

Finishing and Detailing in Orthodontics: A Short Review

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Abstract: Finishing is perhaps one of the most deceiving and difficult phases of orthodontic treatment. The finishing procedures are considered, from the beginning stages of the treatment, as a part of total scheme of treatment. In recent times, great deal of emphasis is placed on achieving perfect finishing and detailing of the orthodontic treatment, so that the results are pleasing to the eye and are more stable and conducive to improved function and health. Thus, the aim of this article is to provide comprehensive knowledge about finishing and detailing in orthodontics.

Keywords: Finishing, Detailing, orthodontic treatment

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I. Introduction

Orthodontic finishing is described as an "art" comprised of individual perceptions and small detailing. Finishing distinguishes the true master of the profession from the average orthodontist. It is the small details that make the difference and these details are the essence of finishing.¹

Definition:

Finishing: The final stage of fixed appliance orthodontic treatment, during which final detailing takes place to idealize individual tooth position.²

The better the brackets are placed and repositioned as needed, the less work is required in finishing. The greater the attention paid to accurate arch form and archwire coordination, the less work is required in finishing. The less that force levels overpower the appliance system, moving teeth to appropriate positions, less work is required during finishing.

II. Discussion

Finishing is perhaps one of the most deceiving and difficult phases of orthodontic treatment. Finishing distinguishes the true master of the profession from the average orthodontist. It is the small details that make the difference and these details are the essence of finishing. Finishing is the last phase of "active" treatment and thus is heavily dependent upon the previous stages of 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. Major tooth movement, or macromechanics, should have been executed properly, so the minute tooth movements, or micromechanics, can be achieved with precision in the final finishing phase of treatment. When the treatment mechanics are less than optimal, the finishing stages often include indiscriminate use of intermaxillary elastics and quick-fix therapies like interproximal reduction.¹

Evolution of the concept of finishing has changed from that of the earlier authors who relied on the nature to achieve final finishing in each individual case. Edgewise appliance brackets had a modest beginning in the form of Ribbon arch bracket designed by Edward Hartley Angle.^{3,4} Merrifield belief of finishing stresses on overcorrecting major problems so that changes during denture recovery would move occlusion towards ideal.

Finishing in Conventional Begg therapy which emphasizes overcorrection of all aspects of the malocclusion (e.g. Deep bite were finished in edge to edge or slight open bite, class II cases finished in super class I) so teeth would settle in proper positions after tissue rebound.^{5,6} Although, the earlier authors like Tweed relied primarily on placement of the lower incisors over basal bone. He stressed about finishing of a case, the incitement to this concept was given by Andrews. In 1972 his own study of 120 non-orthodontic models led him to formulate the "six keys to normal occlusion".^{7, 8} This study established normal values for in out, tip and

torque for each individual tooth were built into the edge wise brackets for the starlight wire appliance. Followed with Roth added the goals of gnathologic finishing as part of orthodontic treatment.^{4,7} Finishing was considered to be very difficult and time consuming in Conventional Begg therapy. But the same has become very easy with the PEA systems since the Andrews starlight wire concept. If the tip, torque and in-out compensation built into the appliance is accurately suited to the patients dentition, and if brackets are properly positioned, then only minimal wire bending should be required to complete the treatment.^{9,10} McLaughlin and Bennett prefer passive tiebacks in finishing stage especially in extraction cases to maintain space closure.^{7,8,11,12} Finally lingual appliance uses a Systematic Finishing Procedure in 3 steps of finishing protocol followed by detailing using different bends such as inset ,offset , v and rotation bends. The use of tooth positioners has been suggested for final finishing.^{13,14}

Although many variations are inevitable to meet the demands of specific cases, it is possible to outline a logical sequence of archwires for continuous arch edgewise technique. The sequence is based on two concepts :(1) that the most efficient archwires should be used, so as to minimize clinical adjustments and chair time; and (2) that it is necessary to fill the bracket slot in the finishing stage with appropriately flexible wires to take full advantage of the modern appliance.¹⁵

Finishing the case:

During this last stage of treatment, finishing and detailing, it is important to continue to focus on treatment goals. As stated at the outset, in the preface, these are as follows:

- Condyles in a seated position – in centric relation.
- Relaxed healthy musculature
- A ‘six keys’ Class I occlusion
- Ideal functional movements - a mutually protected occlusion
- Periodontal health
- Best possible esthetics

Because of the built in features of the preadjusted appliance, and the major emphasis on bracket placement, moving teeth to their finished positions begins as soon as the brackets have been placed and the first arch wires tied in. There is a gradual flow toward the finishing stage, with less work required at the end. Finishing and detailing, is therefore no longer a separate and lengthy stage of mechanics, but more a rewarding outcome for good management of the case, earlier in the treatment.

The greater the attention paid to accurate arch form and archwire coordination, the less work is required in finishing. The less the force levels, the less work is required during finishing.

During the closing stages of treatment attention needs to be given o the following considerations ¹¹:

- Horizontal
- Vertical
- Transverse
- Dynamic
- Cephalometric and esthetic

General Considerations In Finishing And Detailing

The final stage of treatment is evaluated according to four major categories: intraoral, extraoral, radiographic, and functional objectives. Each category has specific objectives that must be met to obtain a desirable finish.

