ARTICLES SCIENTIFIQUES

Contribution of preprosthetic surgery in the optimization of removable prosthesis : Case series

Apport de la chirurgie préprothétique dans l'optimisation des prothèses amovibles : Série de cas

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Abstract

The mandibular and maxillary anatomy of a significant number of partially or totally edentulous patients is not favorable to the integration of removable prosthesis. These defects can be acquired or innate.

Pre-prosthetic surgery is always part of an overall treatment plan. Any element unfavorable to the success of the prosthetic project must, if possible, be modified to come as close as possible to the "perfect recipient site" described by removable prosthesis specialists.

The aims of this work were to highlight, through a series of cases, the importance of pre-prosthetic surgery on the elimination of certain abnormalities of hard and soft tissues for successful removable dentures placement, integration and durability.

Key words

Removable denture- Preprosthetic surgery- Prosthetic balance- Partial edentulism- Total edentulism

Résumé

L'anatomie des arcades mandibulaire et maxillaire d'un nombre important de patients partiellement ou totalement édentés n'est pas favorable à l'intégration de prothèses amovibles par la présence de défauts architecturaux. Ces défauts peuvent être acquis ou inné.

Face à ses situations, la chirurgie pré-prothétique trouve pleinement ses indications. Cette chirurgie fait toujours partie d'un plan de traitement global. Tout élément défavorable à la réussite du projet prothétique doit, si possible, être modifiée pour se rapprocher le plus possible au « site receveur parfait » décrit par les spécialistes des prothèses amovibles.

L'objectif de ce travail était de mettre en évidence, à travers une série de cas, l'importance de la chirurgie pré-prothétique dans l'élimination de certaines anomalies des tissus durs et mous pour permettre et optimiser l'intégration des prothèses amovibles.

Mots clés

Prothèse amovible- Chirurgie préprothétique- Equilibre prothétique- Edentement partiel- Edentement total

INTRODUCTION

During his daily practice, the dentist is often confronted with patients presenting partial or total edentulism with unfavorable anatomical conditions hindering any adequate prosthetic rehabilitation [1].

The presence of an unfavorable osteo-mucosal environment will therefore imposes a pre-prosthetic surgery which was defined a long time ago as "surgery which makes it possible to improve the wearing of dental prostheses" [2]. Therefore its ultimate objective is to modify local conditions in order to improve prosthetic stability.

Pre-prosthetic surgery is divided into two categories, it can be either by subtraction or by addition [3,4].

The aims of this work were to highlight, through a series of cases, the importance of pre-prosthetic surgery on the elimination of certain lesions and abnormalities of hard and soft tissues for successful removable dentures placement, integration and durability.

CLINICAL OBSERVATIONS

Clinical situation n°1: Tuberosity hypertrophy

A 55-year-old patient in a good general health consulted the prosthetic department for an oral rehabilitation with functional requests.

The intraoral examination revealed a bilateral terminal edentulism of medium extent in the

maxillary arch bordered by the 15-12-11-21-22 and the 25. In the mandible, there was a moderately extensive bilateral edentulism bordered by the 35 and the 46. The 46 was treated endodontically and restored with a bulky amalgam. The 34 and 35 also had coronal amalgam fillings.

The osteomucosal examination showed in the maxilla a high and wide crest covered with adherent fibromucosa. The tuberosities were very large and the palate was moderately deep (Figure 1A).

In the mandible, the edentulous ridges were moderately high and wide and covered by a thin fibromucosa (Figure 1B).

The radiological examination revealed a radiological crown radiological root ratio less than 1 for all maxillary teeth except the 25 with a ratio more than 1 and the 15 with a ratio equal to 1. The patient had two horizontal impacted maxillary canines.

In the mandible, the residual teeth had a radiological crown radiological root ratio less than 1 except the incisors whose ratio was equal to 1 (Figure 1C).

