

# Occlusal finishing, functional occlusion, and elastodontic concept. How? And why? A look at one case



Danielle DEROZE, Jean LACOUT\*

## ABSTRACT

*The last stage of orthodontic treatment is occlusal finishing. This complex and subtle treatment period demands careful reflection by orthodontists in order for them to achieve an optimal occlusion.*

*Elastodontic concept is a straightforward therapeutic tactic, whose essence is a considered and individualised approach to treatment within a well-structured plan.*

*Elastodontic concept enables orthodontists to construct of a functional occlusion which satisfies the three fundamental criteria of function of the masticatory apparatus: effectiveness, harmony, and economy.*

*An illustrated case study will give the reader an understanding of the design and unique action of this type of appliance.*

## KEYWORDS

*Occlusal functions*

*Elastodontic concept*

*Centring*

*Guidance*

*Occlusion*

*Stability.*

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\* Danielle Deroze and Jean Lacout are members of the AGORA group, responsible for the development of the elastodontic concept.

Address for correspondence:

D. DEROZE,  
76 rue Henri Tomasi,  
La Trigance, 13009 Marseille,  
danielle.deroze@orange.fr

## INTRODUCTION

Can the variability of human biology, the particular structure of each dental arcade, and the individuality of dental morphology be reconciled during orthodontic treatment?

In the present era of relative (and unfortunate?) standardization of techniques, this daily challenge of orthodontic practice can become tedious, especially during the final stage of treatment.

Final refinement of the occlusion is a difficult, even crucial, treatment step: patients are weary and long clinical sessions are necessary to achieve the objectives of the final stage of treatment. To make matters

worse, an improvement in the cosmetic appearance of the teeth has quite often occurred by this point, making it difficult for the conscientious practitioner to convince the patient to continue with treatment until a satisfactory occlusion has been attained.

Our goal is to attempt to show, firstly, the value of a simple and intelligently individualized concept: elastodontic; and, secondly, as part of this global concept, the use of two high-quality appliances, the Elasto-Aligner and the Elasto-Finisher, to bring about treatment finalization quickly and easily.

## THE IMPORTANCE OF OCCLUSAL FINISHING

It would be extremely presumptuous, in this era of evidence-based medicine and professional regulation, to state categorically that refinement of occlusal finishing at the end of orthodontic treatment is necessary for TMJ comfort or case stability, if the patient is satisfied with the appearance of his or her teeth:

- The relationship between malocclusion and temporo-mandibular dysfunction (TMD) is controversial and non-demonstrable because of its multifactorial nature: systemic physical factors, psychosocial factors and others are intertwined and it is difficult to consider each in isolation in randomised trials. The literature abounds with contradictory studies of variable quality<sup>1-6</sup>.

- In 2003, the ANAES<sup>1</sup> (now the HAS, the French public body responsible for accreditation and evaluation in health care) quoted the conclusion of a literature review aimed at defining guidelines for management of an ideal functional occlusion: "no workable definition of the ideal occlusion can be conclusively established"<sup>3</sup>.

A year earlier, however, it recommended<sup>2</sup> treatment for anomalies at risk of causing:

- the arrest or maldevelopment of facial growth or the dental arcades, or of altering their appearance;
- problems with oral or nasal function;
- risk of dental trauma.

Circumstances that might give rise to caries, periodontal diseases or joint

**problems** should also be considered for treatment.

What should we conclude from this sometimes contradictory guidance?

- The mechanical element of occlusal problems is difficult to demonstrate objectively though the clinical intuition that it is important is a daily experience.
- Inductive reasoning (plausibility increased by accumulation of facts in favour of a hypothesis and lack of opposing examples), held dear in the bioprogressive approach, makes an occlusion-comfort or TMJ-discomfort interaction plausible.

If we immerse ourselves in the issues of the final stages of orthodontic treatment, and use some common sense, some simple notions can be defined<sup>5</sup>:

- Orthodontic treatment is very often a major disruption to occlusion;
- The dental alignment required for cosmesis is necessary, but not sufficient;
- The notion of the "ideal occlusion" should be abandoned, and replaced by the notion of the "optimisation of

the occlusion" which is both more realistic and more clinically relevant;

- even if an adaptation is possible (for example though growth or modelling), it is not individually significant, and it is preferable not to rely on it too heavily, particularly in adults or where a surgical approach is required;
- Finally, above all, biology is governed by two elementary principles: the conservation of tissue, and the conservation of energy.

As Ricketts recognised in 1969<sup>8</sup>, when applied to general dental practice and to orthodontics, these notions favour the optimal reconstruction of the occlusion according to the principles of **simplicity** and **economy**, within a holistic approach to the patient's health.