Intraoral Objectives

This category is arguably the most important of the four. The intraoral objectives are classified into two subcategories: intra-arch and inter-arch objectives.^{16,17,18,19,20,21} The primary objective in both is to achieve ideal occlusion with well aligned arches. Most of these intraoral objectives are described in the American Board of Orthodontics (ABO) grading criteria.²²

Extraoral Objectives

The extra oral objectives are based on esthetic concepts, with the majority of these concerning the smile. The key factors within the smile that need to be addressed are: smile arc, incisor display, gingival display, buccal corridors, incisal plane, midlines, upper incisor third-order angulations, and tooth morphology in the esthetic zone.^{23,24,25,26,27}

Radiographic Objectives

The most important factors to be evaluated with the cephalometric headfilms taken approximately 3 to 4 months before debonding involve the soft tissue profile, the antero-posterior position of incisors, torque of the incisors, changes in mandibular plane, the degree to which vertical development has occurred or been restricted and success in correcting the horizontal, skeletal and dental component of the problem. The finishing panoramic radiograph is also helpful in evaluating root resorption. If external apical root resorption is observed, the orthodontist may want to decrease the length of time spent on the finishing stage. Although monitoring for root resorption has been recommended during the first 6 months of treatment,²⁸ usually it is noticed on the finishing panoramic radiograph.

Periapical radiographs are usually only indicated in the finishing stages to obtain a more detailed view of any significant findings observed in the panoramic radiograph such as: extensive root resorption, root parallelism between adjacent teeth to an implant site, or evidence of periodontal bone loss.²⁹

Functional Objectives

A proper functional occlusion is the goal in every orthodontic treatment. A mutually protected occlusion is considered to be the ideal goal. To achieve this ideal occlusion during the finishing stages, it is important to have the maximum amount of normal occlusal contacts during maximum intercuspation. Coincidence of centric relation with centric occlusion is a goal for various clinicians and also normal functioning of TMJ.³⁰

Special Finishing Procedures To Avoid Relapse¹⁵

Relapse after orthodontic treatment has two major causes:

- (1) continued growth by the patient in an unfavorable pattern, and
- (2) tissue rebound after the release of orthodontic force.

Control of Unfavorable Growth

Changes resulting from continued growth in a Class II, Class III, deep bite or open bite pattern contribute to a return of the original malocclusion, and so are relapse in that sense. These changes are due to the pattern of skeletal growth, not just to tooth movement. Controlling this type of relapse requires a continuation of active treatment after the fixed appliances have been removed, rather than specific finishing procedures to prevent relapse. For patients with skeletal problems who have undergone orthodontic treatment, this "active retention" takes one of two forms. One possibility is to continue extraoral force in conjunction with orthodontic retainers (high-pull headgear at night, for instance, in a patient with a Class II open bite growth pattern). The other appropriate option, which often is more acceptable to the patient, is to use a functional appliance rather than a conventional retainer after the completion of fixed appliance therapy.

Control of Soft Tissue Rebound

A major reason for retention is to hold the teeth until soft tissue remodeling can take place. Even with the best remodeling, however, some rebound from the application of orthodontic forces occurs, and indeed the tendency for rebound after interarch elastics are discontinued. There are two ways to deal with this phenomenon:

- (1) overtreatment, so that any rebound will only bring the teeth back to their proper position, and (2) adjunctive periodontal surgery to reduce rebound from elastic fibers in the gingiva.

Supracrestal Fiberotomy

In patients whose original malocclusion was characterized by significant anterior crowding or rotation of teeth. (e.g. Class II division 2 malocclusion with flared and rotated lateral incisors), gingival surgery may be indicated. The procedure of choice is the circumferential supracrestal fiberotomy (CSF), as advocated by Edwards.³¹ The research of Reitan, and others, has shown that the supracrestal tissues (free gingival and transeptal fibers) remain stretched for months or years after tooth movement. The remodeling period for the transeptal fibers contrasts with other fibers of the periodontal ligament that remodel within 2-3 months after orthodontic rotation of teeth.

We recommend that the CSF procedure ideally be carried out 1- 4 months before appliance removal, after the anterior teeth are aligned properly. CSF procedures are contraindicated in patients who have active periodontal disease, gingival recession, lack of attached gingiva, and/or poor oral hygiene.

Raleigh Williams: Six Treatment Keys For Eliminating Lower Retention:³²

Six treatment keys are essential if lower retention is to be eliminated.

First Key:

The incisal edge of the lower incisor should be placed on the A-P line or 1 mm in front of it. This is the optimum position for lower incisor stability. It also creates optimum balance of soft tissues in the lower third of the face for all the variations in apical base differences within the normal range.

Second Key:

The lower incisor apices should be spread distally to the crowns more than is generally considered appropriate, and the apices of the lower lateral incisors must be spread more than those of the central incisors.

Third Key:

The apex of the lower cuspid should be positioned distal to the crown. The occlusal plane, rather than the mandibular plane, should be used as a positioning guide.

