

Selective grinding and neuro-occlusal rehabilitation

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Abstract

The characteristics of the modern human diet do not favour normal tooth wear. This lack of evolution of the occlusal morphology will be responsible for limitations in mandibular lateral movements and masticatory work.

When masticatory impotence is detected, artificial wear of the cuspid reliefs should be performed as soon as possible.

These grindings, called selective by Pedro Planas, make it possible to free the mandibular lateral movements and to rehabilitate the masticatory function.

Physiological, unilateral and alternating chewing function allows for «happy growth» of the jaws and maintenance of a healthy masticatory system.

Keywords: Selective grinding; Neuro-occlusal rehabilitation; Masticatory impotence; Characteristics.

1. Introduction

For Pedro Planas, a balanced occlusion is an occlusion where «all the mandibular teeth articulate, up to bordering occlusion, with all the maxillary counterparts, with the exception of the canine on the non-working side during mandibular occlusal displacements» [1].

During the clinical observation of the occlusion, the laterality movements must be correctly performed since they reflect mastication.

Although the laterality movement is not functional in itself, it is nevertheless the one that best imitates the masticatory functional situation: it is the movement that the clinician must examine to study the patient's mastication.

It should be noted that the muscular work developed during mastication and the resulting interdental friction constitute demands on various growth processes of the jaws and provoke morphological adaptations of the structures which will then appear as a signature of physiological or pathological masticatory behaviour [2].

If masticatory work is strongly solicited by a hard, non-softened or tenderised diet, this results in forces and important muscular work which will abundantly stimulate adaptive growth responses from tissues (membranous sutures, periosteum, condylar cartilage...) whose potential for mitosis, remodelling and mineralisation is great in young age [3, 4, 5, 6].

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Efficient and powerful mastication contributes to increasing the dimensions of the jaws, especially transversely, which allows the final dentition, and in particular the incisors, to find sufficient space on the dental arches and to align harmoniously [7].

These balanced forces will ensure that the morphological and functional relationships between the two dental arches are coordinated and that the dental intercuspitation progresses towards an attritional occlusion, reflecting the efficiency of the masticatory system.

Unfortunately, in our time and in our industrialised societies [8], most children are given a tenderised, softened or even semi-liquid diet from a very early age, which hardly requires any masticatory work. This often leads to a kind of functional atrophy, a masticatory impotence, where muscle work is greatly reduced but also where mandibular movements are profoundly impaired. Mastication then often consists of vertical opening and closing movements without lateral displacement and therefore without occlusal friction.

Faced with the weakness of the forces involved, the processes of adaptive growth are little solicited, the occlusal surfaces hardly wear out and the cusps retain their initial height (in particular the canines) which does not facilitate lateral excursions because the masticatory functional angles of Planas (FMAP), instead of gradually reducing, remain very open.

Another type of dysfunctional chewing may appear, that is dominant unilateral chewing [9, 10] or even exclusive one-sided chewing. Over the months and years, the persistence of functional asymmetry will lead to morphological asymmetries.

The quality of the masticatory function is therefore a determining factor in obtaining the harmonious development of the masticatory apparatus and ensuring its stability but also its adaptability over time.

The entire therapeutic approach in neuro-occlusal rehabilitation (RNO) of Planas [11, 12, 13] is centered on the restoration of physiological, balanced, symmetrical but unilateral and alternating masticatory movements.

Different types of treatments respecting this concept exist. In this work, we will describe one of the therapeutic tools used in RNO: selective grinding.

2. The Planas concept: Neuro-occlusal rehabilitation

In 1960, Pedro Planas (Spanish stomatologist, illustrious functionalist) elaborated new concepts based on mastication: *«All the problems of the stomatognathic system, with rare exceptions, are caused by masticatory functional impotence caused by the insufficiency of mechanical constraints, engendered by our civilized diet»*. If the masticatory apparatus [11, 12, 13] performed the work for which it was created, it would normally develop to its physiological fullness.

Pedro Planas transcribed his thought, traced his clinical experiences and his concepts on mastication and occlusion in a book entitled: *Rehabilitation Neuro-Occlusal (RNO)*, published in 1987 and translated into French in 1992 by M. Chateau, J and J. Kolf. A second edition was published in 2006. This work constitutes a rather exhaustive presentation of the thought of Planas where are approached not only his conceptions of a balanced functional mastication and his pathological deviations generating dysmorphies, but also his experience in the functional rehabilitation of mastication and occlusion, from the first interceptive treatments in temporary dentition to these designs of the total prosthesis in the edentulous adult.

