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Finishing and detailing in Orthodontics – The guidelines, methods and philosophies - A comprehensive review

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Abstract: *In an era of evolving beauty standards, an orthodontist is bound to provide to the patient, a pleasing face and smile. With the availability of enormous philosophies and prescriptions orthodontic treatment has been made simple for the clinician and made more comfortably available for the patient. Finishing procedures are more challenging than they sound as it has to comply to an individual's requirement. Customisation of procedures like bracket positioning and prescription and wire bending makes it more complex for the clinician. Keeping in mind that finishing begins during the stage of diagnosis and treatment planning avoids additional steps and time needed to correct individual errors in the end. A better understanding of the finishing guidelines, methods and philosophies is essential for an orthodontist. This article is a comprehensive review of finishing and detailing concepts, evaluation guidelines and methods of finishing for specific conditions and malocclusions.*

Keywords – *Finishing, Detailing, ABO Guidelines, Alignment*

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I. Introduction

"Begin with the end in mind".

Orthodontic finishing is an "art" of individual perceptions and small detailing. It distinguishes a true master of the profession from an average orthodontist. Finishing involves fine-tuning individual tooth positions and intraarch and inter-arch relationships and optimizing the treatment results. Finishing is the last phase of "active" treatment. It is extremely difficult, if not impossible, to achieve an acceptable end result when the treatment objectives have not been met and the mechanics have not been delivered properly Finishing is a broader objective of obtaining at the end of Orthodontic treatment, optimium teeth positions as related to the entire stomatognathic system , for achieving stability of correction, improved function, enhancement of health of masticatory apparatus and best possible esthetics. Detailing is a part of finishing and refers to the optimal individual positioning of every tooth in all the three orders of movement viz bucco- lingual crown position, rotational correction, height of crown and mesio distal tip and torque of all the teeth.

EVOLUTION OF CONCEPTS OF FINISHING

The concept of finishing has changed from that of the earlier authors. They primarily relied on nature to achieve final finishing in each individual case. The first real effort to present a structured assessment of the treatment result was made by Andrews. His "six keys to normal occlusion" constituted the first real effort to tabulate specific variables that could be measured in the finished orthodontic result. His study established normal values for in-out, tip and torque for each individual tooth which were then built into the edgewise brackets for the straight wire appliance. This gave the necessary impetus for precise detailing procedure to be taken up. The six keys include[1]

- I - Molar relationship
- II - Crown angulation (tip)
- III - Crown inclination (labiolingual of buccolingual inclination)
- IV – Rotations
- V - Tight contacts
- VI - Occlusal plane

FINISHING GOALS

The generally accepted goals of treatment according to Richard P. McLaughlin and John C. Bennett for MBT prescription are as follows[2]

- Condyles in a seated position—in centric relation;
- Relaxed healthy musculature;

- A "six keys" Class I occlusion with 3 mm of overjet and overbite;
- Ideal functional movements—a "mutually protected" occlusion;
- Periodontal health; and
- Best possible esthetics

GUIDELINES FOR FINISHING

Based on the collective and cumulative results of extensive field tests, the American Board of Orthodontics officially initiate the use of this Objective Grading System for candidates who will be examined at the February 1999, ABO Phase III examination in St. Louis[3]. The ABO Objective Grading System for scoring dental casts and panoramic radiographs contains eight criteria:

1. Alignment
2. Marginal ridges
3. Buccolingual inclination
4. Occlusal relationships
5. Occlusal contacts
6. Overjet
7. Interproximal contacts
8. Root angulation.

The measurements were made using an ABO measuring gauge (Fig-1). Apart from the examination, these criteria also suit well for general evaluation of finished cases post orthodontic treatment.