Fourth Key:

All four lower incisor apices must be in the same labiolingual plane. Spreading the apices of the lower incisor roots distally causes a strong reciprocal tendency for the crowns to move mesially.

Fifth Key:

The lower cuspid root apex must be positioned slightly buccal to the crown apex. This is extremely important because of its influence on post-treatment stability. Lower fixed retention was then routinely needed to prevent intercusp distance from diminishing and incisors from collapsing.

Sixth Key:

The lower incisors should be slenderized as needed after treatment. Lower incisors that have sustained no proximal wear have round, small contact points, which are accentuated if the apices have been spread for stability. Consequently, the slightest amount of continuous mesial pressure can cause various degrees of collapse in the lower incisor segment.

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American Board Of Orthodontics Criteria:²²

Another set of criteria was developed in 1998 by the directors of The American Board of Orthodontics for objectively evaluating the dental cast and panoramic radiographs. Dental Cast were evaluated using ABO grading scale.

1)Alignment:

Alignment is usually a fundamental objective of any orthodontic treatment plan. In the maxillary and mandibular anterior regions, proper alignment is characterized by coordination of alignment of the incisal edges and lingual incisal surfaces of the maxillary incisors and canines, and the incisal edges and labial incisal surfaces of the mandibular incisors and canines .

In the mandibular posterior quadrants, the mesiobuccal and distobuccal cusps of the molars and premolars should be in the same mesiodistal alignment. In the maxillary arch, the central grooves (mesiodistal) should all be in the same plane or alignment. The total number of deductions shall be subtracted from 64 to give the score for alignment.

2)Marginal ridges:

Marginal ridges are used to assess proper vertical positioning of the posterior teeth. In patients with no restorations, minimal attrition, and no periodontal bone loss, the marginal ridges of adjacent teeth should be at the same level. If the marginal ridges are at the same relative height, the cemento-enamel junctions will be at the same level. In a periodontally healthy individual, this will result in flat bone level between adjacent teeth. In addition, if marginal ridges are at the same height, it will be easier to establish proper occlusal contacts, because some marginal ridges provide contact areas for opposing cusps. The total number of deductions shall be subtracted from 32 to give the score for marginal ridges.

3)Buccolingual inclination :

The buccolingual inclination of the maxillary and mandibular posterior teeth is assessed by using a flat surface that is extended between the occlusal surfaces of the right and left posterior teeth. The buccolingual inclination is used to assess the buccolingual angulation of the posterior teeth. The total number of deductions are subtracted from 40 to give the score for posterior inclination.

4)Occlusal relationship :

The occlusal relationship is used to assess the relative anteroposterior position of the maxillary and mandibular posterior teeth. The most verifiable method of scoring this criteria is to use Angle's relationship.

5)Occlusal contacts :

Occlusal contacts are measured to assess the adequacy of the posterior occlusion. Again, a major objective of orthodontic treatment is to establish maximum intercuspation of opposing teeth. Therefore, the functioning cusps are used to assess the adequacy of this criterion, ie, the buccal cusps of the mandibular molars and premolars and the lingual cusps of the maxillary molars and premolars. If cusp form is small or diminutive, that cusp is not scored. The total number of deductions are subtracted from 64 points to give the score for occlusal contacts.

6)Overjet:

It is used to assess the relative transverse relationship of the posterior teeth and the anteroposterior relationship of the anterior teeth. In the posterior region, the mandibular buccal cusps and maxillary lingual cusps are used to determine proper position within the fossae of the opposing arch. In the anterior region, the mandibular incisal edges should be in contact with the lingual surfaces of the maxillary anterior teeth.

The overjet is evaluated by articulating the models and viewing the labiolingual relationship of the maxillary arch relative to the mandibular arch. The total number of deductions are subtracted from 32 to give the score for overjet.

7)Interproximal contacts :

All spaces within the dental arches should be closed. This assessment is made by viewing the maxillary and mandibular dental casts from an occlusal perspective. The mesial and distal surfaces of the teeth should be in contact with one another. If no interproximal spaces exist, then no points are subtracted. The total number of deductions are subtracted from 60 to give the score for interproximal contacts.

8)Root angulation :

Root angulation is used to assess how well the roots of the teeth have been positioned relative to one another. Although the panoramic radiograph is not the perfect record for evaluating root angulation, it is probably the best means possible for making this assessment. If roots are properly angulated, then sufficient bone will be present between adjacent roots, which could be important if the patient were susceptible to periodontal bone loss at some point in time. If roots are dilacerated, then they are not graded. The total number of deductions are subtracted from 64 to give the score for root angulation.

III. Conclusion

Finishing phase is probably the most challenging and difficult stage of treatment. In certain cases, it may take as much or more time and effort to finish the detailing of a case than to correct the major problems of the malocclusion. The time spent by individual clinicians in detailed finishing is an important factor in the variation of treatment duration. Orthodontist must keep them in mind and take care from the beginning of treatment to minimize errors in the different stages so that he has to do the minimum amount of work during the actual stage of finishing and detailing. There by providing efficient treatment to his patient.

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