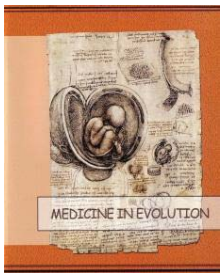
Overdenture on CEKA attachments-a good prosthetic option



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Abstract

A dental successful restoration aims for two main goals: the aesthetics, stability, and maintenance of the prosthesis, in other words, the satisfaction of patients for a long time. The degree of satisfaction of patients wearing overdentures is high, especially since the prostheses properly maintain their stability and retention for a much longer time than conventional total dentures. The functional characteristics of the overdentures are validated even more in the situation when the dental abutments kept under the prosthesis are provided with special means of fixation, retention and stabilization. The technique of over prosthesis on root abutments is an approach that addresses patients with too few remaining teeth and reserved periodontal prognosis with the advantage of postponing for a long time the installation of total edentulous condition and in addition reduces the atrophy advance. This paper presents the whole process for manufactured an overdenture on CEKA attachments, and describes the technical steps for a real case with a subtotal mandibular edentation and two extruded canines, which had circular caries of the package. They were prepared for the crown-root devices. The classic method was used in making overprosthesis on staples.

Keywords: Overdenture, Ceka attachments, removable dental prosthesis, dental restauration, removable partial denture

INTRODUCTION

The considerable advances in dentistry in recent decades are largely due to new equipment and concepts, which are generating therapeutic techniques and procedures. "All aesthetic reconstructions should have one thing in common. It should be modeled on nature, ie existing natural structures. Because the better we manage to imitate this model, the harder it is to recognize the denture as such" [1].

Marginal periodontopathy along with dental caries complications and occlusal dysfunction are the main factors that determine the appearance of subtotal edentulousness. Stress, fear of pain, financial deprivation and irrational nutrition have contributed to lowering the age of onset of subtotal edentulousness. Although the treatment possibilities are much more diverse and the average age has increased, more and more often the subtotal edentation affects the structures of the stomatognathic system, especially the elderly and not only, a good part of the patients being middle aged.

Mobile or removable prosthesis, during treatment, raises a number of problems in order to obtain the desired solutions, all of them depending on the degree of difficulty of the case. The basic objectives of a removable prosthetic treatment are the preservation of structures and the restoration of masticatory functions, in conditions of maximum balance of the prostheses, through the possibilities offered by the remaining teeth, to increase the quality of life and comfort of these patients, usually being in the elderly category. "Special systems or attachments are two-component aesthetic joints which connected, on the one hand to the tooth, root or implant, and on the other hand, to the removable partial denture (RPD). They are part of the direct means of fixation, retention and stabilization of removable partial dentures. However, special systems can also connect components of fixed partial dentures and are also used in overdentures" [2].

A correct and conservative treatment of pathological conditions, preservation of the remaining dental elements regardless of the prosthetic value, denotes an excellent prophylaxis of the prosthetic field, protecting the future completely edentulous from the phenomenon of mucosal atrophy in those areas. At the same time, through the attention offered and the effort exerted for saving the remaining dental elements and using them in the most judicious way, we can thus postpone the final installation of total edentulousness. "Carrying out a dental prosthesis that is functional and that meets the special aesthetic requirements of the patient is a challenge for the dental technician. If the dental technician manages to successfully combine both elements, then his work will be crowned with laurels" [3].

Aim and objectives

The overdenture on root abutments is a good method for patients with very few teeth and with periodontal prognosis because it has several advantages such as postponing the installation of the total edentulous condition and, in addition, the reducing of the atrophy advance. The objectives for overdentures are as follows:

- obtaining a correct height of the edges and the maximum optimal extension of the prosthesis base;
- distribution of relatively equal pressures on the hard and soft components of the prosthetic field;
- respecting the freedom of muscle movements and achieving the optimal marginal closure of the prosthesis;
- choosing artificial teeth that fit the patient perfectly;

great emphasis on the processing and polishing the prosthesis.

