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Orthodontic Treatment: Art or Science?

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Most orthodontists prefer to think of themselves as scientists, and yet much of orthodontic therapy is closer to art than to science. While many aspects of diagnosis, treatment planning, treatment, and retention require considerable scientific prowess, others clearly demand artistic abilities and judgments.

The problem list, which the orthodontist develops through evaluation and examination of the functional, intraoral, and extraoral characteristics of the patient, is best considered as science filtered through the knowledge of the clinician. On the other hand, treatment goals are more of an artistic expression moderated by scientific principles.

Every treatment goal should be defined in three planes of space, taking into account the biological limitations of the individual patient and of the force systems that may be employed. To the extent that such a plan can be expressed and designed mathematically, it is a scientific process. Nevertheless, successful treatment can usually be accomplished with a wide variety of appliances, and appliance selection is often a matter of esthetic judgment.

This article illustrates the technique used by the graduate orthodontic department at Aarhus University in Denmark to develop a diagnosis, problem list, treatment plan, and therapy for a periodontally compromised patient, and shows how these various components relate to one another in such a difficult case.

To avoid overlooking any problems, the clinician needs to develop a predictable and unvarying technique of examination that is used with every patient. The resulting problem list can isolate and reduce each issue to its simplest form. The chosen solutions are then combined into a single coherent treatment plan and appliance design as follows:

First, the treatment goals are summarized in a brief, clear narrative. Next, the clinician develops a three-dimensional treatment goal, combining the cephalometric analysis with the occlusogram to determine the necessary tooth movements. Force systems are then calculated to move the teeth into their new positions, the appliance is designed, and the mechanism is drawn and entered into the patient record. The 3D treatment plan helps the clinician select the correct force system and avoid "round-tripping".

Following treatment, the final tooth positions and supporting bones are evaluated in three dimensions by superimposing before-and-after cephalometric tracings as well as before-andafter occlusograms.

Case Report

A 44-year-old woman was referred for orthodontic treatment because of flaring of her maxillary incisors and an excessive overbite and overjet. Her malocclusion had gradually worsened during her 30s, and she had also developed periodontal problems. She had just finished one year of intensive periodontal treatment, complete with reverse bevel-flap surgery to all of her teeth and followed by a thorough oral hygiene program. Her dentition displayed general gingival recession, but no pockets greater than 5mm (Fig. 1).

A problem list (Table 1), treatment goals (Table 2), and 3D treatment plan (Fig. 2) were developed.

The first phase of treatment retracted and intruded the maxillary central incisors. A canine-to-canine bite-raising splint (Fig. 3) permitted the placement of two lingual power arms on the central incisors. Two 50g Sentalloy coil springs were attached from the power arms to a transpalatal arch (Fig. 4). The point of force was applied below the center of resistance of the maxillary incisors to produce controlled tipping (Fig. 5).

Since the maxillary lateral and central incisors were in different vertical positions, placing a single wire for anterior leveling and intrusion would have resulted in an unnecessary round trip. Therefore, the lateral incisors were intruded separately, using two facial .018" × .025" TMA rectangular loops welded to stiff stainless steel posterior segments (Fig. 6). The mandibular incisors were intruded and proclined with an anterior segmented arch connected to a utility base arch by a one-point ligature tie.

The second phase of treatment required facial movement of the mandibular canines and correction of the posterior scissor bite. Treatment was finished with continuous archwires.

Evaluation

Thirteen months of treatment resulted in an acceptable occlusion (Fig. 7) and eliminated the original lip catch (Fig. 8). The maxillary incisors were intruded and tipped back, while bone apposition occurred at A point. No loss of maxillary molar anchorage was detected in the sagittal plane of space. The mandibular incisors were intruded and proclined, and B point demonstrated anterior remodeling. The mandible showed a slight undesirable posterior rotation due to the extrusion of the maxillary molars, which might have been avoided by using a splint with posterior onlays.

Superimpositions of the before-and-after cephalometric tracings and occlusograms illustrate that the treatment goals were achieved, but with less maxillary incisor intrusion and more facial advancement of the mandibular incisors than was originally anticipated (Fig. 9).