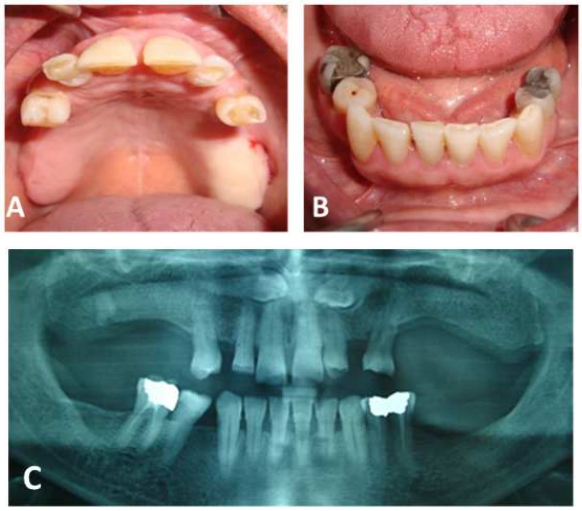

Figure 1 Initial situation : A: Endo oral view of the maxillary arch; B: Endo oral view of the mandibular arch ; C : Panoramic X-ray

Study casts analysis on the articulator showed a large volume of tuberosities causing insufficient occlusal height (Figure 2), or even none in the level of the left tuberosity.

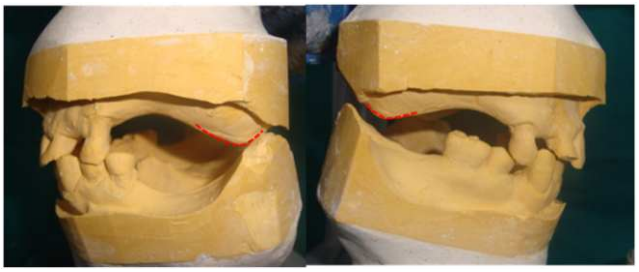

Figure 2 Study casts analysis on the articulator

Following clinical and additional examinations, the prosthetic decision was to realize a combined prosthesis in the maxillary arch with a metal-resinous bridge going from the 15 to the 22 and a metallic framework removable partial denture with two extra coronal attachments as complementary retention means.

In the mandible, a metallic framework removable partial denture with two metal-resinous crowns on the 45 and the 46 replacing the 44 in mesial extension and two crowns on the 34 and the 35 were indicated.

The feasibility of this treatment option was closely related to the provision of sufficient prosthetic height, therefore, surgical correction was indicated in order to recreate a prosthetic space compatible with an adapted occluso-prosthetic concept.

The tuberosity hypertrophy for this patient was due to the increase in bone volume. An osteotomy was carried out with the essential prerequisite of making a surgical guide after simulating the surgery on the study cast (Figure 3).

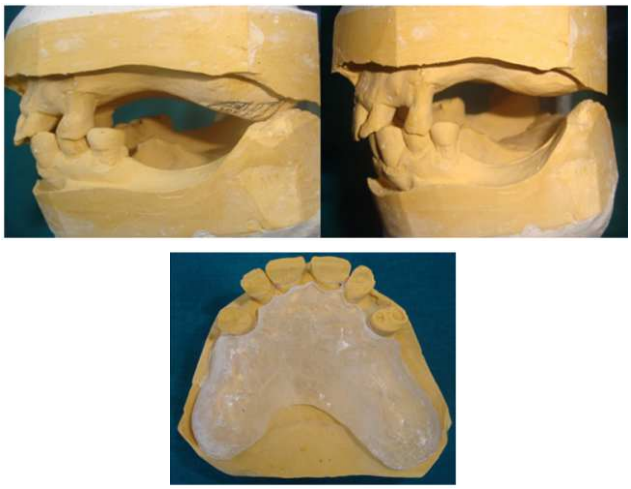

Figure 3 Simulation of surgical reduction on a plaster cast and creation of the surgical guide

The surgical protocol consisted of a crestal incision ending distally in an arcuate manner. After that, a full thickness flap was detached revealing an underlying hypertrophic bone tissue. Bone resection will first be done using rongeurs. Then, a careful regularization of the bone surface using a bone rasp or bone mill was carried out. Suturing the edges of the flap was the last step (Figure 4).