MATERIALS AND METHODS

The model used in performing the prosthesis is based on a real case with a subtotal mandibular edentation. The two extruded canines, which had circular caries in the cervical third of the teeth, were prepared for the post-and-core casts. The method used in making overdentures on attachments is the classic method. Making the preliminary model is an important step in the technology of total prostheses. It is not enough for the impression to be of good quality, but it is necessary for it to arrive in due time (depending on the material from which the impression is taken) in the dental laboratory where the model is made. A model that has imperfections can compromise the final prosthetic part, cancelling the physical and material efforts, both of the doctor and of the technician, during the technology of any overdentures. In this regard, two types of plaster were used to make the models.

The stages of making the preliminary model are:

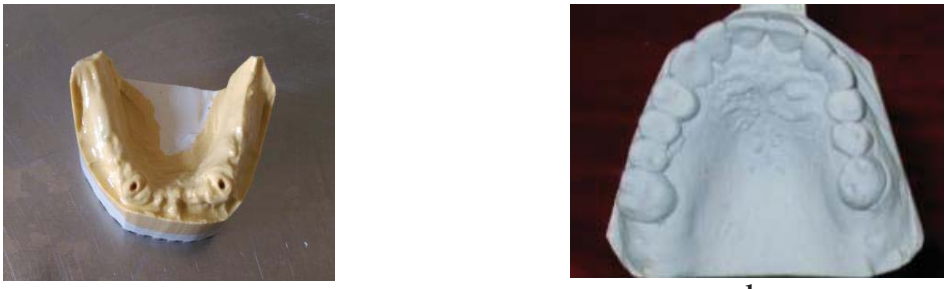
a) Impression preparation: washing, decontamination, detensioning, drying

b) Casting an extra-hard plaster, which will not exceed the height of the edges of the impression by more than 3-4 mm

c) After the material setting, the base is poured from a hard plaster, whose expansion coefficient is close to the extra hard one, previously used.

d) After the final setting, the impression is demoulded and then the working model is trimmed (Fig.1.a)

The antagonistic model was also made of moldano plaster (Fig 1.b).



a. **b.**

Figure 1. a. Working model; b. Antagonistic model

After removing the impression, the model was isolated at the level of the teeth prepared for post-and-core casts and their layout was started using red modeling wax, making the root device by dripping into the root canal, then the ring and then the cover of the system. The patrices of the special CEKA attachment system were placed over the latter with the help of the parallelograph for parallel positioning. Wax rods (wax rods, Hungary) were used for packaging because they melt together with the model and allow easy removal of wax from the mold. The rods were applied to the thickest part of the model, away from the edges and contact areas.

Figure 2. Layout of the post-and-core casts and assembly of patrices of the special CEKA attachment system

The Heraeus technique was applied for placing the rods, ie a rod of 3-3.5 mm with a length of 4.5-5mm was attached to each model, after which they were joined by a horizontal rod with a diameter of 3.5mm, which has role in being the metal reservoir. A vertical rod is detached from this rod which is attached to the casting cone.

Before packing, the model was detensioned, ie it was sprayed with a detensioning solution from Bredent. (Bredent, Senden, Germany). The size was tested; the model was placed in a plastic ring of the Bego company. The packaging mass used was BellaVest SH (Bego, Bremen, Germany) which is a phosphate-based material along with BegoSol HE liquid (Bego, Bremen, Germany).

Figure 3. Calcination furnace model STC 411.26 (Super Therm, Prahova, Romania)

The next important stage is the casting. Casting means the operation of inserting the molten metal or alloy into the mold cavity to make the cast part. A Ni-Cr alloy called VeraSoft (AallcaDent, USA) was used. Among the specific properties of the metal in the liquid state, the viscosity and the surface tension directly intervene in the casting process. The property that determines the rate of flow of fluids is called viscosity. It expresses the internal friction between the layers of liquid which, when flowing, move at different speeds. It is, therefore, the one that determines the fluidity of the liquid alloy and its ability to fill all the details of the pattern. When casting the alloy used in this case, a temperature of 100-150 ° C higher than the melting temperature is required, which ensures an appropriate viscosity.

At the casting temperature, the viscosity of the alloy is 1.5-3 times higher than that of water at ambient temperature. After the wax has melted, the mold was placed in the heating furnace and subjected to the plug of a thermal cycle.