Dawson<sup>4</sup> explains it thus: "The teeth and the TMJ are components which must be integrated in a global approach to the masticatory apparatus whose disequilibrium results from anatomical or functional disharmony of its different constituent parts."

## MANAGEMENT OF THE FINAL STAGES OF ORTHODONTIC TREATMENT

The criteria for judging the outcome of orthodontic treatment<sup>7</sup> are centric occlusion, occlusal stops, and occlusal guidance.

### • Mandibular centring

In this position of the mandible, the condyles are centred in the glenoid cavity, with the disc at the level of the temporal eminence.

The movement from centric occlusion towards maximal intercuspation is slight (around 1 mm) and is only in the sagittal plane.

The mandible is held slightly forward, providing anterior guidance without locking. At the central position, occlusal contacts are symmetrical with a clean and precise guidance from the palatal cusp of the first maxillary premolar, preventing posterior movement.

The lateral movement from centric occlusion to maximal intercuspation must not exceed 0.3 mm, the condylar-fossa position allowing only a little play of the condyles.

It is necessary to integrate only the essential relations of mandibular centring, a sign of symmetrical and harmonious play of the mandibular condyles, whether compatible or not with the alignment of the occlusive spaces.

### • The occlusion

The mandible is stabilised by the opposition of 4 or 5 pairs of opposed pluricuspidate teeth, each one in contact with its two antagonists, in the sagittal plane.

In the labial-lingual plane, there are multiple harmonious stops, on both the labial and lingual aspects of the teeth.

### • Guidance

During mandibular movement, posterior disocclusion must occur during

propulsive and lateral movements. Guidance must be symmetrical without posterior interference or anterior locking.

The overjet, the overbite and the angulation of the canines are indispensable parameters of measurement of guidance.

The overall functional schema is arranged in a curvilinear system: the curve of Spee in the sagittal plane, and the curve of Wilson in the frontal plane.

Objective diagnostic analysis of these different parameters is essential during the last phases of occlusal finishing. A set-up on an articulator can assist in the interpretation of "occlusal lacunae," but it is not compulsory; accurate clinical assessment may suffice.

However, if a set-up on an articulator is done in order to design elastodontic appliances, other residual problems of the occlusion can also be visualised, clarifying the lingual cusp/fossa relationships, and aiding in their resolution. (fig. 1 a and 1 b).

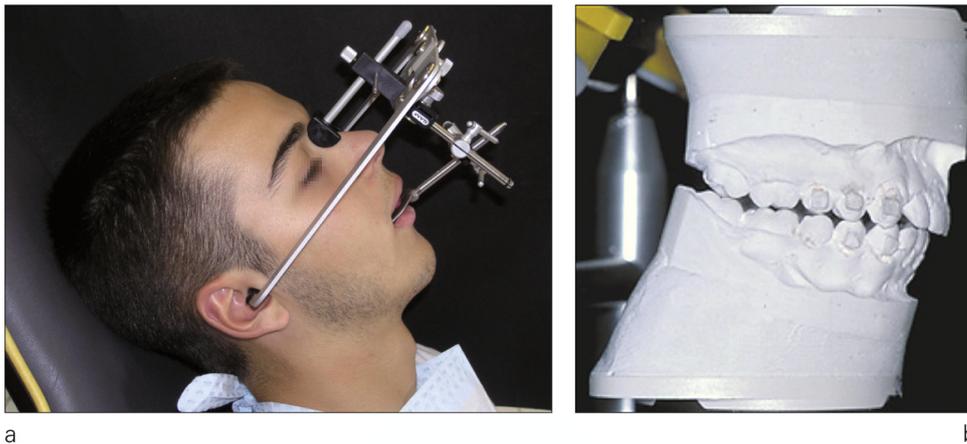
## THE VALUE OF ELASTODONTIC CONCEPT

After reflection on the individual case, elastodontic concept can be the judicious choice, providing a straightforward therapeutic technique.

The concept is not a panacea for occlusal problems: it cannot restore the gross occlusal disharmony caused by problems such as excessive overjet, overbite, palatal cusps that are too high, or abnormal canine angulation.

However, as part of a considered strategy in the last stages, it enables a higher level of refinement to the occlusal finishing, while respecting the occlusal function of the individual patient.

It allows the individual dental anatomy of each patient to be taken into account, thereby permitting optimisation of cusp/fossa relations, and of the



Figures 1 a and b

Set-up on the SAM articulator.

The set-up allows both assessment of the occlusion and design of the elastopositioning appliance, in conjunction with the information provided by the referring clinician.

anterior and canine guidances, by personalisation of the palatine faces of the upper incisors and canines.