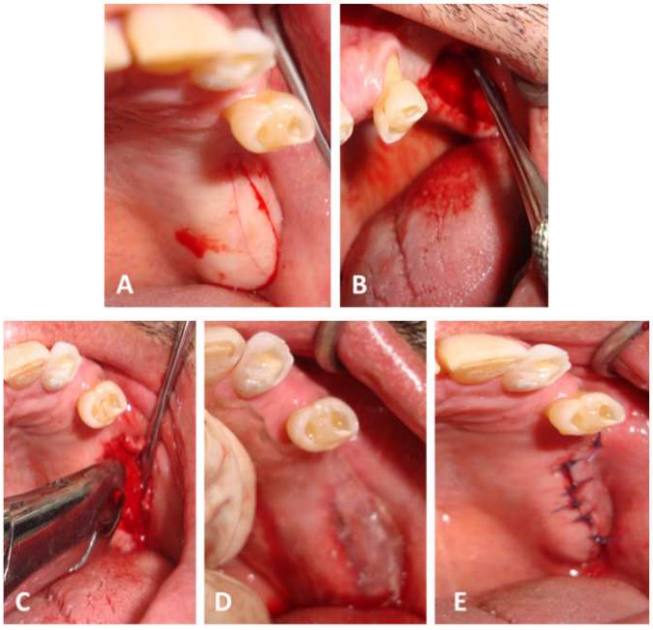

Figure 4 Surgicel steps:A: Crestal incision ;B: Full thickness flap detachment ;C: Osteoplasty ;D: Control of the surgical reduction using the elaborated surgical guide ;E: Flap repositioning

The creation of a temporary prosthesis which takes into account the elimination of tuberosity hypertrophy was planned in advance. This prosthesis was placed in the mouth immediately after the surgery. Its lower surface was filled with a delayed setting resin which will serve as a surgical dressing and guide to healing.

After healing, the anatomical conditions were optimized and the stages of prosthetic elaboration were undertaken. The final result was very satisfactory for the patient (Figure 5).

Figure 5 Final result

Clinical situation n°2: Vestibuloplasty

A 68-year old patient came in consultation for an oral rehabilitation with functional request. In the maxillary arch, there was a complete edentulism. The crest was moderately high with insufficient height of attached gingiva, the palate was wide and tuberosities were well formed.

The frenulum insertions were low, which could interfere with the prosthetic edges and harm the stability of the prosthesis. The mandibule was completetly toothed (Figure 6 A,B).

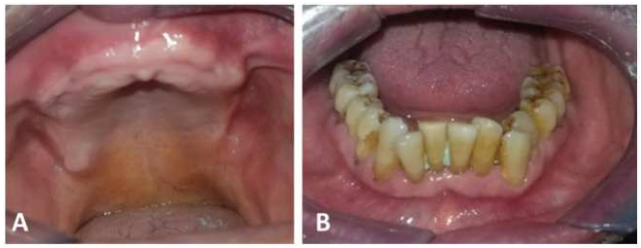

Figure 6 Initial situation: A: Insufficient depth of the vestibule at the maxillary level ; B: Endo-oral view of the mandibule

In order to garantee the stability and the retention of the removable complete prosthesis, a vestibuloplasty was indicated. A complete prosthesis was made beforehand on a plaster cast on which the surgery was simulated will serve as a surgical guide.

After perioral and intraoral disinfection, local anesthesia was performed. A crestal incision was made, then the alveolar mucosa was prepared in a pocket half-thickness in the apical direction. A frenectomy was also realized. The removable prosthesis was used to control the depth of the vestibule (Figure 7 A,B).

Finally, The flap was repositioned then sutured apically. This prosthesis was placed in the mouth immediately after the surgery. Its lower surface was filled with a delayed setting resin to guide tissue healing (Figure 7 C,D). The tissue conditioner was renewed first every 3 days, then every week for the first two months, subsequently an indirect relining of the prosthetic intrados was carried out.