Jose Nelson Mucha[4], has proposed procedures considered indispensable for the excellence in orthodontic finish. The goals are results with excellent oral health; facial, dental and smile harmony; functional occlusion; and especially long- term stability. Following a logical sequence of procedures helps in obtaining an excellent orthodontic finishing treatment. In this context, it is important to follow a series of procedures that can be summarized in 10 steps: (1) define clearly your goals; (2) have a checklist; (3) improve bracket placement; (4) repositioning of brackets; (5) make adjustments in the archwires; (6) look at the face, teeth and smile, not the appliance; (7) improve the functional occlusion; (8) reshape teeth anatomically; (9) plan the retention; and (10) plan the appliance removal. To achieve great results, it is crucial to keep in mind that in clinical orthodontic practice, it is important to clearly define your goals, to know the basics (foundations), have technical domain (training and repetition) and implement the plan.

II. A Method Of Finishing The Occlusion

The PEA philosophy

The widespread use of the Preadjusted orthodontic appliance has assisted orthodontists in achieving good results for patients with greater efficiency and effectiveness. However, the results generated by the Preadjusted appliance are limited by the ability of the orthodontist to adequately place the appliance and the adaptability of the selected appliance to individual patient variation. An orthodontist may have to reposition brackets or make adjustments to the orthodontic wires in order to obtain an excellent finished result.

Rebecca Poling[5] has proposed a method of evaluation of the individual patient to be used during the finishing stage of treatment and a written system of notation that can guide the orthodontist in producing an excellent finished result for each patient. In this system the orthodontist considers multiple aspects of esthetics, occlusion and function, periodontal health and root alignment, and stability. Every feature of these characteristics is examined and desired changes are noted on the "Detailing Form" resulting in a written plan that guides the orthodontist to achieve excellence in finishing. This written form can also act as a final checklist of obtainment of the goals of orthodontic treatment. This system of finishing can improve the efficiency of the individual orthodontist and assist in communication in multidoctor practices. The detailing form is divided into six sections: three sections for recording examination findings and three sections for wire adjustment notations and procedures that need to be completed. (Fig- 2)

The final detailing appointment is where the Orthodontist uses the Detailing form. The findings are recorded in the first part of the form. The second part of the Final Detailing appointment involves adjusting and inserting the final finishing wires. Final Detailing appointment is scheduled for about 45 minutes, 4 to 7 months before the expected debonding.

The finishing wires

This stage involves marking the finishing wires interproximally with a wide mark at the midline, smaller interproximal marks, and a solid mark at the right end to distinguish right from left. A black marker is used in the maxillary arch, and a red marker is used in the mandibular arch. In case of torque changes, 0.019 ´x

0.025 titanium molybdenum alloy (TMA) (Ormco Corporation, Orange, Calif) finishing wire in a 0.022 slot and 0.017 x 0.025 TMA wire in a 0.018 slot can be used.
Panoramic radiograph is used to evaluate root parallelism and asses the degree of root angle bends if needed. The notation is drawn on the form in the same manner that the bend will be made in the wire. A "V" bend in the maxillary wire would bring excessively divergent roots together. If adjacent roots are too close together, a "tent" bend is made to move them apart. Marginal ridge discrepancies arising from difficult bracket positioning and root angulation can be identified and rectified using root angle bends.

The detailing appointment also involves evaluation of

- Patient's facial form, incisor display, and gingival contours
- Coincidence of facial Midlines with dental midlines and Occlusal plane
- Profile and anterior Torque
- Functional habits
- Temporomandibular Joints and function
- Angle classification and Overjet
- Posterior transverse Concerns
- Vertical relationships
- Spacing and tooth size Relationships
- Maxillary anterior tooth Positions
- Segmentwise evaluation of maxillary and mandibular dentition.

Finishing Procedures and Retention in Bio - progressive therapy

According to Hilgers et al[6], the greatest values of the visual treatment objective is the establishing of specific end results from the very beginning. The visual treatment objective considers the morphological and functional variations due to the facial type and proposes the necessary torque for incisor alignment, arch forms and tooth positioning depending upon the angulation of the individual facial axis. Therefore, the "cephalometric setup" of the V.T.O. becomes an important tool of visualizing the final finishing procedures.