Many clinicians, former students of Planas or followers of neuro-occlusal rehabilitation, have since published on the subject in order to disseminate this functional approach to dento-functional orthopedics and to relate a clinical experience that is now essential. These include Kolf, Raymond, Canalda, Limme, not forgetting Planas' grandson, Carlos De Salvador-Planas.

Finally, we must highlight the recent articles published by Gaspard, which constitute an exhaustive and meticulous analysis validating the concepts of Plans by comparing them with the most recent data on the anatomy, physiology and biomechanics of the masticatory system and its development.

Beyond the form of Planas' message, there is the sagacity and experience of an outstanding clinician whose well-applied concepts form the basis for the prevention, interception and treatment of many dentofacial dysmorphies.

RNO is based, in Planas' own words, on the principle of Claude Bernard [12]: «the function creates the organ and the organ adapts to the function». The quality of the masticatory function governs the development of the dental arches and occlusal relationships.

2.1. FMAP and minimum vertical dimension

Examination of Planas masticatory functional angles FMAP [12, 14, 15, 2, 16] is fundamental for neuro-occlusal rehabilitation. It is systematically performed in all patients because it is able to provide most of the useful information concerning the masticatory function of the subject examined.

From the exploration of the mandibular laterality movements, Planas described what he called the masticatory functional angles whose value determines whether there is, for example, a preferential mastication side or, on the contrary, if the patient masticate alternately on both sides.

FMAPs represent, concretely, the end of the most frequent chewing cycles. Chewing is preferentially done on the side of the smallest FMAP.

On the other hand, if the right and left FMAPs are equal, this means that chewing is unilateral alternated, in other words physiological.

Planas explains the prevalence of cycles on the side of the smallest FMAP by what he calls the law of the minimum vertical dimension [17] which favors chewing on the side where the lowering of the mandible is less during prehension food bolus through the mandible.

2.2. Therapeutic in RNO

The stomatognathic system must be given the stimuli necessary for harmonious development as soon as possible. Never wait, repeated Pedro De Salvador Planas over and over [18, 19, 20, 21],

2.2.1. In children

The treatment for children in RNO consists of:

- Encourage breastfeeding until the age of 1 year or at least until the appearance of the incisors.
- Favor a more consistent diet in young children.
- Carry out selective grinding [12, 18, 21] which is the reasoned wear of the deciduous teeth as it should have been done if the child had always chewed unilaterally and alternately.
- Use direct tracks [22, 23] (**fig.1**) which consist of applying composite to certain teeth to increase their height and change the orientation of the occlusal plane to make it parallel to camper's plane. They have two main indications: cross bite and distoclusion of the mandibular arch. They are used in temporary dentition or at the beginning of mixed dentition.

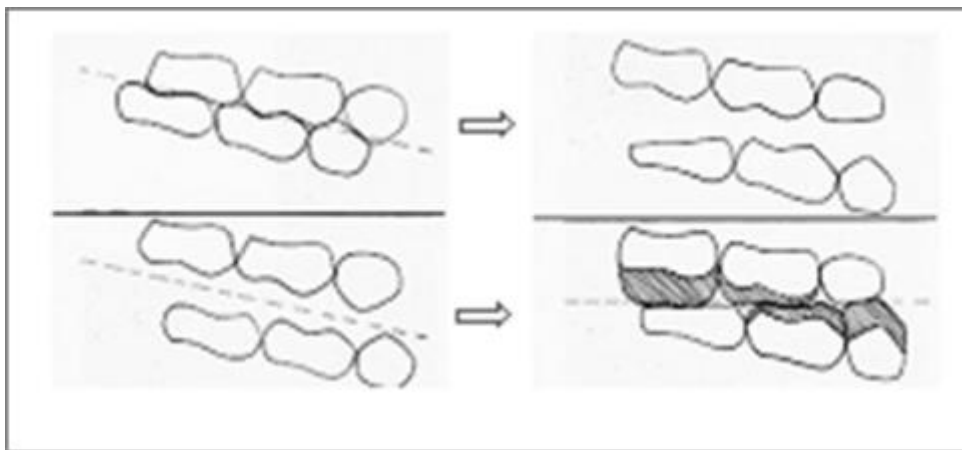


Figure 1 Direct tracks of Planas

- Lay the indirect Planas tracks or track plates [12, 20, 24](Fig.2) which are functional devices directly inspired by the physiology of mastication, and which will allow the expansion of the jaws and the installation of a physiological occlusal plane.