Conclusion

Rather than following a cookbook approach that treats different malocclusions by a common method, the clinician can use the procedure shown here as an objective and scientific way to define problems, select reasonable solutions, and design force systems that allow the achievement of plausible treatment goals. This technique of planning, performing, and evaluating orthodontic therapy ensures an optimal outcome with a minimum of round-tripping.

FIGURES

Fig. 1 44-year-old female with excessive overbite and overjet and severe periodontal problems.

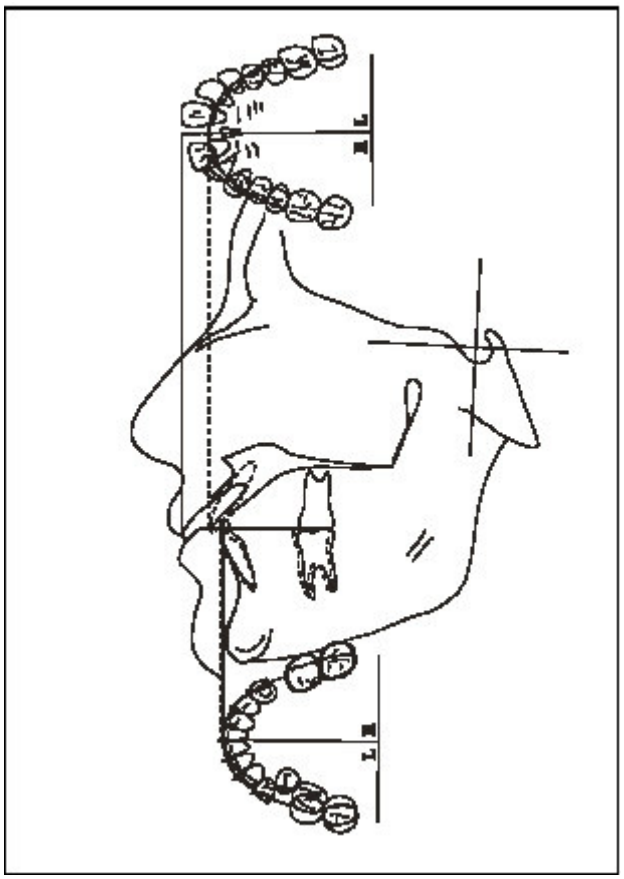

Fig. 2 Three-dimensional treatment plan.

Fig. 3 Bite-raising splint.

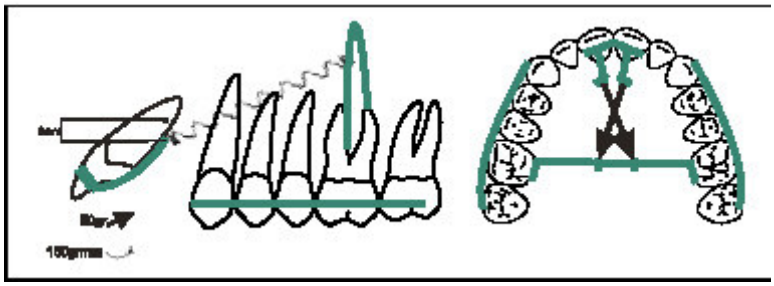

Fig. 4 Power arms with 50g Sentalloy coil springs used for incisor intrusion and retraction.

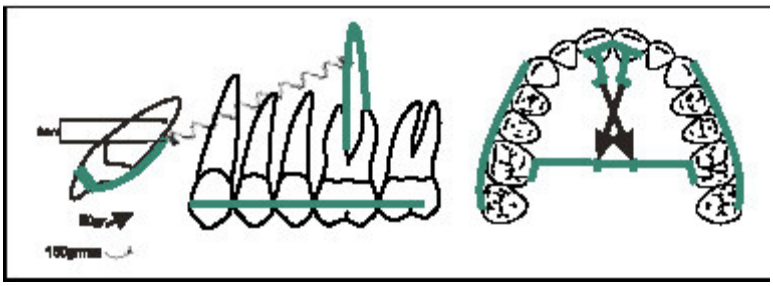

Fig. 5 Force application of power arms with Sentalloy coil springs.