Bioprogressive Therapy proposes a concept of overtreatment in order to compensate for the original malocclusion and the abnormal function that was originally present. The natural forces of eruption and the natural forces of occlusion combine with those of physiology and growth to settle functionally into the best position for each individual's characteristics. Overtreatment is an attempt to reverse the natural biological tendency and allow natural function to guide the teeth into the best functioning occlusion for each individual.
Bioprogressive therapy also lays emphasis on functional influences on finishing and retention

- The proper location and function of the condyle in the TMJ is essential to the health and stability of the occlusion
- A normal airway which effects the basic respiratory process and influences the tongue posture and function is important to the stability of the denture
- Lip function and its variations have an influence upon the incisor alignment and stability.
- The buccal and facial musculature along with the muscles of mastication also influence stability.

Finishing Procedures and Retention in Begg philosophy

Finishing with Begg appliance is difficult but not impossible. Difficulty in finishing using classic Begg appliance was because of use of round archwires in begg bracket. Begg mechanics provides good 1st order control and vertical level adjustment but poor 2nd and 3rd order control. These missing ingredients can be compensated by continued use of 3rd stage auxillaries/ rectangular finishing wire for torque control.
When round wires are used for finishing, 0.020" Stage III archwires are used for finishing in 0.040" high begg bracket slot as it allows vertical movement of about 0.5mm. Torquing auxillaries are continued to the finishing stage and the upper and lower archwires should be well coordinated.

1st order adjustments	2nd order adjustments
• Horizontal offset for upper lateral incisor to compensate for difference in labio- lingual thickness between central and lateral incisors • Offset between Upper lateral incisor and canines to accomodate the canine prominence • Offset made in 3rd stage archwire between Premolar and molar to compensate for their different buccal contours • A toe – in in upper 1st molar for distolingual rotation to obtain a good Class I molar relationship. • Lower canines are "Tucked in" to prevent of relapse of	• Vertical step in upper archwire for lateral incisor which should be sligtly shorter than central incisor • A slight mesio angulation of upper 1st molar to seat the distobuccal cusp against the mesiobuccal cusp of lower 2nd molar. *(A slight distal tip of lower molar for its proper fit against upper molar takes place on its own because of the anchor bend.)* • The upper canines are slightly more mesially angulated to make their cusp tip occlude with the distal half of labial surface of lower canines (Cuspid protected occlusion) • Levels of lower lateral incisors and canines are

lower incisor crowding (Ricketts)	adjusted with step in the arch wire.

At the end of Stage III, over tip and over torque of all teeth by 10 – 15% is achieved so that they settle to their correct tip and torque during finishing.

When rectangular finishing wire is used, usually 0.022" X 0.018" alpha titanium ribbon wires are the wires of choice.

1. They provide Precise degree of torque in anterior segment using 0.022" turret in ribbon mode
2. Wire is soft while shaping and becomes hard intra orally ansorbing hydrogen atoms.
3. Its vertical 0.022" dimension gives enough clearance in 0.040" Begg slot for vertical settling.

Precision finishing in lingual orthodontics

One major reason for the current unpopularity of lingual orthodontic therapy is the difficulty in finishing the occlusion to a desirable esthetic and functional result. This is due to

1. Variation in tooth anatomy.
2. Evaluating the nature of misalignments
3. Wire bending with short interbracket distances
4. Psychological factors.

Consistent excellence in finishing lingual orthodontic treatment requires the coupling of precise bracket placement with accurate archwire bending. Archwire bending can be better accomplished using Orthomate which consists of a scanner, CAD program and robots for automated wire bending[7].

Three finishing approaches using the Orthomate system

Type I Finishing: (Clinical Corrections with Orthomate) used when minimal bends need to be placed in the finishing archwire to achieve optimal alignment and intercuspation in the anterior region.

Type II Finishing: (Rapid Target Simulation with Orthomate (RTS)) used when severe rotations / partially erupted teeth requiring initial bracket positions to be offset and repositioned later. It helps fabricate complex wire geometries to eliminate the need for rebonding of brackets.