Figure 2 Track plates of Planas

- Use the Planas equiplane [2, 11, 25] (Fig.3) which corrects overbites.



Figure 3 Equiplane of Planas

2.2.2. In adults

The same therapies can be used but the results will take longer to obtain and more subject to recurrence.

Grinding will be used but with caution. As Planas [11] said: «a well-done selective grinding, for example at two years, can save a mouth for life» but he added: «a badly done selective grinding is more harmful than no treatment at all.»

In case of occlusal imbalance, it will first be necessary to seek and eliminate the double occlusion then to check and equalize the FMAPs.

3. Selective grinding

In many children, the « modern » diet no longer requires much masticatory work or lateral movements.

The deficit of occlusal dental friction does not allow the progressive wear of the cuspid reliefs. The functional deficit is thus accompanied by an absence of evolution of the occlusal morphology which in turn will be responsible for constraints and limitations in the lateral and anterior mandibular movements [2, 18].

Often then, the FMAPs are very open, reflecting the difficulty of lateral excursions which can only be achieved at the cost of a significant increase in the vertical dimension.

The child does not present an energetic alternating unilateral mastication and rather performs vertical and symmetrical masticatory movements that generate little dental friction and abrasion, but also little growth solicitation.

When this chewing «impotence» is detected, namely FMAPs that are too open but nevertheless symmetrical, it is necessary to help this dentition as soon as possible to achieve its maturation by artificially using the cuspid reliefs in order to facilitate lateral movements on both sides and thus rehabilitate masticatory function.



Figure 4 5.5-year-old child with symmetrical and vertical AFMPs

These selective grindings [19, 21, 26] are in fact artificial attritional grindings that aim to achieve the adaptive wear that nature should have produced identically on the left and right.

The aim is therefore, by selective grinding of certain cuspids, to facilitate lateral movements by creating a balanced "attritional" occlusion [27] where all antagonistic teeth remain in contact.

The amount of tooth enamel to be progressively removed is dictated by the repeated visualisation of FMAPs during grinding. These FMAPs should decrease, resulting in more horizontal trajectories in the lateral mandibular movements.

These selective grindings are performed by using a turbine-mounted diamond bur (fig.5) under cooling spray with or without local anaesthesia and articulating paper.



Figure 5 Wheel shaped cutter turbine-mounted



Figure 6 Selective grinding

Grinding (**fig.6**) is done gently without reaching the dentin-enamel junction and should not affect the supporting cusps.

During grinding, take care to maintain perfect symmetry between the right and left FMAPs to avoid the development of dominant or even exclusive unilateral mastication on the side of the smaller FMAP.

Selective grinding in temporary dentition [2, 11, 28] is relatively easy. In general, it is, first and foremost, the upper canines on their mesial side and the lower canines on their distal side that interfere with mandibular movements, which we can detect with articulating paper. Then we can find interferences at the level of the vestibular cusps of the second upper primary molars and the lingual cusps of the lower molars. It also happens, quite often, to have to grind, by the palatal surfaces of the upper incisors, the distal part of their incisal edge, which gives the free edge of the incisal front a slightly sinusoidal appearance.

Finally, it is necessary to insist on the fact that these selective grindings must be progressive. The quantity of enamel to be eliminated must be divided over time and correspond to what nature would have eliminated physiologically.

We must obtain that all the lower teeth come into contact with the upper ones both in maximum intercuspitation and during lateral movements and simultaneously on the working and non-working sides. One easily arrives at this state of artificial maturation of the temporary dentition, after a few sessions of grinding, in children from 3 to 6 years old.

The ideal is reached when we obtain a soft occlusal friction on both sides simultaneously with equal FMAPs and close to zero degrees.

Of course, it is not these grindings that directly produce the growth stimulation that was lacking in the jaws, but by facilitating the realization of functional movements, we restore the physiological processes of stimulation of adaptive bone growth.