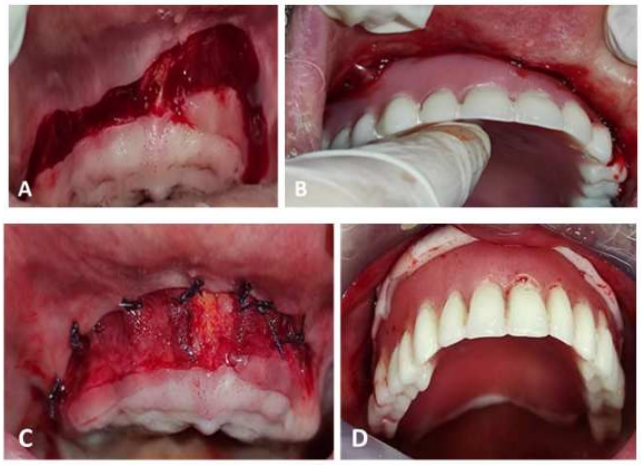

Figure 7 Vestibuloplasty: A:Incision at the mucco-gingival line of reflection; B: Control of the depth of the vestibule using the prosthesis; C: Fixation of the flap in a more apical situation; D: Tissue conditioning

Clinical situation n°3: Frenectomy using the conventional technique

A male patient consulted the prosthetic department for a prosthetic rehabilitation. The oral examination revealed a total edentulism in the maxillary arch. The mandibule was toothed.

The crest was high and wide covered with adherent fibromucosa with no undercuts. The palate was wide and tuberosities were well formed. The insertion of the labial frenulum is low with a gingival location.

The prosthetic decision was to realize a complete maxillary removable denture. In order to avoid the instability of the prosthesis or injuries of mucous membranes due to the repulsive effect of the frenulum, a frenectomy was indicated.

After local anesthesia, the frenelum was highlighted by traction on the upper lip and the bleached part was grasped using hemostatic forceps. The frenulum was incised using a blade. The incision lines were made on either side of the instrument, the fibers were dissected down to the bone. The incisions must encompass all of the insertions. The incision lines drew two triangles whose common basis was taken from the pliers. The tissue diamond thus formed was then eliminated. The wound also drew a diamond shape. The edges of the wound were sutured with separate stitches (Figure 8 A to E).

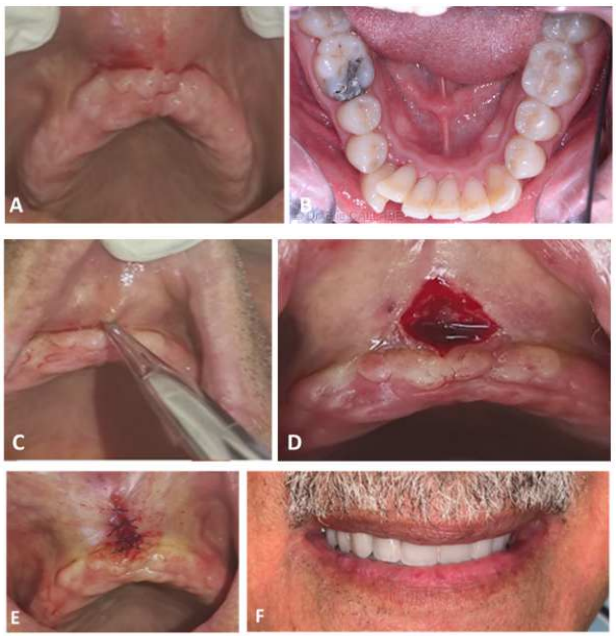

Figure 8 Frenectomy according to the conventional technique: A and B: Endo oral views of the maxillary and mandibular arches; C: Pinching of the frenulum by a hemostatic forceps ; D: Incision making; E: Wound suture ; F: Final prosthetic result

The prosthetic phase was started after complete healing (Figure 8F)

Clinical situation n°4: Laser frenectomy

A female patient came in consultation for an oral rehabilitation. The oral examination revealed total edentulism in the mandibular and maxillary arches. The crest was moderately high and wide covered with adherent fibromucosa at maxillary and mandibular level. In the mandibule, the labial frenulum has a gingival insertion (Figure 9 A,B).