Type III Finishing: (Setup Related Finishing with Orthomate (SRF)) used for complex three-dimensional corrections. A second set of brackets is transferred to a duplicate of the original cast as described above, individual teeth are reset in a diagnostic setup to reflect the target occlusal scheme.

III. Conclusion

Given the number of variables in all three planes of space, finishing should begin at start of treatment planning, to avoid tedious procedures during the final stages. Regardless of the prescription or philosophy used for treatment, it is important to maintain arch coordination, proper inclination and angulation to satisfy Andrew's six keys to normal occlusion. A neatly completed case with a signature finish differentiates an average orthodontist from a real master.

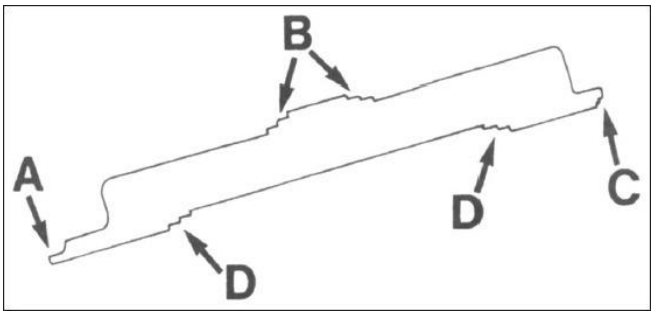

Figure - 1 - ABO measuring gauge

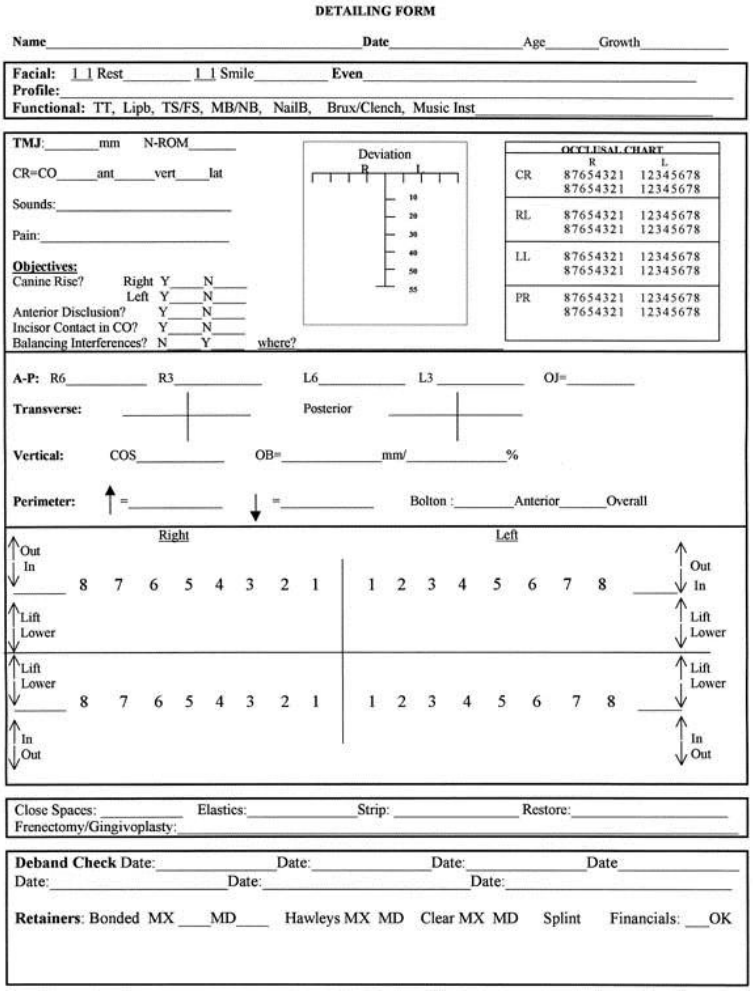

Figure 2 – The detailing form

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FIGURE LEGEND

Figure 1- ABO measuring gauge
Figure 2 – The detailing form