽附着体组患者满意度中美观性、舒适程度优于传统卡环固位组($P < 0.05$), 磁性附着体组患者满意度中固位情况、舒适程度优于球帽附着体组($P < 0.05$)。牙龈指数: 磁性附着体组 > 球帽附着体组 > 传统卡环固位组(P 均 < 0.05); 基牙松动度: 磁性附着体组 < 球帽附着体组 < 传统卡环固位组(P 均 < 0.05); 磁性附着体组、球帽附着体组牙周袋深度增加程度轻于传统卡环固位组($P < 0.05$); 牙槽骨高度: 磁性附着体组 > 球帽附着体组 > 传统卡环固位组(P 均 < 0.05)。结果表明使用精密附着体固位的覆盖义齿较传统卡环固位的可摘局部义齿在临床疗效上具有一定的优越性; 磁性附着体在修复下颌覆盖义齿时较球帽附着体具有一定的优越性, 能够提供满意的固位力, 更好地保护基牙牙周组织健康。

作者贡献: 李昀生进行实验设计, 实验实施为姚希, 实验评估为李昀生, 资料收集为姚希, 姚希成文, 戴永雨审核, 李昀生对文章负责。

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经济或利益的赞助。

伦理要求: 45 例患者均自愿选择覆盖义齿修复和传统可摘局部义齿修复方式而放弃种植修复方式。根据中华人民共和国国务院颁发的《医疗机构管理条例》, 在实验前将实验方案和风险告知对方, 并签署知情同意书。

医生资质: 口腔医师具有有从事口腔工作的经验, 经过相关培训, 具有从事口腔修复工作所要求的资质。

学术术语: 磁性附着体-指利用基牙上的磁体将义齿吸附到基牙上, 用以稳定和固定义齿的一种口腔修复装置。

作者声明: 文章为原创作品, 数据准确, 内容不涉及泄密, 无一稿两投, 无抄袭, 无内容剽窃, 无作者署名争议, 无与他人课题以及专利技术的争执, 内容真实, 文责自负。

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