Enhanced CPD DO C

Joey Donovan

Siobhan McMorrow, Erfan Salloum, Declan T Millett and Grant T McIntyre

Finishing and detailing with the pre-adjusted edgewise labial fixed appliance: the why, the what and the how

Abstract: Finishing and detailing is typically undertaken towards the end of orthodontic treatment. It should, however, be considered at the start of treatment and then evaluated at the end of each treatment stage. An appraisal of the disharmony between the planned and observed facial, skeletal and occlusal objectives is required with ongoing refinement to achieve the treatment goals. With the pre-adjusted edgewise labial fixed appliance, finishing and detailing may involve bracket repositioning, archform adjustment, localized wire bending, elastic traction, partial debonding, occlusal adjustment as well as restorative and periodontal input. It should also take into consideration the retention plan.

CPD/Clinical Relevance: This article summarizes what is involved in finishing and detailing with the pre-adjusted edgewise labial fixed appliance in regard to aesthetics, function and stability, and critiques the evidence available in relation to these aspects.

Ortho Update 2024; 17: 98–106

From an orthodontic perspective, finishing is described as the art of addressing individual perceptions and minute details during the final stages of fixed appliance therapy.[1] In the same context, detailing encompasses locating each tooth in its optimal position in all three planes.[1]

Pre-adjusted labial fixed appliances incorporate first, second and third order tooth movements in the appliance prescriptions to produce the respective 'in-out', tip and labio-lingual torque. These movements occur gradually throughout treatment, with archwire progression leading to greater engagement of the bracket slot. Accurate placement of brackets and other attachments is fundamental to finishing and detailing and, although it may seem counterintuitive, finishing and detailing therefore has its origins at the start of treatment.[2]

The intention of accurate attachment placement is to locate the teeth in their optimal positions and thereby achieve Andrews' six keys of static occlusion, as well as functional occlusal goals (Table 1).[3,4] Several variants of the pre-adjusted edgewise appliance exist with different prescriptions.

Joey Donovan, BDS, DClinDent (Orth), MOrth, Specialist in Orthodontics, Private Practice, Singapore. **Siobhan McMorrow**, BA, BDSc, MFDS (RCSI), DClinDent (Orth), MOrth (RCSEd), MATLHE, Lecturer/Specialist in Orthodontics, Orthodontic Unit, Oral Health and Development, Cork University Dental School and Hospital, University College Cork, Ireland. **Erfan Salloum**, BDS, PgCert (Orth), DClinDent (Orth), M.Lingual (Orth), MFD, MFDS, MOrth, FFD, IMOrth, EBAO, Specialist in Orthodontics, ES Orthodontics, Dublin, Ireland. **Declan T Millett**, BDSc, DDS, FDS, DOrth, MOrth, FHEA, Professor of Orthodontics/Consultant Orthodontist, Orthodontic Unit, Oral Health and Development, Cork University Dental School and Hospital, University College Cork, Ireland. **Grant T McIntyre**, BDS, MOrth, PhD, FDS(Orth), FDT, FHEA, Consultant/Honorary Professor in Orthodontics, Orthodontic Department, Dundee Dental Hospital and Research School. email: drjoeyd@gmail.com

Figure 2. Second order bend to correct tip of UR1.

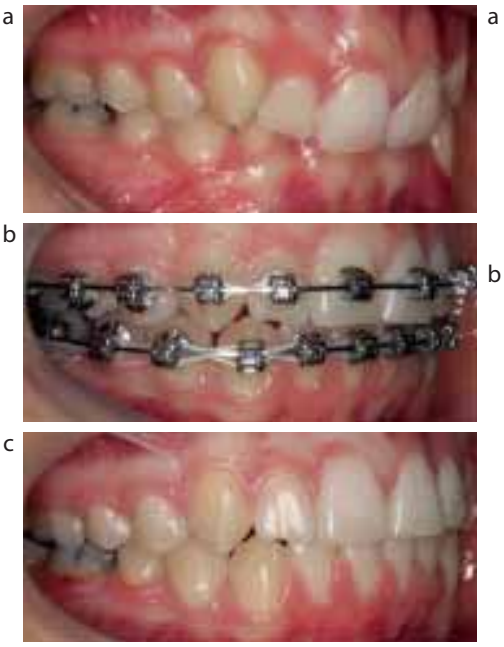

Figure 3. Full torque expression: **(a)** pre-treatment (undertorqued); **(b)** mid-treatment; and **(c)** post-treatment.

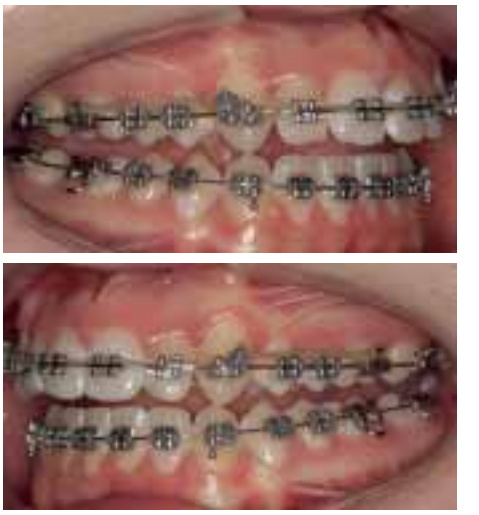

Figure 4. (a,b) Checking functional occlusion prior to debonding of fixed appliances.

judged to be more aesthetically pleasing than those with asymmetry, particularly with respect to coincidence of dental and facial midlines where a discrepancy of over 2 mm compromises aesthetics.[12,13]