## CONSTRUCTION AND MATERIALS

The case is set-up on an articulator. We prefer the SAM articulator with the Axio Split system. The SAM bases are calibrated in the laboratory. It is sufficient to send the model, mounted on a magnetic base (France Elastodontie<sup>®</sup> laboratory), along with referral details, cephalometry results, and clinical photographs.

The referral that must be completed by the referring orthodontist has 27 criteria, including:

- Administrative details: patient identification data, appliance requested;
- construction criteria: overcorrection required? retainer type, desired propulsion
- the occlusal criteria of the final stages of treatment: position of the mandibular incisors, dental

axes, intercuspitation, the values of compensatory curves.

This document is necessary for the coherent and accurate design of the therapeutic set-up.

**The quality of the set-up model will determine the eventual quality of the response of the occlusion to treatment**, integrating the essential elements of the occlusal finishing for each case.

- the data for repositioning the dentition in centric occlusion
- the position of the condyles in the reference position,
- mandibular kinematics,
- the anterior and posterior determinants of occlusion,
- the compensatory sagittal and frontal curves.

Each set-up is **unique for each patient**.

Polyvinyl silicon is used to construct the appliance. This material is malleable, strong, and well tolerated, enabling precise control of even the smallest dental movement.

The individual action **on each tooth**, unique in orthodontic therapy, is the

key to restoring occlusal harmony with elastodontic concept.

Every aspect of the relation of each tooth to the appliance can be considered, avoiding the torque errors to intercuspitation which may result from fitting elastic bands to a multiply attached orthodontic system.

## APPLIANCE RANGE

There are several types of elastodontic appliance.

In the context of occlusal finishing, only two need to be particularly considered:

- The Élasto-Finisseur (Elasto-Finisher) which uses some or all of the screws already placed for attachment of an anterior orthodontic arch
- The Élasto-Aligneur (Elasto-Aligner) which requires judicious placement of screws in order to achieve its desired action on the occlusion.

Both devices share the same mode of action.

### • Requirements

The success of the elastodontic phase of treatment depends on the previous treatment stages:

- the functional envelope must be balanced with the requirements for breathing and swallowing. Errors of technique here will result in a poorly tolerated appliance, even if breathing holes are cut to permit oral ventilation;
- The dentition must not be locked in any of its three axes of movement. The purpose of the elastodontic device is not to compensate for inadequate earlier treatment, but rather to assure fine control of the final stages.

## ELASTODONTIC CASE STUDY

A 30 year old woman was referred by her general dental practitioner.

She complained of dental instability and jaw and neck pains severe enough to interfere with both sleep and her daily activity.

The history-taking revealed a habit of mouth breathing and problems with swallowing.

There was no clicking or pain related to the TMJ.

The condition of the teeth and periodontium was completely satisfactory.

### • Diagnosis

The work-up included recording baseline clinical details, photography, a dental impression, an orthopantomogram, facial and lateral X-ray views, and cephalometry. The face was aesthetically balanced with a mesofacial pattern (fig. 2 a to 2 c) (fig. 4).

The molar occlusion was class I.

The maxillary aspect suggests deficiency of the alveolar ridge, notably at the canines and premolars, and there is a slight negative overbite (fig. 3 a to 3 d).

The set-up on the articulator at the outset of treatment confirms the importance of the occlusal deficit on

both the labial and palatal aspects (fig. 5 a to 5 d and 6 a to 6 c).