A ceramic crucible was used to induce the melting by induction. A high frequency current device was used as the casting method. It was the centrifugal force that pushed the molten alloy into the mold. The temperature required to melt the dental alloy is generally between 850 and 1450 ° C. The cooling of the cast piece and the print was next.

The first step of unpacking is the detachment of the molded part with a core of packing mass from the ring, followed by the removal of the rest of the packing mass with pliers and weak hammer blows. After unpacking the cast metal part, it is necessary to clean the packaging waste and the oxides from the metal surface. By blasting, in addition to cleaning the metal surfaces from the packaging residues and oxides, the metal skeleton is also conditioned. The process consists in bombarding the metal surface with a jet of particles of different sizes, projected with the help of a column of compressed air at a pressure of 6 bars. By blasting, micro-retentions are made, therefore an increase of the contact surfaces is achieved. Sandblasting is also used to condition the metal surfaces of the metal component in order to make a connection with the aesthetic component.

For preparing metal components (Fig. 4), several types of milling cutters were used, from those with high hardness to those with low hardness with different oblique, crossed blades. Gum, brushes and fluff were used for polishing, along with polishing pastes.

Figure 4. Fixed metal components on the model

The next step was to make the light-curable resin individual/custom tray. The first step was to isolate the model with Izodent solution (Doriot Dent, England). The model was deretentivized in the fixed prostheses area, after which the Pico Tray plastic phase resin plate (PicoDent, Wipperfürth, Germany) was applied to the model and the base and accessories were cut in compliance with all the principles of making the individual tray. The model was then introduced into the light curing apparatus DentaColorXS(Kulzer, Germania).

The individual tray was sent to the dentist's office. The dentist sent the functional impression to the technician to begin the next phase of the prosthesis.

For this phase of the prosthesis a special conformer was needed in which alginate was placed and the impression was clogged up to a distance of 2-3 mm from the edges in order to highlight as well as possible the mucobuccal fold. Alginate Plus Phase from Zhermach, Germany, was used, which was mixed with water to create a creamy consistency like gypsum. This soft alginate was introduced into the conformer and then the functional impression was positioned with the base of the tray clogged in the alginic mass and the imprint with direct view. It was not covered on any part with alginate.

The working or final model is the positive replica of the totally edentulous prosthetic field made from hard plaster, done in the laboratory, based on the functional impression prepared in advance. On this model, the base of the future prosthesis is modelled, the artificial teeth are mounted, the pattern is made, and the future prosthesis is polymerized.

The technology of realizing the working model includes the stages:

a) Examination of the final impression in the laboratory;
b) Imprint preparation by embankment and formwork;
c) Casting the final model itself;
d) Imprinting the impression;
e) Modelling.

Determining intermaxillary relationships is an important clinical step. This can assess the position of the maxillary arch regarding to the mandibular arch, even in the absence of all dento-periodontal units. The occlusion templates have the role of being stylized imitations of prostheses in order to transfer them later to the dental laboratory. They have two components: the base of the templates and the occlusion rims.

First of all, the base of the light-curable resin template similar to the individual Pico Tray (PicoDent, Wipperfürth, Germany) was started, on which the pink modeling wax occlusion rim (Hungary) of the following dimensions was mounted:

- height in the frontal region – 10 mm, decreasing distally to 8 mm;
- width in the frontal area – 6 mm, increasing distally to 8 mm.

The occlusion rims were sent to the office to determine the intermaxillary relations.

Then the dentist sent the templates to the technician to mount the models in the articulator. The Handy articulator (Shofu, Ratingen, Germany) was used, a device that reproduces certain mechanical conditions of mandibular movements and which, due to some

mechanisms, forms an articular system similar to the temporomandibular joint. A Handy articulator (Shofu, Ratingen, Germany) presents the components:

- Upper member;
- Lower member;
- Shoulders or frame uprights (grip);
- Model mounting plate;
- Tightening screws for the mounting plates;
- Incisive plate with a 10 grade tilt;
- Incisive rod with an incisive pin;
- Model mounting disc tightening pins.