A change in eating habits and, in particular, the texture of food should be advised, because now, thanks to the balance obtained by grinding, the child is able to triturate more fibrous, harder food.

In children who present with asymmetric masticatory impotence with unequal FMAPs, the objective of grinding will be, above all, to restore equality between the FMAPs. The grinding carried out as described previously, must initially bear exclusively on the side where the most important blockages are located in order to reduce the value of the FMAP on this side.



Figure 7 8½ year old child with dento-maxillary disharmony and asymmetrical FMAPs in A. Result after interceptive treatment with Planas track plates and selective grinding in B

Xhervelle [29], having carried out clinical research assessing the effect of selective grinding in temporary dentition on the progress of masticatory cycles (recorded using a Sirognathograph), noted that, after grinding, the outlines of the cycles became more regular and homogeneous translating a better coordination of the movements and less hesitations in their execution.

In mixed dentition, the principles to be respected will be, depending on the tooth, those of the deciduous dentition and those of the permanent.

The occlusal and tissue principles to be applied are the same whatever the dentition:

- Start on the FMAP side which must be reduced.
- Grinding is done without reaching the enamel-dentin junction.
- Never mill the primary supporting cusps or the vestibular faces, but first grind the guide cusps and then, if necessary, the secondary supporting cusps on the non-working side. «*We touch what guides and keep what supports*»^[11].

In permanent dentition, after the teeth have been placed in the arch, care should be taken to perform the appropriate selective grinding, as a poorly executed veneer can be detrimental to the periodontal health of the tooth.

3.1. Occlusal support points

Primary support points: we call primary, the support points which, in a mouth with a normal occlusion and in a centred relationship, maintain the vertical dimension. These are (fig.8):

- The free edges of the lower incisors (A, B) against the palatal surface of the upper incisors (A', B').
- The distal part of the free edge of the lower canine (C) against the lingual surface of the upper canine on its mesial side (C').
- The vestibular cusps of the lower premolars (E, D) against the inter proximal pits or embrasures of the upper premolars (E', D').
- The palatal cusps of the upper permanent molars (G, H) against the lower pits (G', H').

Secondary support points: also contribute, albeit to a lesser extent, to maintaining the vertical dimension. These are:

- The palatal cusps of the upper premolars (h, g) against the lower inter-premolar embrasures (h', g').
- The vestibular cusps of the lower permanent molars (b, c, d, e, f) against the main mesio-distal groove of the upper molars (b', c', d', e', f').

Intermediate support point: formed by the mesiovestibular cusp (a f) of the mandibular first molar (a'f').

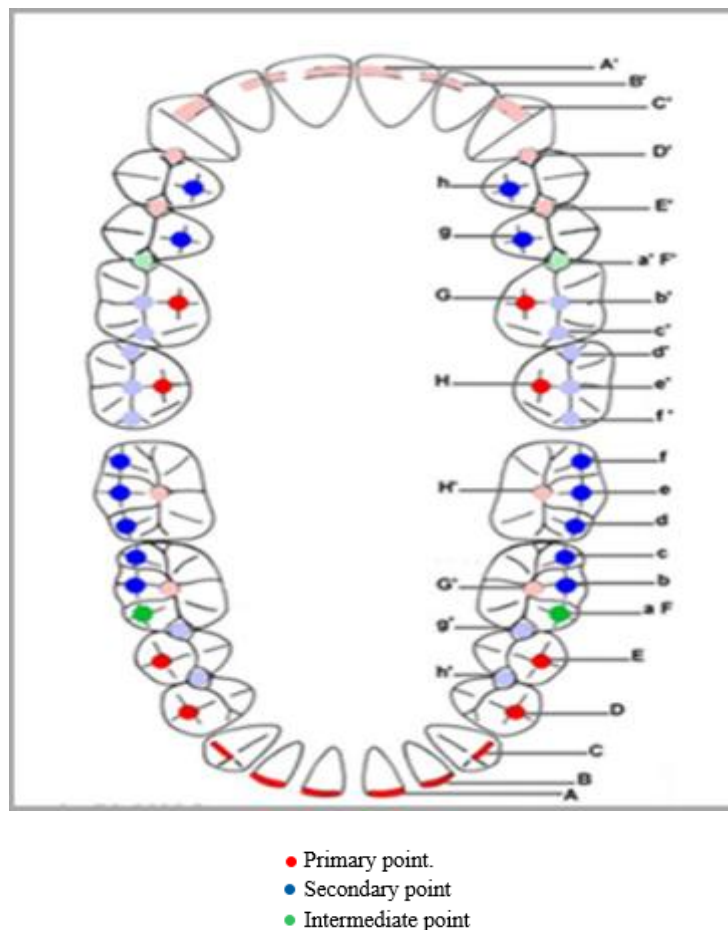


Figure 8 Occlusal support points according to Planas [11]