### • Treatment plan

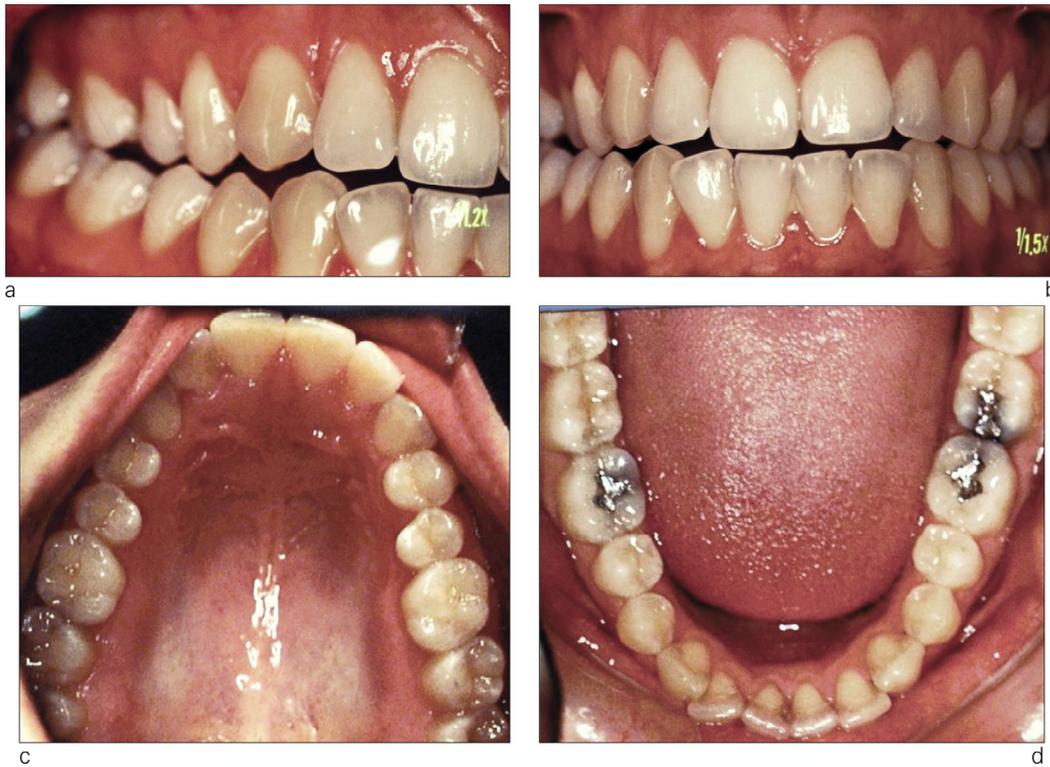
An orthodontic treatment plan is established and discussed with the patient.

Its objective is to restore a satisfactory equilibrium to the occlusion, with guidance and centring of the mandible to enable symmetrical and efficient mastication:

- A quad helix to restore transverse compatibility between the arcades,
- behavioural therapy for the problems of ventilation and swallowing,
- a diagnostic re-evaluation for finishing that corresponds to the envisaged objectives for the occlusion.



*Figures 2 a to c  
Facial views before treatment.*



Figures 3 a to d  
Lateral, frontal and occlusal views before treatment.

## • Treatment

The quad helix is fitted, and the patient undergoes behavioural therapy for the problems of ventilation and swallowing (fig. 7).

After several months, the required transverse dimension is obtained, and the quad helix is removed.

Nasal ventilation and physiological deglutition are re-established by the patient without difficulty, there being no respiratory pathology.

The second set-up on the articulator, the key to diagnostic re-evaluation, is performed (fig. 8 a to 8 e).

A good proportion of the occlusal contacts have been re-established on

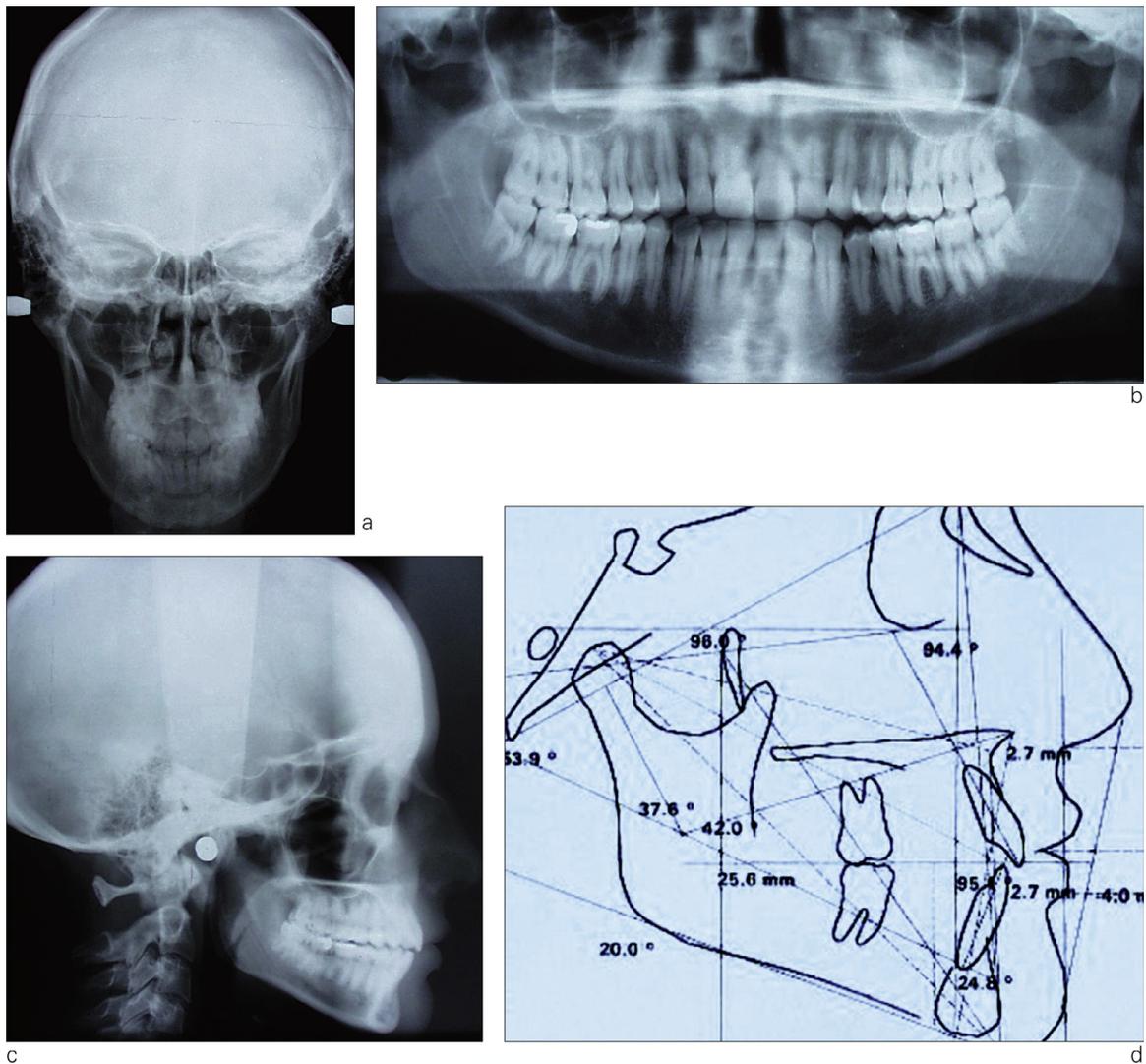
both labial and palatal aspects, notably between the premolars and molars, although the molar torque may have been altered by the action of the quad helix.