Complete mandibular and maxillary removable dentures were indicated. It was necessary to optimize the balance of the future mandibular prosthesis by a frenectomy prior to the prosthetic restoration.

The laser used in this case was an Nd:Yag. It was equipped with a fiber optic which delivers the energy and it was introduced inside a handpiece which allows easy use and high tactile sensitivity. This Nd: Yag laser acts in pulsed mode, working in direct contact for surgery of soft tissues [5].

The soft tissue incision was simply made. Pulling on the lip highlights the frenulum which becomes tensioned. The tip of the laser fiber was then directed along the incision (Figure 9 C,D).

The laser energy is delivered by pulse (20 pulses per second), the practitioner worked in contact mode by maintaining the laser fiber moving along the incision, which is essential to avoid carbonization of tissues and deep damaging effects (Figure 8). In fact, the duration of tissue exposure is associated with increased temperature in situ.

Sutures are usually not necessary and the wound will heal by second intention. After healing,final impressions were taken (Figure 9 E).

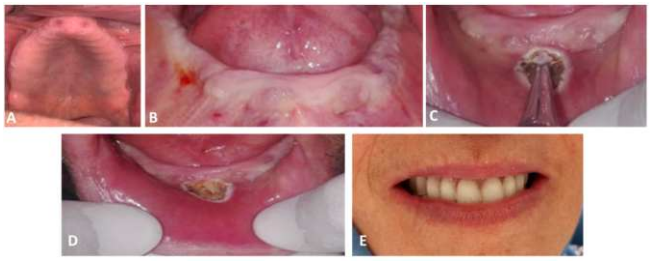

Figure 9 Frenectomy according to the laser technique: A and B: Endo oral views of arches; C and D: Surgical phase; E: Final result

Clinical situation n° 5: Hyper mobile ridge management

A female patient consulted the prosthetic department for an oral rehabilitation. The oral examination revealed terminal bilateral edentulism in the maxillary and mandibular arches bordered respectively by the 15, 24, 35 and the 45. The examination of the bone mucosa support surfaces revealed a high and wide crest covered with hyperplastic fibromucosa in the maxillary left edentulous sector (Figure 10 A,B). Periodontal probing as well as radiological examination show excessive thickness of the fibro-mucosa.and a bone hypertrophy, which leads to a decrease of the available prosthetic space in the left edentulous sector (Figure 10 C,D).

The prosthetic decision was to make resin removable partial dentures. Preprosthetic surgery for mucosal thinning associated with osteotomy was indicated.

After local anesthesia, an orange quarter incision was realized in order to eliminate excessive thickness of the fibromucosa followed by a full thickness flap detachment. The bone tissue was eliminated using gouge pliers, then surfaced by the bone rasp. Flap repositioning was then carried out (Figure 10 E,F,G).

