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CLINICAL-TECHNOLOGICAL INTERACTIONS OF TREATMENT IN PARTIALLY EXTENDED EDENTULOUSNESS

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Abstract :

The study aimed to individualize the classical versus digital therapeutic methods of prosthetics, anchored in partially removable prosthetics with metallic or non-metallic infrastructure. The detection by clinical and paraclinical methods of the whole range of post-edentulous complications constitutes an essential condition of targeted therapy but also a starting point for the rigorous selection of the dental materials involved and the requirements related to the rendering of a high fidelity morphology grafted on the particularities of the clinical case.For greater precision in the clinical-technological algorithm of partially extended edentulousness rehabilitation, digital models were also recorded.Modern techniques and technologies of intraoral scanning and digital design of the therapeutic solution contribute significantly to the development of a high-performance clinical-technological algorithm, oral scanning eliminates many of the classical steps of making the prosthesis and provides greater accuracy of recording impressions, and digital designs will eliminate the classical step of casting models avoiding changes that can occur through contact reactions of the plaster.

Key words: edentulous patients, removable prostheses, dental materials;

The choice of the therapeutic solution in the complex territory of the partially extended edentulousness is the result of a careful analysis of the particularities of the prosthetic field, a particular attention being paid to the evaluation of the periodontal support, of the muco-bone support, of the presence of local, loco-regional, or general complications in conjunction with the aspects of the paraclinical evaluation[1-15]. For greater precision in the clinical-technological algorithm of partially extended edentulousness rehabilitation, digital models were also recorded. The advantage of this technique is the high accuracy, but also the saving of time and materials. Elastic non-metallic biomaterials associated with the injection technique can be considered a very good solution for partially removable dentures, they offer resistance over time, they are flexible, so they do not bother the patient, they are 100% biocompatible, they integrate perfectly with the dental tissues.

Modern techniques and technologies of intraoral scanning and digital design of the therapeutic solution contribute significantly to the development of a high-performance clinical-technological algorithm, oral scanning eliminates many of the classical steps of making the prosthesis and provides greater accuracy of recording impressions, and digital designs will eliminate the classical step of casting models avoiding changes that can

occur through contact reactions of the plaster[16-25].
To increase the chances of long-term success, the design of skeletal prostheses should be made as simple and efficient as possible. At the same time, however, the clinician must be constantly concerned about the protection of the supporting tissues (abutment teeth, mucosa, and alveolar bone), on whose strength the longevity of the treatment directly depends. In order to achieve this protection effectively, the practitioner must assess the forces acting on the prosthetic field in the present edentulousness as well as the transmission of these forces through the prosthesis and anchorage systems. The vertical movement of disengagement is slowed down by the retention achieved by brackets or special systems and also by the friction of the primary and less so of the secondary braces[26-36].

The study aimed to individualize the classical versus digital therapeutic methods of prosthetics, anchored in partially removable prosthetics with metallic or non-metallic infrastructure. The detection by clinical and paraclinical methods of the whole range of post-edentulous complications constitutes an essential condition of targeted therapy but also a starting point for the rigorous selection of the dental materials involved and the requirements related to the rendering of a high fidelity morphology grafted on the particularities of the clinical case.

Material and Method

A total of 52 clinical cases diagnosed with partially edentulous teeth were analyzed, the therapeutic solutions being anchored in both the classic and modern registers, the essential element in these choices being the particularity of the case.

Results and discussions

The concern for the design of skeletal prostheses meets the patients' desire to obtain prosthetic restorations of edentulous arches that are as aesthetic and less visible as possible.

The design of skeletal removable partial dentures must be based on a thorough analysis of their movement possibilities during the exercise of the functions of the dento-maxillary apparatus. The components of the skeletal prosthesis, necessarily including braces and special retention systems, are used to counteract these movements.

The variety of solutions offered by contemporary dentistry - different materials, different technologies, customized approaches - is highly appreciated by both patients and clinicians. However, complex cases continue to pose many challenges. Especially for dental technicians, extensive rehabilitation of the maxillary and mandibular arch is often necessary. In these cases, it is important to get an overview of the case, analyze it in detail and then develop a treatment plan.

A first representative case for the aspects of interest regarding the interrelation between clinical elements and technological finality is anchored in the register of classical skeletal prosthesis emphasizing the importance of choosing the therapeutic solution in accordance with the positive and negative clinico-biological indices of the case diagnosed with Kennedy class II partial edentulousness. The treatment plan chosen was a removable prosthesis with Ackers brackets on the teeth limiting the edentulous gaps and a dento-mucosal plate as the main connector.