However, there is still an unacceptable occlusal deficit which must be corrected.

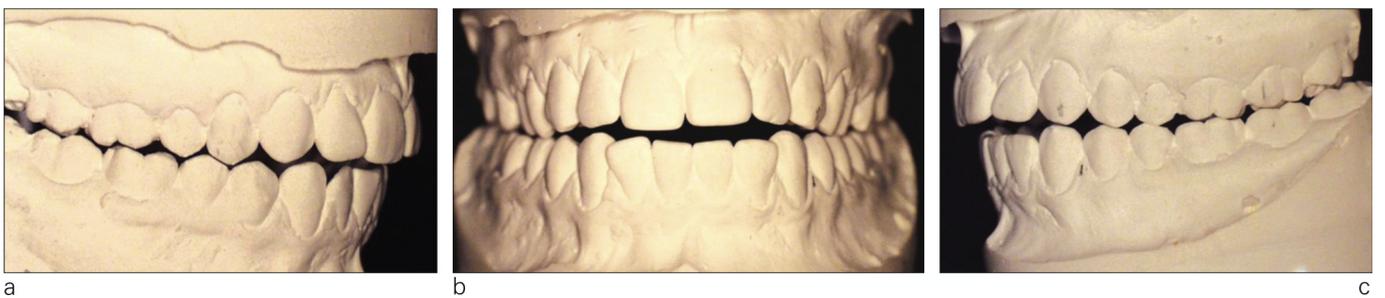
So what would be the best means of orthodontic treatment to optimise this occlusion?

## • The end of treatment

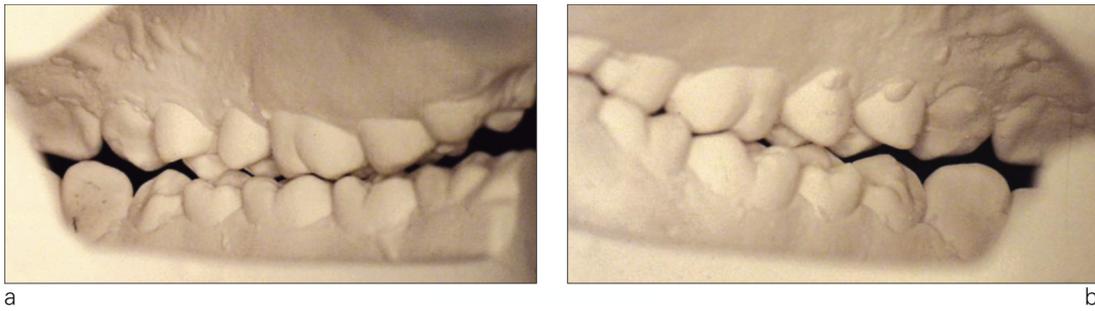
Further adjustment of the occlusion by treatment with an orthodontic arch appliance that uses elastic bands to



Figures 4 a to d  
Radiographs and cephalometric tracing before treatment.