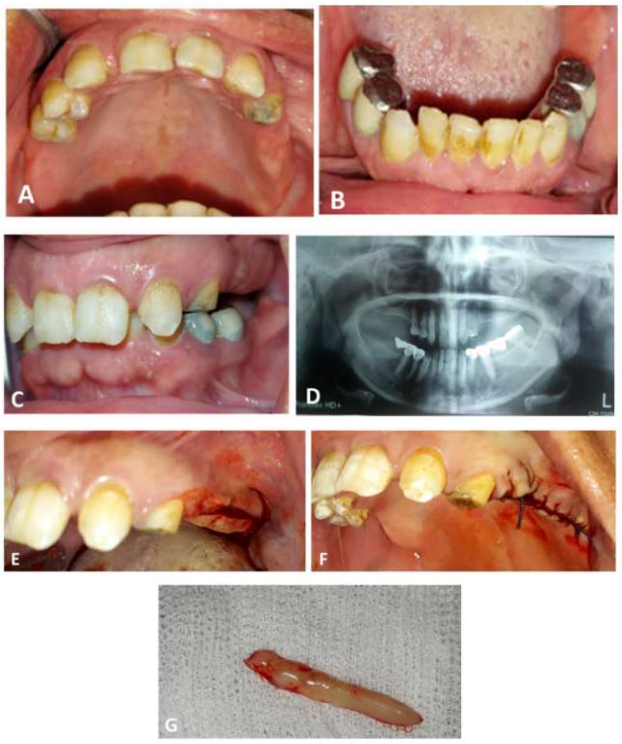

Figure 10 Hyper mobile ridge thinning: A and B: Endo oral views of arches; C: Hyper mobile ridge reducing the available prosthetic space; D: Panoramic X-ray; E: Crestal incision, mucosal thinning and osteotomy; F: Flap repositioning ;G: The removed mucos membrane.

After healing, prosthetic procedures were carried out starting with anatomo-functional impressions. The patient was satisfied with the final result (Figure 11).

Figure 11 Functional integration of the prosthesis

Clinical situation n°7: Elimination of epulis fissuratum

A female patient consulted the prosthetic department with a chief complaint of an extensive lesion at the level of the anterior edentulous sector related to an unstable prosthesis with an overextended edge that the patient had been wearing for a year.

The oral examination revealed the presence of an epulis fissuratum in the anterior region of the maxilla (Figure 12).

Figure 12 Epulis fissuratum in the anterior region of the maxilla

Excision surgery was immediately indicated given the size of the lesion. The surgery consisted of excision of the entire lesion including points bone anchors. A thorough curettage of the implantation area was carried out with a sharp curette. The edges of the flap were then sutured (Figure 13).

The tissue conditioning was undertaken. The conditioner was placed at the level of the old prosthesis after eliminating the extension and ensuring occlusal equilibration. Making a new prosthesis was planned after complete healing.

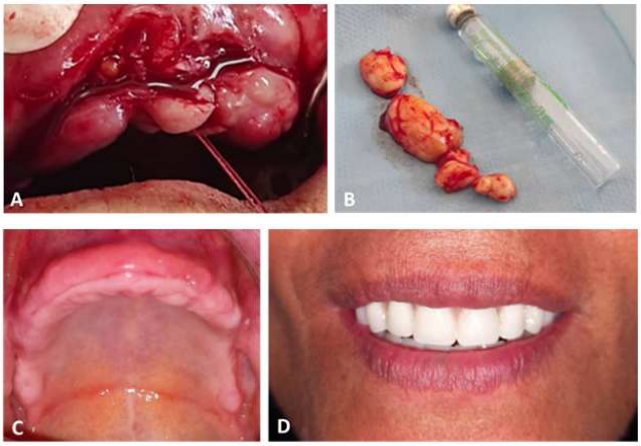

Figure 13 Epulis fissuratum removal: A: Chirurgical phase; B: The eliminated fibrous tissue ; C: Excision site healing; D: Prosthetic rehabilitation after tissue removal

DISCUSSION

For certain patients candidates for removable dentures, the incorporation of surgical interventions into a removable prosthesis treatment plan could be the determining factor for prosthetic success.

The objectives of preprosthetic surgeries are to:

-Ensure good stability through the increase of the functional biological space as well as the prosthetic support surfaces.

- Ensure the retention of the prosthesis through improving the shape, volume and degree of depressibility of the reflection lines of the mucosa.

-Ensure sustentation of prosthesis through restoration of the intrinsic qualities of the osteo-mucosal tissues of the maxillary and mandibular support surfaces [6].

The indication of preprosthetic surgery results from a rigorous clinical examination [7]. Great attention must be given to detect possible contraindications to surgical interventions, or the necessity of special precautions. Visual examination and palpation of all surfaces likely to be in contact with the prosthesis are necessary to note negative biological indices requiring a surgical procedure (irritative spines, undercuts, areas of hyperplasia, flanges, etc)

Thus, close collaboration between prosthodontists and pathologists is essential to ensure the integration of the future prosthetic device and sometimes even allow prosthetic creation.