The assembly was started by fixing the maxillary model in contact with the occlusal plate at a distance of 10.5 cm from the intercondylar axis. After the fixing plaster has hardened on the base of the upper model, the plate was removed. The next phase was to mount the lower template in contact with the upper model according to the benchmarks from the determination of the intermaxillary relations. It was checked if the vertical rod comes into contact with the incisal plate.

The next stage was the making of the wax model denture. In this stage we started with the choice of artificial teeth according to the antagonistic model, the aesthetic and chromatic requirements required by the patient and the doctor. The prosthesis base was modelled and then the teeth were fitted.

Since it was a mandibular model, without toruses and exostoses, there was no need for foliation and engraving before the layout of the prosthetic base.

A pink modelling wax plate (Hungary) was taken and the layout of the prosthesis base began. After finishing the base of the prosthesis, from the same wax, a roll was made which was placed in the middle of the crest of the mandibular model, after which the installation of Vita MFT artificial teeth began (Sackingen, Switzerland). At the end, the model was ready to be sent to the dental office for the in mouth checking, the last check before completion.

Figure 5. Fixed metal components on the model

After the test, the molding was done. It was used an indirect, wave less molding. The cuvette in which plaster class II was placed was taken, after which the model and the molding were placed with the base of the model sunk in plaster until the limit at which the model begins. After the gypsum set, it was isolated with Izodent solution (SpofaDental, Marcova, Jicin, Czech Republic) after which the second part of the basin was assembled. The gypsum paste was prepared and poured into it until filling, then the lid was placed and inserted into the hydraulic press until the gypsum has set.

The next step was to remove the wax from the mold; for this the cuvette was inserted, inside where the prosthesis stayed in hot water for 5-6 minutes to plasticize the wax. After plasticizing the wax, the cuvette is opened and washed gently with hot water to completely remove any wax left in the mold.

Then, followed with the insulation of the pattern, a necessary procedure to prevent direct contact of the acrylic resin with its plaster walls. Patterns isolation aims to:

- Prevent the adhesion of the pattern to the acrylic resin;
- Demold without risk of fracture or cracking;
- Facilitate the detachment of the printing prosthesis;
- Prevent the risk of penetration of gypsum monomer or resin water in the polymerization process.

Thus, this is followed by the preparation, manual insertion, pressing and thermospolymerization of the acrylic resin of the overdenture base. It started with the preparation of the acrylic resin which takes place by mixing the powder with the liquid.

The acrylic paste, which is inserted in the mold, goes through the following polymerization steps:

- The sedimentation stage that gives the mixture a sandy character;
- The dissolution stage, in which the liquid diffuses between the monomer particles and gives a creamy appearance;
- Saturation stage, with a pasty appearance;
- The stage of evaporation in which an elastic paste appears - the phase is over.

Superacryl Plus pink acrylic resin from SpofaDental (Jicin, Czech Republic) was used. 6-8 ml of liquid was placed in the well, over which 14-16 g of powder were added over the liquid, which would be the equivalent of 1 g per tooth of powder, after which it was mixed and then the composition was left in the well until the paste reached the 3rd stage listed above, after which it was manually inserted into the pattern where the teeth are and the cuvette was closed. (Fig. 6).

Figure 6. Pressing the paste with the manual press

The next step after closing the cuvette was to press the paste using the hand press. Pressing the paste inserted in the pattern is done slowly and progressively, repeating the tightening 2-3 times with the help of a crank specific to the manual press. The final pressing is for at least 15 minutes at a pressure of about 3 barrels. Rapid thermopolymerization was used, where the cuvette is inserted and maintained at 65 ° C for 60 minutes and then the temperature rises to 100 ° C for 60 minutes.

Cooling was slow at room temperature. Unpacking followed when the cuvette was completely cooled. A wax knife was inserted between the two halves of the shaper to separate them. The prosthesis remained in part of the pattern. This unpacking procedure must be performed smoothly so as not to crack the prosthesis.