Fig. 6 Differential intrusion of maxillary incisors.

Fig. 7 Patient after 13 months of treatment.

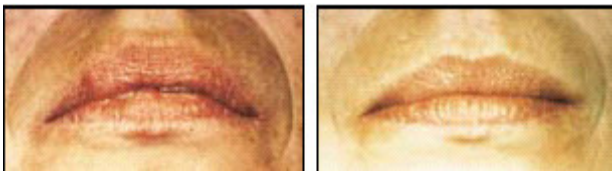

Fig. 8 Lip closure before and after treatment.

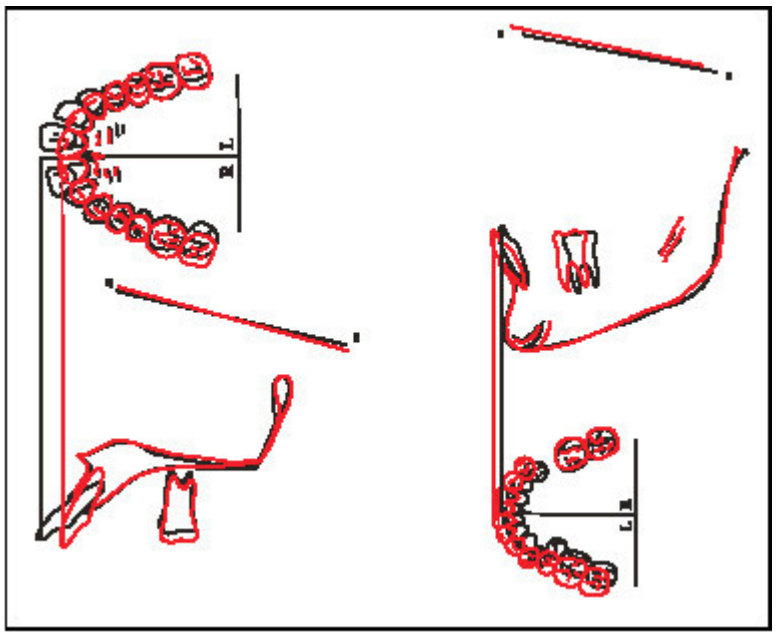

Fig. 9 Maxillary and mandibular superimpositions before (black) and after (red) treatment.

TABLES

TABLE 1
PROBLEM LIST

Chief complaint:		increasing overjet
Objective analysis	*Extraoral*	lip catch
	Function	tongue thrust gingival impingement general gingival recession
	Dentition	mes. rot.: 6 +6, –5 dist. rot.: +2 diastema mediale 6mm ling. incl.: –5 extracted: 5– overeruption of lower front deep curve of Spee
	Occlusion	*Sagittal* molar rel. left 1/4 distal canine rel. left 1 distal overjet 13mm *Vertical* overbite 8mm *Transverse* scissor bite on +5/–5
	Spacing	lower dental arch –7mm
Cephalometric analysis		increased max. alv. protrusion increased max. inc. inclination decreased vert. jaw rel. due to decreased mand. inclination compensatory decreased max. zone decreased jaw angle and beta angle anterior rotation type of mandible

TABLE 2
TREATMENT GOALS

	Extraoral	eliminate lip catch and create sufficient lip closure
	Function	eliminate gingival impingement change tongue thrust
	Occlusion	*Sagittal* achieve neutral molar, canine rel. on both sides achieve normal overjet *Vertical* achieve normal overbite *Transverse* correct scissor bite
	Spacing	eliminate crowding in mandibular arch

Table. 1

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Table. 2

FOOTNOTES

1 Sentalloy: trademark of GAC International, Inc., 185 Oval Drive, Central Islip, NY 11722.

2 TMA: registered trademark of Ormco/"A" Company, 1717 W. Collins Ave., Orange, CA 92867.