Among the first laboratory steps carried out was the casting of the hard plaster documentary model which is obtained after recording the documentary impression to establish the prosthetic treatment.

The documentary model is used to: specify the clinical diagnosis of the edentulousness, analyze the remaining arches, analyze the intermaxillary occlusion ratios

The doctor is obliged to analyze the study model and the technician the final model. Before this analysis, the doctor has already established the abutment teeth and the place of the stud slots.

Once the skeleton design was finalized, the individual acrylic self-polymerizing impression tray was made. In order to keep the thickness of the impression tray uniform, it is recommended to lay it on a sheet of cyclophane and apply the self-curing acrylate by lightly pressing it onto the model by means of the film. After pressing and fitting on the model, the surplus that appears at the periphery of the prosthetic field we cut off at the level of the marks that establish the edges of the impression tray on the model.

A particularly important step in the clinical-technological algorithm for the creation of the skeletal prosthesis is the analysis of the model on the surveyor (Fig. 1). The same steps are followed as in the preliminary model analysis: determination of the insertion axis, drawing of the equator, determination of the position of the tip of the hook retaining arm, drawing of the skeletal outline

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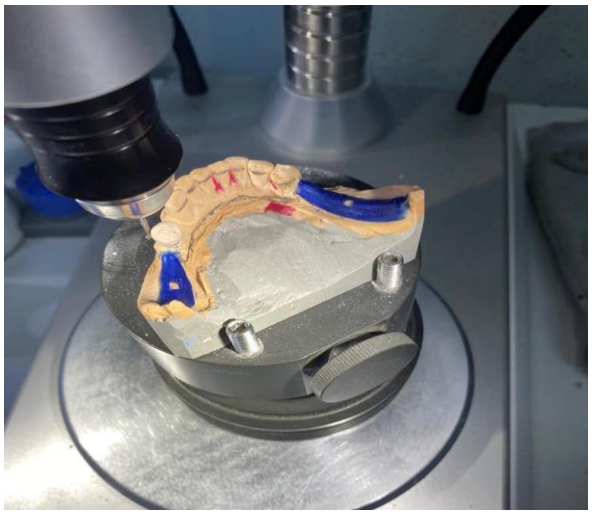

Fig.1– Surveyor analysis

The model is then prepared for duplication by de-inking, filming, and engraving.

By blocking out, wax was applied under the prosthetic equator of all remaining teeth, and at the level of the abutment teeth under the path of the retentive arms of the cast brackets. The alveolar ridges and the path of the main connector were filmed with 0.25 mm calibrated wax (fig.2, fig.3).

Fig.2 – Blocking-out

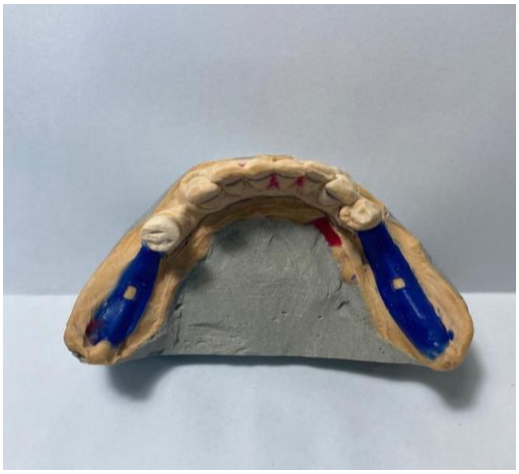

Fig.3 - Filming

The modern technique with irreversible silicones in bicomponent form was used to duplicate the functional model.

The 2 liquids, base, and activator are mixed and poured over the duplicated model. After the silicone has set, the model is released by gentle traction.

The duplicate model is dried by placing it in an oven at 100 degrees for 15 minutes.

Fig.4 – Conformer for duplication

Fig.5 – Duplication of functional model

The model of the skeleton cast on the duplicate model was made, which will be part of the wax print by preformed and adapted elements(Fig.4, Fig.5).

After the mounting mass was set, the mold was created .It represents the negative image of the model, being a cavity piece that connects to the outside through the diverting channels of the molten alloy. In order to obtain it, the preheating and heating of the conformer with the mounted model was carried out.

The heating stage was carried out in the calcination furnace, at a higher temperature, slowly increasing from 400^0C to 760-800^0C, and a longer time, about 45 minutes. All traces of wax were removed, the walls of the mold were completely dried and thermal expansion of the mold was carried out, the temperature of the mold being close to the melting temperature of the alloy.

A Ni-Cr based non-noble alloy was used to make the metal component. This type of alloy has good fluidity, hardness, elasticity and low thermal conductivity, and the melting range is between 1260 and 1350oC.