Figures 5 a to c  
Pre-treatment set-up on the articulator showing occlusal deficit from labial aspect.



Figures 6 a and b  
Pre-treatment set-up on the articulator showing occlusal deficit in palatal aspect.

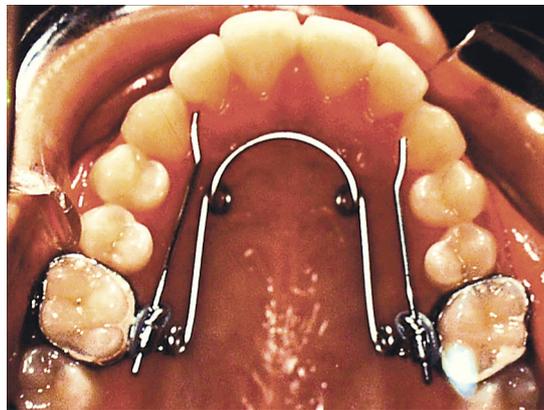
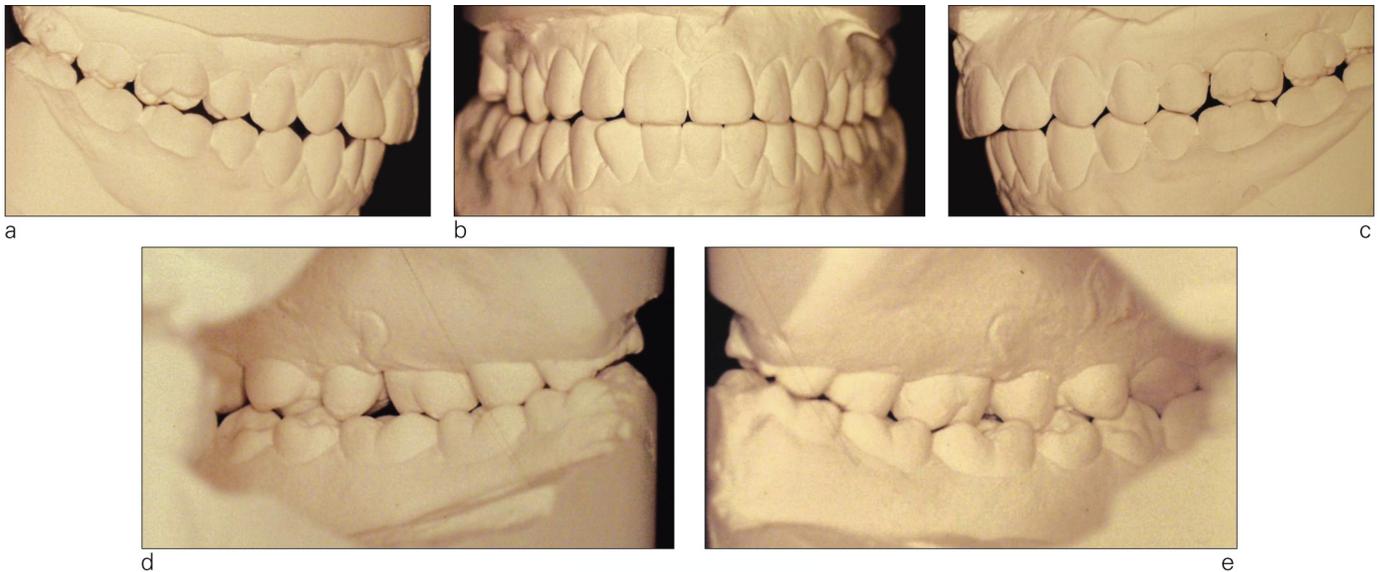


Figure 7  
Quad helix in position.



Figures 8 a to e  
Set-up on the SAM articulator for diagnostic re-evaluation. The labial and palatal views show the beginnings of interlocking of the premolar and molar cusps and fossae. The occlusion remains inadequate.

improve intercuspation would be one possible solution.

Even if the psychological difficulties engendered by wearing this kind of appliance can be overcome by the patient, this is far from straightforward. Controlling torque will be difficult, especially that of the lingual cusps, and there is also the risk that the dental axes may be compromised, leading to torque from the elastic bands. All this can make for a lengthy treatment.

When there is a need, as here, for subtle adjustments to the occlusion, elastodontic ticks all the boxes in the therapeutic checklist:

- acting on each individual tooth ;
- completely personalized for each case ;
- precise adjustment of occlusal interlocking in all three axes ;
- highly discreet appliance ;
- worn at night ;
- The form of the appliance favours normal functional re-education.

An Elasto-Aligneur is suggested, with placement of temporary retainers between the canine and first premolar teeth.

This will assure perfect centring and easy fitting of the appliance the first time it is worn.