In this context, several preprosthetic surgeries can be performed like osteoplasty, paratuberosity undercut removal, tuberosity hypertrophy elimination, vestibuloplasty, frenectomy, mucosal thinning.

Osteoplasty has just been imposed to improve the comfort of wearers of removable dental prosthesis.

It is a simple, quick and safe procedure but an error in indication will lead to a loss of bone height and therefore a loss of stabilizing elements for the future prosthesis [7].

Tuberosity hypertrophy removal allows, on the one hand to facilitate the insertion of the prosthesis and, on the other hand, to arrange the prosthetic space.

A vestibuloplasty may be indicated in the presence of a reduced depth of the vestibule caused by frenulum insertions, flanges and muscular insertions which constitute a major disadvantage from a mechanical point of view to retention and stability [8]. The vestibuloplasty allows the vestibular extension of the prosthesis. Consequently, its retention and stability increase significantly. When a vestibuloplasty is performed, it is imperative that a prosthesis, perfectly adapted to the new mucosal structures, be placed immediately after surgery to guide healing and avoid mucosal reattachment leading to recurrence.

Mucosal thinning certainly offers a benefit for the prosthetic balance by increasing the stability of the removable prosthesis.

Frenectomy in its turn improve prosthetic stability by removing frenal insertions which tend to destabilize the prosthesis during functional movements. The use of recent technology, such as the laser technique, has multiple and various benefits. Indeed, the laser is less painful than the classic scalpel and requires less anesthetic. It is easy to use and the cutting procedure is precise due to the perfect visibility [9].

Thanks to its sterilizing power, laser can reduce the levels of bacteria and other pathogens at the surgical site. It leads to good hemostasis and the reduction or elimination of the need for sutures. Post-operatively, after-effects of surgery are reduced [9].

Surgery may also be indicated to correct pathological conditions created by wearing poorly fitted prosthesis such as the case of epulis fissuratum, which is an inflammatory fibrous hyperplasia of the oral mucosa [10,11]. The diagnosis is obvious, but the anatomo-pathological examination allows it to be confirmed and to appreciate the appearance of this tumor [12].

The different surgical procedures served as an effective aid for the fabrication of well-fitting and comfortable prosthesis [13]. Certain rules must be respected. In fact the pre-prosthetic surgery must be:

- Economical at the tissue level, so it is

ecommended to simulate the surgery on the cast and to make a surgical guide in transparent resin [14]. This surgical guide will be used to guide the osteoplasty by transferring the corrections made on the cast to the patient's mouth and to visualize areas of tissue compression to be eliminated in order to avoid any pain [15].

- Carried out under anesthesia
- Completed with non-compressive stitches
- At the end of each surgical procedure, the management of healing and temporization are therefore also necessary for the success of the treatment.

Followed as much as possible by tissue conditioning and rigorous healing control.

Several tissue conditioning materials can be used such as Kerr's Fitt, viscogel, co-comfort... The prosthesis would be temporarily relined with this soft, delayed-setting resin. Patients are asked to wear their rebased prosthesis for at least 4 to 6 weeks and to remove it for hygiene reasons. Periodic check-ups are necessary to maintain the obtained results.

Tissue conditioning allows the restoration of adequate histological, morphological and physiological environment most favorable to the new prosthetic function, for all mucosal and submucosal tissues in contact with the intrados and prosthetic edges. It helps to expand and exploit the support surfaces as much as possible, in order to optimize the distribution of occlusal loads [16].

CONCLUSION

Preprosthetic surgery, as its name indicates, is a part of a treatment plan which must result in a biofunctional prosthesis respecting the dental and osteo-mucosal support structures.

Surgical techniques are constantly evolving, with a view to facilitate surgical procedures and surgical consequences, so the practitioner must be able to follow this continuous development in order to offer the best services for the patient.

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None

CONFLICT OF INTEREST

Authors declare that they have no conflict of interest.

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