Facial attractiveness reduces as the smile arc deviates away from the ideal contour which should follow the curvature of the lower lip. Attractiveness also decreases with increasing buccal corridor show and increasing occlusal cant.[14,15]

A smile is considered more attractive when the teeth are aligned, with a pleasing hue and there are no discrepancies in the shape, colour and level of the gingivae with no black triangles.[16,17]

How

To achieve optimal smile aesthetics, consideration needs to be given to these macro, mini and micro features. As finishing starts at the beginning of treatment, the following need to be considered from the outset:

- Facial and dental aesthetics: Comprehensive examination and treatment planning includes an assessment of facial and dental aesthetics. As macro-aesthetics in this context are influenced principally by orthognathic surgery or functional appliance therapy, they are not typically considered finishing or detailing procedures and will not be discussed further here.
- Incisor display: To increase incisor display in cases of localized gingival excess, laser gingivectomy or crown lengthening may be used.
- Gingival display: Botulinum toxin A could be administered to the upper lip elevator muscles to reduce gingival display in cases with 'gummy smile' owing to hyperactive lip musculature.[18]
- Buccal corridor width: Upper arch expansion may be indicated as part of treatment to reduce the width of buccal corridors.
- Smile arc and occlusal cant: Compensatory adjustments to bracket positions may be made in cases of flat or non-consonant smile arc or where an occlusal cant exists.
- Individual dental anatomy: Precise bracket positioning in all three planes (mesiodistal, vertical and angular) for every tooth, taking specific regard of teeth visible in the smile. Alterations should be made to account for incisor wear or enamel fractures.
- Bracket positioning errors or insufficient expression of the bracket prescription: Where these are observed, archwire bends should be incorporated (Figures 1 and 2). Full-dimension archwires are required for full torque expression (Figure 3).
- Bracket prescription modifications: Specific adjustments to the bracket prescription for individual teeth, e.g. inverting a bracket on an in-standing upper lateral incisor reverses the prescription from palatal root torque to labial root torque to ensure that the root is palpable labially and the crown inclination is in line with the adjacent incisors.[19]
- Tooth size and shape: Measurement of both the true mesiodistal dimensions of the anterior teeth and their apparent widths as observed in the smile to take account of the Bolton ratio (77.2% ± 1.65%) and golden proportion (1.618:1), respectively.[20,21] Restorative build-up or interproximal enamel reduction can be performed to ensure that the upper canine–canine mesiodistal width complements that of the lower for optimal aesthetics.

Function

Why

The finished occlusion should be well interdigitated and free of displacing occlusal contacts as these may predispose to relapse, compromise periodontal health and promote temporomandibular joint problems.

What

Any occlusal scheme is acceptable, provided occlusal interferences are eliminated.[22] These are:

- Canine guidance: unilateral working side contact of maxillary and mandibular canines only during lateral excursion which disoccludes all other teeth.
- Group function: simultaneous contact of the canine and posterior teeth on the working side during lateral excursion.
- Balanced occlusion: bilateral, simultaneous occlusal contacts on working and non-working sides during excursive movements.

Distinction should be made between non-working side contacts, where teeth come together without incident, and occlusal interferences that compromise function or cause dysfunction.[22]

Figure 5. Bracket repositioning: UR1 repositioned. **(a)** Initial bonding, **(b)** initial alignment, **(c)** repositioned and **(d)** finish.

Figure 6. (a) Settling elastics with finishing archwires (0.016 inch stainless steel) and **(b)** post-treatment.

Figure 7. (a) Sectioned archwires used in conjunction with settling elastics (not shown). **(b)** final occlusion.

Figure 8. 0.016 inch stainless steel archwire used in finishing stage of treatment, customized and coordinated to the pre-treatment archform.

Figure 9. IPR with **(a)** handheld strip and **(b)** air rotor.

How

The static and functional occlusion must be checked prior to debonding to ensure the presence of a well-interdigitating static occlusion and a dynamic occlusion free of interferences (Figure 4). Adjustments at this stage may be necessary because, although following debonding, the naturally occurring occlusal, soft-tissue and periodontal forces have the potential to bring about spontaneous improvement in occlusal interdigitation, for most, the functional occlusion remains unchanged.[23] Articulator mounting of casts is not required.[24] The following may be necessary:

- Bracket repositioning (Figure 5) and archwire bends to address premature displacing contacts with or without occlusal equilibration.
- Settling elastics, sectioning of archwires and/or partial debonding to maximize occlusal interdigitation (Figures 6 and 7).

Stability

Why

Following orthodontic treatment, teeth tend to revert towards their pre-treatment positions.[25] Finishing and detailing should optimize the prospect of stability. Rotated teeth are particularly prone to relapse as is any marked change in the labio-lingual position of the lower labial segment and expansion of the lower intercanine distance.[26]

What

The teeth should be positioned in a zone of equilibrium between the lips, cheeks and tongue.[27] To garner long-term stability, the following should be checked and realized during finishing:

- Maintenance of the pretreatment lower archform, particularly of the lower labial segment and intercanine distance.
- Maximal contact areas of the lower incisors.
- Full alignment of initially rotated teeth.
- Overbite reduction to within normal limits.
- Well-interdigitated buccal segment occlusion.

These factors will help to inform the retention plan, which should be customized for the individual patient considering pre-treatment features of the malocclusion.

How

- Finishing archwires should be customized and coordinated to maintain the original archform (Figure 8).