The set-up is sent to the laboratory with the photos, cephalometry, and construction instructions outlining the required final occlusion. Mandibular centring, guidance, symmetrical dental calage and restitution of the compensatory curves **are all specified for each individual patient.**

In this case, a slight transverse overcorrection and an enhancement to the overbite have been requested.

The therapeutic set-up and the appliance are made according to these instructions by the France Elastodontie® laboratory (fig. 9 a to 9 e and 10 a and 10 b).

The appliance is mainly worn at night.

Results are obtained very rapidly, and the temporary retainers can be removed at the first follow-up appointment at six weeks. (fig. 11 a to 11 c).

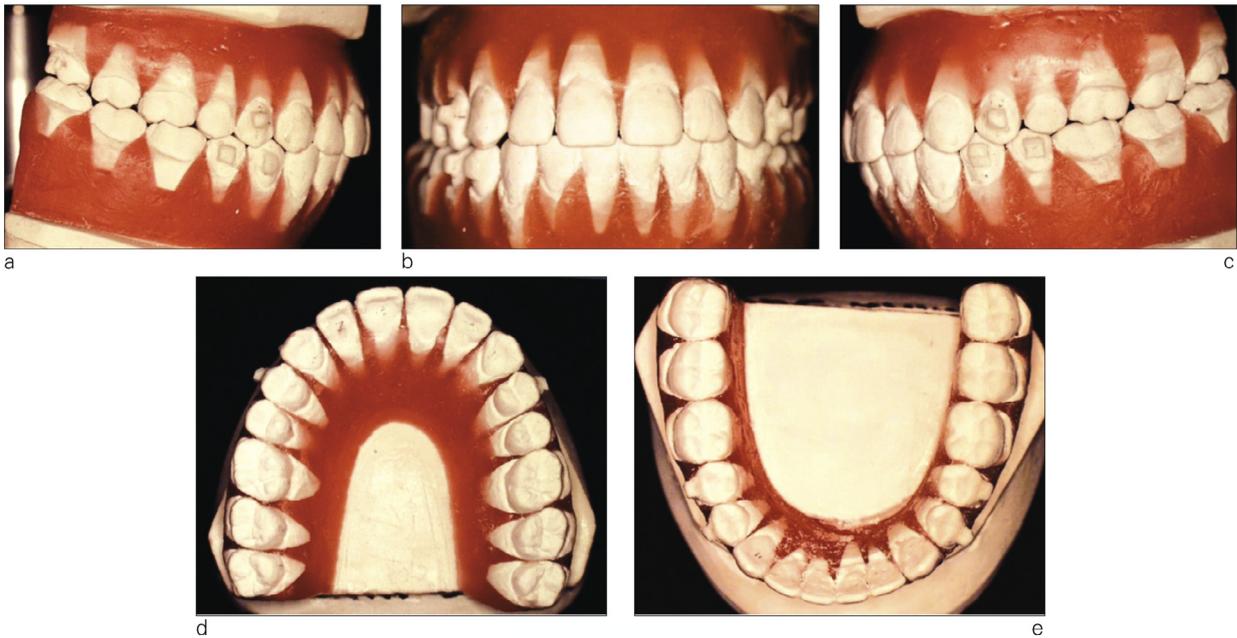
At the next follow-up appointment the inferior incisors have come into alignment without any direct pressure from the appliance. This has been made possible by three concomitant elements: the larger transverse maxillary dimension, the intelligent and individualised design of the therapeutic set-up model for adjusting incisor occlusion, and finally, the qualities of the elastomeric material (fig. 12 a to 12 d).

A final set-up is performed to assess the occlusal results obtained, particularly at the level of engagement of the palatal cusps (fig. 13 a to 13 c).

The cusp engagement has been re-established on both the labial and palatine aspects of the teeth.

The patient no longer complains of muscular pains, reports that her teeth are stable and comfortable, and is smiling once more.

Radiography and cephalometry at the end of treatment demonstrate that the anterior guidance has been re-established, with an appropriate curve of Spee, and good control of the incisor axes (fig. 14 a to 14 c).



Figures 9 a to e

The therapeutic set-up model. The individual specification for each occlusion must be respected. A slight transverse maxillary overcorrection and an enhancement to the overbite have been prescribed.



Figures 10 a to b

Elasto-Aligner in place. The appliance is clipped to the retainers, ensuring a stable fit during initial use.