The casting of the alloy is carried out under the action of centrifugal force, this type of centrifuge having two available speeds.

Mechanical machining of the metal skeleton consists of sandblasting, cutting the casting rods and planishing the external surfaces.

Fig.6 – Metallic infrastructure after dismounting

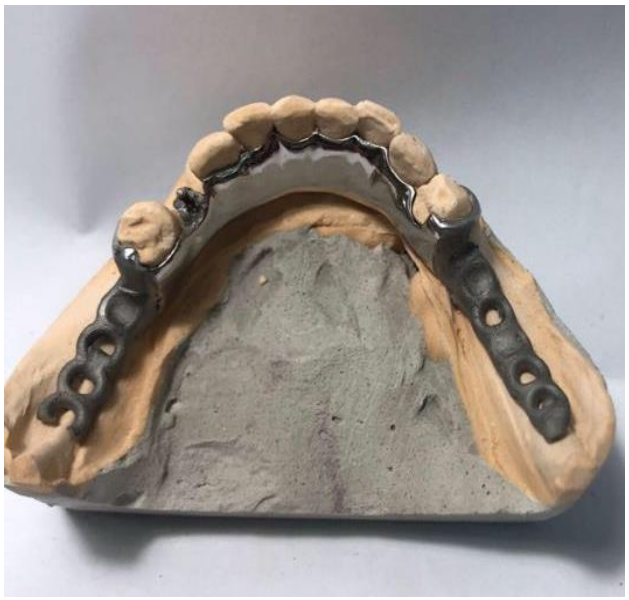

Fig.7 – Processed metallic infrastructure

Sandblasting is carried out both to clean the surface of the metal skeleton of traces of gypsum and to condition its surface by making micro-retainers that will create a strong bond between its surface and the ceramic composition. This technological step is achieved by projecting a jet of sand particles, under pressure, onto the metal infrastructure(Fig.6, Fig.7).

The cutting of the casting rods is carried out using carborundum discs applied to the micromotor. The planing of the external surfaces consists of removing the pluses with the help of a high-grain abrasive tool in order to adapt the metal infrastructure.

After fitting the metal infrastructure to the model, it was polished with brushes, cotton fluff, filaments, together with the polishing paste, to obtain the gloss of the external surfaces.

The metal framework is fitted to the functional model, then it was checked that: the occlusal spurs on 3.4 and 4.4 have entered their sockets, the incisal jaws are in contact with the front teeth, the metal saddles and the main connectors are correctly located in relation to the surface of the prosthetic field.

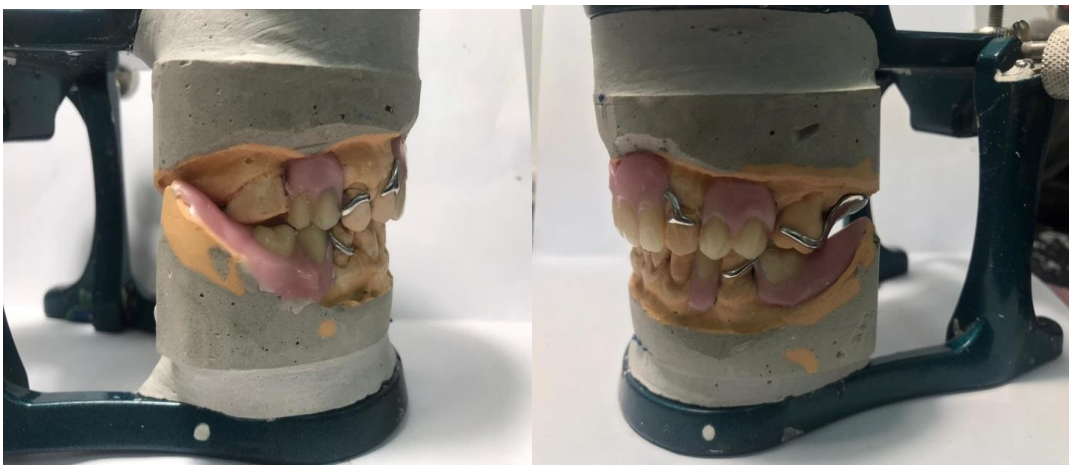

Fig.8 –Technological stage with teeth mounting

The general rules for fitting teeth have been followed which require that:

- each artificial tooth must articulate with two antagonists
- the artificial teeth should be fitted in the middle of the alveolar ridge
- the teeth of the two arches meet each other along a plane, called the occlusal plane, which forms three curves: sagittal, transverse, frontal
- in centric relationship there is maximum intercuspation between the two arches; in protrusion there must be at least three points of contact: one frontal and two lateral, and in laterotrusion there must be contacts on both the active side and the balance side(Fig.8).

