USING MAGNETS TO INCREASE RETENTION OF LOWER DENTURE - CASE REPORT
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Abstract: Oral diseases and the patient’s history of dental treatments can compromise important jawbone characteristics. If possible, extractions should be avoided for all patients who already suffered extensive bone loss because of the reduced stability and retention of the future denture, especially the lower one. Magnets increase retention of partial or complete dentures and overdentures regardless of the path of insertion. Magnets are easy to use alone or together with any type of retainers. Patient A.S., female, 62 years-old, referred the dental office for a complete rehabilitation complaining of chewing inefficiency and inesthetic appearance. The patient has a pathological history of osteoporosis and diabetes. The only mandibular tooth excepted from extraction was the canine (3.3) because of its good implantation and stability. After the surgical phase and the root canal treatment of 3.3, a cap-type magnetic attachment (Magfit, Aichi Steel Corporation, Japan) was applied. The technical simplicity, the usefulness for geriatric and handicapped patients, the increased control of jaw function trough the maintained periodontal ligament and the physiological action of magnetic forces in the tooth axis are arguments for the use of magnets.

Keywords: magnet, retention, lower denture

INTRODUCTION
Oral diseases and the patient’s history of dental treatments can compromise important jawbone characteristics. If possible, extractions should be avoided for all patients who already suffered extensive bone loss because of the reduced stability and retention of the future denture, especially the lower one. Implants are a good solution but a healthy root system of teeth deteriorated above the gum line always surpasses the value of the artificial root due to the presence of periodontal ligament which enable the transmission of axial forces towards the alveolar bone. The axial forces are essential in maintaining the height of alveolar bone. The magnetic attachment consists of the magnetic assembly and the keeper. The magnetic assembly is the main part of the magnetic attachment and consists of the magnet and its coating. The keeper is a metal part casted on the root cap which is attracted to the magnetic assembly.

It has to be noticed that magnets increase retention of partial or complete dentures and overdentures regardless of the path of insertion. Magnets are easy to use alone or together with any type of retainers. The most important aspect to be cleared is the influence of magnetism to human body. Modern magnets were tested in many aspects (cell toxicity, cell growth, allergic response) and the results meet international standards. The magnetic field leakage is extremely weak compared to daily use magnetic appliances. For a long time the saliva corrosion of rare-earth magnets was the reason which determined the decrease of magnetic attractive force. The problem was solved through the enclosure of magnets in anticorrosive steel with a small percentage of iron.

PATIENT AND METHOD
Patient A.S., female, 62 years-old, came to the dental office for a complete rehabilitation complaining of chewing inefficiency and inesthetic appearance. She has a pathological history of osteoporosis and diabetes. The patient presented at the upper jaw two metalo-acrylic bridges (fig. 1 and fig.2). On the right side of the arch there is a 4-unit distal cantilevered bridge with two abutments (1.2., 1.4.); on the left side, a 6-unit bridge with 4 abutments (2.2, 2.3, 2.5, 2.7). The central incisors
presented severe coronary destruction. Both fixed partial dentures presented mobility. Bone loss around several abutments and periodontal complications will cause the extraction of some maxillary teeth. The lower jaw presents only the frontal group of teeth. They are united by a metalo-acrylic cantilever bridge with a two teeth distal extension only on the right side. The canines were covered by full metal crowns. Periodontal disease is extended associated with labial and lingual gingival retraction at teeth 4.1, 3.1 and 3.2. Most remaining teeth were irretrievable. At the lower jaw, the only tooth excepted from extraction was the left canine (3.3) because of its good implantation and stability. The surgical phase was executed and a 30-days period elapsed before the primary impression was made. During this period the endodontic treatment of 3.3 was completed.

After the root canal treatment, this tooth was used for a cap-type magnetic appliance (Magfit, Aichi Steel Corporation, Japan) on the occlusal surface of the root cap. The preparation involves placing chamfered margin at the level of marginal gingiva and creating slightly divergent walls of root canal and slightly convergent for the axial walls (around 15°). Due to low lateral forces transferred to abutments, the dowel post can be shorter – about 5 mm or less. Also ferrule effect is useful in protection of abutments. Root cap embeds the keeper, which should be surrounded by proper thickness of metal; otherwise the possibility of casting defects will be high. The wax pattern cast with the bonded keeper is the critical laboratory phase; it is necessary to have at least 0.3 mm thick wax for a proper casting (fig. 3 and fig. 4).

RESULTS
Two complete overdentures were fabricated and the patient’s esthetic appearance and chewing efficiency improved. The magnet’s position is parallel with the occlusion plan in order to obtain better retention for the lower denture (fig. 5). The patient was instructed how to clean the denture in the area where the magnet is located (fig. 6). Placing the magnet on the lower canine did not disturb the esthetic appearance (fig. 7). The massive bone loss that began following extractions will be prevented around the kept canine (fig. 8).
DISCUSSION

In 2004, Rutkunas and Mizutani (2) evaluate and compare stabilizing and retentive characteristics of studs vs. magnets during linear and rotational dislodgements. Their results show the experimental superiority of studs regarding stabilization but underline that constant retentive properties of magnetic attachments could assist abutment preservation. Also, the research suggests a proper attachment type choice depending on the clinical situation. Decreased manual dexterity and multiple abutments could be an indication for using magnetic devices. Mizutani and al. (3) presented a study which evaluated the retentive force of magnetic attachments (Magnedisk 500, Magfit EX 600W, Root keeper(dome shaped), Hyperslim 4013, Hyperslim 4513) and various mechanical attachments (O-P Locator, Root Locator, Era Overdenture). They concluded that magnetic attachments have adequate retentive force.

Ono et al. (4) support the use of magnetic attachments in immediate overdentures. They report that even when
the amount of bone supporting tooth is insufficient for the prosthetic treatment, the preservation may become possible by reducing crown/root ratio through cutting the crown of the tooth and simultaneously reducing the effect of paraxial forces through lowering the power point. They stated that immediate dentures (although the chair time is increased) are efficient especially by the maintained sense of periodontal membrane. Chung et al. (5) compared retention characteristics of various neodymium-iron-boron alloy magnetic attachment systems before and after cyclic loading. An 18% decrease of retentive ability was found for Magnedisk system after 100 loadings. These researchers stated that long-term insertion and removal of magnetic attachments may compromise their retention due to wearing of the embedding case or induced corrosion of the magnet. At the same time they underline the ease of magnet replacing which can solve these situations.

CONCLUSIONS
Tooth loss and the imminence of wearing a mobile denture have a profound impact on the lives of the patients, especially after a certain age. In this case, the patient was feeling anxiety and even depression at the first stages of treatment when she was explained that most of her teeth were subject to extraction and that she has to wear mobile dentures. Keeping the lower canine and using it in order to increase the stability and retention of the lower denture had also an important psychological effect. The technical simplicity, the usefulness for geriatric and handicapped patients, the increased control of jaw function through the maintained periodontal ligament and the physiological action of magnetic forces in the tooth axis are arguments for the use of magnets.

REFERENCES