At the end of normal tooth eruption, all these cusps and pits mesh perfectly; their shapes are spherical, without the slightest flat surface, which is precisely what will allow the installation of abrasion facets. In fact, once the system has been set in motion, occlusal friction during lateral movements will lead to the appearance of flat facets through wear.

Planas [12, 19,20], observed that, on the working side, the upper facets flatten from inside to outside and from front to back, and the lower facets from outside to inside and from back to front, regardless of the position of the occlusal plane.

But on the non-working side, abrasion is only possible if the occlusal plane is parallel to Camper's plane. On the upper teeth, the facets flatten from behind to the front and from outside to inside, the lower facets flatten from inside to outside and from front to back.

The knowledge of the orientation of these veneers is the basis for the design of the selective grinding which will allow the adaptation of the occlusal morphology to the establishment of an efficient masticatory function.

The interposition of articulating paper between the dental arches leaves many traces and it is obvious that not everything that is marked should be ground or eliminated. It should be borne in mind that there are more contact veneers on the working side, which is logical as this is where the greatest muscle strength is developed.

What has been described about selective grinding of the temporary dentition for the transformation of its occlusion remains valid for the permanent dentition, except that the occlusion will be transformed much more slowly and with a much more vigorous control of the occlusal balance.

In the incisors, the trace left by the articulating paper on the free edge of the mandibular incisor should never be touched. On the contrary, the traces left on the lingual surfaces of the maxillary incisors should be touched up.

At the level of the canines, the lingual surface of the maxillary canine, on its mesial part, will also be ground.

For premolars, grinding will make it possible to flatten the occlusal face of maxillary premolars, to lower the vestibular cusp in the mesio-distal direction on the working side, and the lingual cusp in the disto-mesial direction on the non-working side.

Finally, for the molars, the traces left by the articulating paper when recording the lateral movements of the molars are more confused and it will be necessary to remember here both the main and secondary support points.

The point of support which should not be touched is the mesio-palatal cusp of the maxillary molar. The working path is between the two lingual cusps, whose abrasion towards the lingual edge can be accentuated.

The path of the non-working side between the centro-vestibular and disto-vestibular cusps is recorded, whose abrasion may be accentuated in the vestibular direction. Planas gave the grinding performed on the mandibular molar a « valley widening operation».

The secondary cusps will leave their pathways on the maxillary molars only in working movements. The mandibular vestibular cusps, by sliding against the mesial sides of the vestibular cusps of the maxillary molars, will cause the latter to move away from each other over time.

With the function of mastication, the points and edges of support will be transformed, by wear, into small facets which will widen with age. The practitioner must therefore respect and control them.

In RNO [30], early treatment is preferred to late treatment in adults. Early treatment in the temporary dentition or second dentition ensures that the permanent dentition is in a perfect state of balance and function by the end of the treatment period, so that the occlusal plane will have settled into its proper position in relation to the temporomandibular joint.

4. Conclusion

Many early dysmorphic disorders, which are already present in temporary dentition, are the result of impotence or functional alteration of mastication from an early age, often in the face of a modern, inconsistent diet.

The RNO, developed by Planas as a result of his observation, makes it possible, when it is well understood and applied, to recover a functional balance in the masticatory apparatus from the youngest age and thus to redirect the growth processes towards a morphological normalisation.

Selective grinding, carried out within the framework of neuro-occlusal rehabilitation treatments, makes it possible to increase the chances of the masticatory system to develop under good conditions by releasing and balancing the mandibular laterality movements at an early stage.

In adults, the restoration of function allows the manducatory apparatus to be maintained in good health.

This philosophy of orthodontics deserves all our attention for its clinical good sense.

Compliance with ethical standards

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Disclosure of conflict of interest

I declare that there is no conflict of interest regarding this article.

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