We modelled the edges of the model up to the bag bottoms. For the completion of the model, we followed the objectives: physiognomic, phonetic, mechanical strength, maintenance and stability, hygienic-prophylactic.

In the lateral region, the buccal slope is shaped slightly concave vertically, when the tone of the buccal muscles is normal, and the atrophy of the alveolar ridge is reduced. The lingual side is shaped slightly concave for phonetic function and stability of the prosthesis.

Converting the model into an acrylic component; for this stage we used the heat-curing acrylate technique following the sub-stages: mounting, printing, acrylate introduction into the mold, polymerization, dismounting, processing(Fig.9).

Fig. 9 – Prosthesis end result

After the doctor's checks, the skeletal prosthesis model is mounted in the sink to make the acrylic component. Polymerization is then carried out according to the acrylate polymerization regime used.

The dismounting of the prosthesis is carried out carefully so as not to deform the components of the metal infrastructure, and the dismounted prosthesis is processed only at the level of the acrylic component, a process that consists of removing excess acrylate, smoothing, and polishing with brushes, special polishing pastes, steps detailed in the previous case.

The second clinical case was diagnosed with partial edentulousness and is anchored in the non-metallic register of removable dentures. The analysis of the clinical features was carried out on scanned models, identifying positive and negative clinico-biological indicators, which were the basis for the planning of subsequent clinical-technological steps. The therapeutic solution for the maxilla was a Valplast partially removable elastic prosthesis and for the mandible a mixed prosthesis was chosen, combining a fixed ceramic prosthesis on a metal skeleton made by laser technique (layering technique) and a partially removable elastic prosthesis.

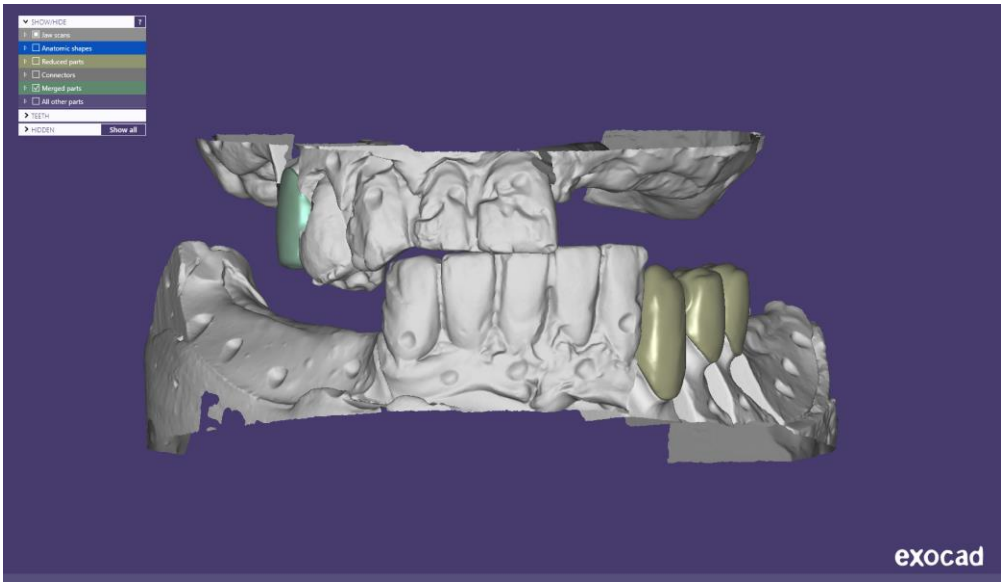

Fig.10 Practical aspects of Exocade asplication

The contribution of the modern Exocad technique of design and planning of the fixed prosthesis has been extremely important in the precision of the adaptation of the restoration(Fig.10).

Conclusions

Rigorous analysis of positive and negative local, loco-regional, and general clinical-biological indicators, in conjunction with the paraclinical evaluation of choice, are relevant starting points for planning therapeutic solutions anchored in the classical or modern register, the aspects of interrelation between the two territories, clinical and technological, leading to a successful clinical outcome in accordance with the particularity of the clinical case.

Technological advances in the realization of removable partial dentures have the potential to replace much of the conventional laboratory work steps with the use of scanning devices, three-dimensional computer simulation software for prosthetic reconstruction and stereolithographic printing techniques. The economic advantages, simplification of procedures and time savings offered by printed prosthetic fabrication technology should be considered in a treatment decision that includes increased attention to the clinical stages of occlusal equilibration after prosthetic fitting.

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