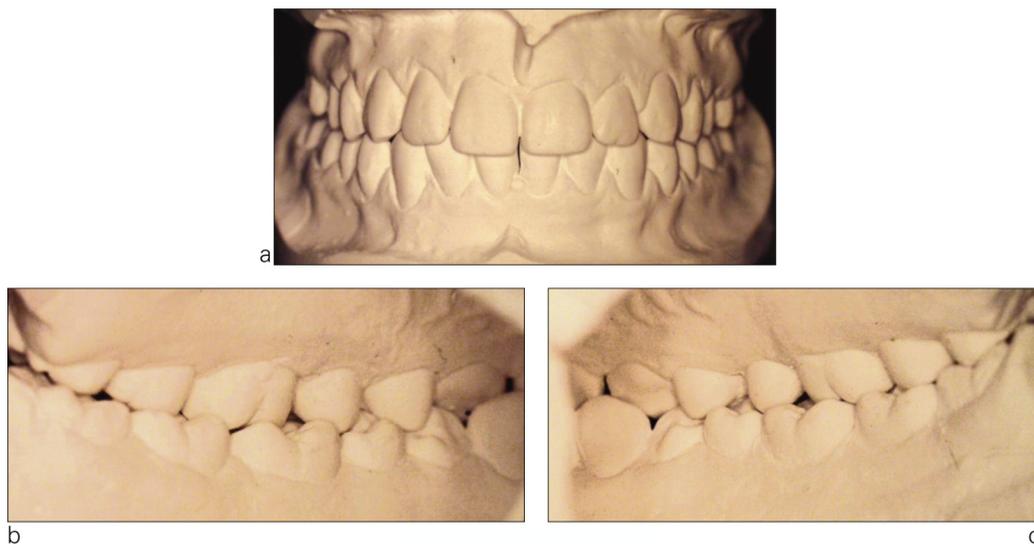
Figures 11 a to c

After 6 weeks of use of the Elasto-Aligner, the retainers can be removed.



Figures 12 a to e

Follow-up at 4 months. The new shape of the maxillary arch allows the upper incisors to come into alignment.



Figures 13 a to c

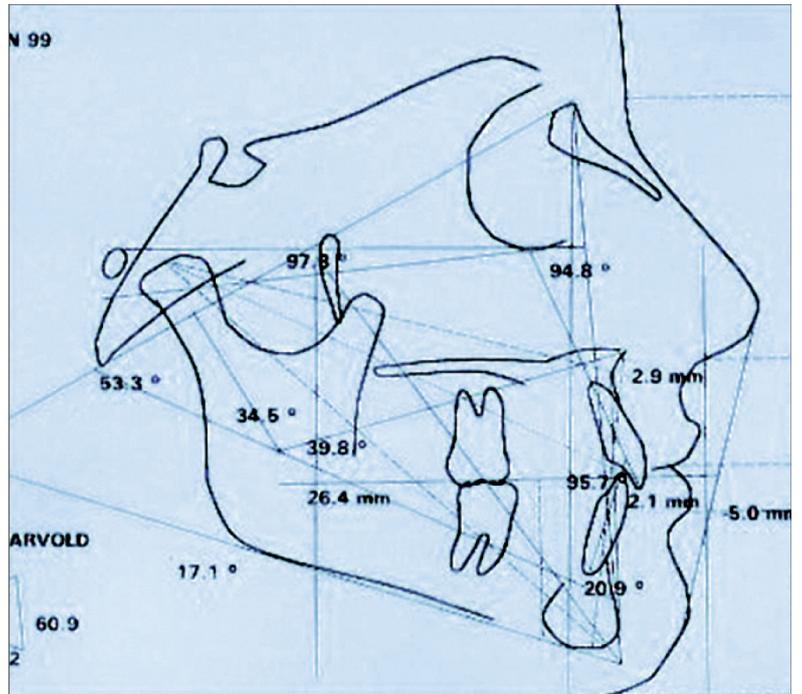
Set-up on the articulator at the conclusion of treatment. The quality of the palatal cusp engagement bears testimony to the precise and targeted action of the Elasto-Aligner.



a



c



b

Figures 14 a to c  
Radiography, cephalometry and smile at the conclusion of treatment.

## CONCLUSION

Orthodontics should be considered an integral part of general dental care and can make an important contribution to the overall health of the patient.

A good cosmetic result is but one criterion in determining the conclusion of treatment; a satisfactory functional occlusion must also be obtained. Individual assessment of the occlusion must always be the final choice in any treatment, because the natural

variability makes standardisation of treatment difficult.

One can look at occlusal finishing in orthodontics from a new angle, opening up technique and meeting the criteria of a functional occlusion.

Elastodontic appliances, thanks to the quality of their design, permit us to embark on the last phase of orthodontic treatment in a calm and intelligent manner.

Using cosmetic criteria as a guide for the completion of treatment is necessary, but not in itself sufficient. The reasoned use of the elastodontic

concept completes the necessary occlusal function.

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