RESULTS

After unpacking the prosthesis, the following steps were followed: prosthesis processing, prosthesis smoothing and overdenture polishing. Prior to processing, the matrices of the special CEKA system were fixed on the mucosal face of the prosthesis with self-curing

acrylate. The processing and smoothing of the prosthesis were done with the micro motor and with rotary tools - milling, drills, brushes, polystyrene and puffs, the polishing was done with the horizontal biax motor. The overdenture is shown in Fig. 7.

a. b.

Figure 7. The overdenture a. Overdenture on attachments; b. Overdenture on attachments- frontal view

The loss of stability and maintenance of the prosthesis was observed within 4-5 years after the insertion of the dentures and could be solved either by a classic refraction of the prosthesis, or by changing the gaskets that ensure friction at the special systems of fixation, retention and stabilization. Prosthesis lining was usually followed by a thorough selective readjustment of the contact made between the root abutments and the mucosal surface of the prosthesis. The selective adaptation of the abutment contacts with the prosthesis base was absolutely necessary because an excessive and prolonged contact of the prosthesis base with the dental abutment determines, as a rule, the appearance of a painful sensation of variable intensity at the level of the abutment tooth.

DISCUSSIONS

Conceptually, the idea of keeping the last teeth under the prosthesis for as long as possible is based on the principle of transmitting occlusal forces from the prosthesis to the underlying bone base through the periodontal ligament system of root abutments kept under the prosthesis. The occlusal forces developed at the level of the prosthesis during mastication are not transmitted entirely through the periodontal ligament system to the bone base, the prosthesis benefiting in this sense from a mixed dento-periodontal and muco-bone support. It is considered that, in addition to the stimulatory effect exerted by the periodontal ligament system on the surrounding alveolar bone, due to the maintenance of the periodontal proprioceptive system, excessive occlusal forces are also avoided. It was considered extremely useful to keep the last teeth at the level of the arch, in order to reduce as much as possible, the bone atrophy at this level, given that at the level of the antagonistic arch there were natural teeth or fixed prostheses capable of exerting high occlusal pressures.

Avoiding the appearance of supraliminal forces due to the modulation of muscle activity by signals from periodontal proprioceptors, has the effect of avoiding functional bone overload at the level of the alveolar ridges and maintaining within confined limits the physiological process of atrophy, both around the remaining root and even remoted biological tissues.

Although carious lesions were one of the most common diseases detected at the level of root abutments during regular examinations, this was not the main cause of the extraction of dental abutments kept under the prosthesis. It has also been observed that the consistent application of mycobacterial plaque control means and caries prophylaxis methods have effectively reduced the incidence of caries.

Wear is another phenomenon that accelerates the corrosion process in vivo. Through this mechanism there are micro particles detached from the mass of metal dental prostheses,

which, together with metal ions (especially Cu, Ni, Co, Cr, Be) and salts, are able to interact locally with periodontal tissues. The role of these ions in oral inflammatory diseases (gingivitis, superficial or deep periodontitis) is certainly not elucidated, although in vitro studies reveal the interaction between metal ions and fibroblasts.

Along with the quality of the processing of the external surfaces of the dental prostheses, another determining factor that influences the development and magnitude of the corrosion phenomenon is represented by the architecture of the dental prosthesis (bio-prophylactic principle of making dental bridges).

CONCLUSIONS

The technique of overdenture on root abutments is addressed to patients to whom fixed prosthetic treatments are not applicable due to a too small number of remaining teeth and with a reserved periodontal prognosis. This treatment postpones for a long time the installation of total edentulous state, achieves a good prophylaxis of the prosthetic field (in the sense of reducing the progression of the atrophy phenomenon), avoids as much as possible the psychological and functional inconveniences related to the installation of total edentulous state. These patients may perceive the extraction of the last teeth as a dramatic organic amputation, with influences on their personality as well as on their social life.

The initial oral hygiene of some patients, although it is a recognized benchmark in choosing the treatment indication, developing the prognosis and monitoring the patient over time, is not a guarantee of the success of the therapeutic method over time.

The prognosis of any type of removable denture and especially overdentures, as well as the evolution of the dento-periodontal and muco-bone substrate depends essentially on the patient's ability to maintain proper hygiene and the regularity of dental appointments at agreed periods with the attending physician.

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