Orthodontics as an adjunct to restorative dentistry - an illustrative case

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Introduction

Masking of underlying malocclusion can result in compromises when undertaking restorative treatment. The degree and consequences of such compromises will vary from case to case, and an analysis and discussion of these should form a part of the consent process. This case illustrates some of the pitfalls that can be associated with a restorative-only approach, which were solved by joint orthodontic-restorative management.

Figure 1: a-b – Pre-treatment facials

Figure 1: c – Pre-treatment smile

Figure 1: d – Occlusal view upper arch

History

Emma was aged 36 when she was referred in 2004 by her general dental practitioner regarding the persistent bonding failure of the veneers on the upper incisors. These had been made four years previously to mask the irregularity and discolouration of the upper incisors. Emma was happy with the aesthetics of the veneers, but becoming increasingly concerned regarding their regular bond failures.

Medical history

There was a benign mild mitral valve prolapse for which antibiotic (AB) cover was recommended by the cardiologist for exposure prone procedures.

Oral examination

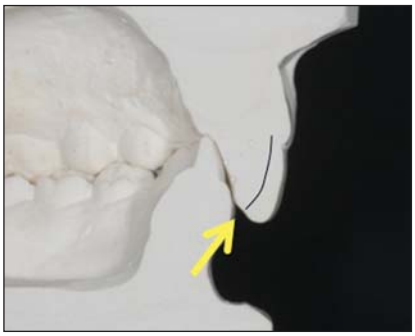
The skeletal pattern was symmetrical and mildly class 2. The lower face height was slightly reduced as was the Frankfort-mandibular planes angle (*Figure 1a* and *b*). The soft tissues were balanced, with competent lips and a high lip line, producing a smile which was somewhat gummy, with 2-4mm of gingival show extending to the buccal segments, combining with narrowness across the premolars to produce significant buccal corridor shadows (*Figure 1c*). The TMJs were healthy and the oral hygiene and general dental condition were good.

The labial surfaces of the upper incisors were well aligned, having been restored with porcelain veneers. The palatal aspects of these teeth were irregular confirming the underlying incisor crowding (*Figure 1d*).

The overbite was increased and complete to soft tissue, the

Figure 2: a-d – Pre-treatment intra oral views

Figure 3: a-b – Palatal veneer margin



retroclined upper incisors having over-erupted. The canines were partially class 2 on both sides. There was mild crowding of the lower incisors and a fairly marked curve of Spee, combining to produce uneven lower incisal edge wear (*Figure 2a-d*).

Observations

Class 2 division 2 relationships produce steep guidance in all excursions, and most patients function mainly in centric and protrusion. This, combined with stronger than average muscular forces associated with this malocclusion type, make the bonding problems with veneers in this case less than surprising (*Figure 3a-d*). However, progression to full coverage restorations would have been highly destructive due to the underlying rotations of the incisors. It was at this point that reorganisation of the occlusion by orthodontic means was considered.

Orthodontic diagnosis

Class 2 division 2 incisor relationship on a mild skeletal 2 base with an average lower face height and mild incisor crowding in both arches. The smile was somewhat gummy. The case was complicated by previous loss of 16 and 35, and by the camouflaging of upper incisor crowding with porcelain veneers which were unstable.

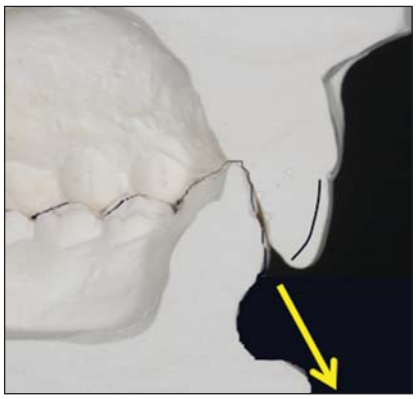
Aims of treatment:

- Reduce overbite
- Decrease inter-incisal angle
- Camouflage underlying skeletal discrepancy
- Eliminate buccal corridor shadows
- Harmonise occlusion for restoration of the upper incisors.

Treatment plan:

- Extract 25 (under AB cover) to balance 16 loss, improving the canine relationship as all upper spaces close
- Upper and lower fixed appliances using rectangular wires to control incisor torque
- 35 space to be kept and restored after orthodontic phase, lower arch expansion being necessary to reduce overbite and camouflage skeletal discrepancy
- Fully bonded appliances to avoid the need for AB cover during appliance fitting Routine use of 0.2% chlorhexidine mouth1 rinse prior to appliance adjustments following BOS guidelines
- Fixed retainers to be fitted to support the upper and lower anterior teeth and kept in place permanently provided hygiene allows it

Figure 3: c-d – Steep anterior guidance displacing veneer



- Removable retainers to be worn in both arches until the completion of the restorative phase.

Treatment time was estimated at 2 years. Emma requested the use of aesthetic appliances, upper lingual fixed appliances offering particular advantages in this case.

Lingual brackets with bite planes are highly effective at overbite reduction, and gave the additional advantage of avoiding bonding to tenuous veneers.

In the lower arch Emma opted for the use of labial ceramic fixed appliances.

Figure 4: a – Lingual appliance incorporating bite planes

Figure 4: b – Immediate disclusion effect

Figure 5: a-b – Front view, day of lower bonding

Figure 5: c – Occlusal view, day of bonding

Figure 6: a-b – Left side before *(left)* and after *(right)* space closure

Orthodontic treatment progress

A laboratory set up of Ormco 7th generation 0.018" slot brackets was prepared, allowing indirect bonding using a transfer tray. These brackets incorporated a bite plane which produced immediate disclusion (*Figure 4a* and *b*). No bonding failures of the veneers occurred after appliances were bonded.
Once initial upper arch alignment had been achieved, the lower arch was bonded with 3m Unitek Clarity 0.022" slot brackets with MBT prescription (*Figure 5a-c*).

Once alignment had been achieved, rectangular stainless steel wires were fitted in both arches to allow space closure with 3-D control. Expression of these wires caused a change in upper incisor inclination and an opening of the contacts between the veneers. Nocturnal class 2 intermaxillary elastics were prescribed during space closure to correct the canine relationship and facilitate overbite reduction. As upper arch spaces were closed, the lower arch was expanded, slightly increasing the 35 space, and space for lower incisor alignment gained by their proclination. Such movement camouflages a skeletal 2 discrepancy, but as proclined teeth occupy more arch length, the canine relationship usually remains slightly class 2, as in this case (*Figure 6a* and *b*).

As space closure neared completion the restorative dentist reviewed the occlusion and requested that the overbite be made incomplete. This would allow full coverage porcelain restorations to be created whilst minimising the amount of palatal tooth reduction. Bends were placed distal to 33 and 43 to achieve this (*Figure 7*).

Treatment progress was somewhat interrupted by the diagnosis of Crohn's disease which required hospitalisation. After two years and six months of treatment, fixed appliances were removed under AB cover and upper and lower lingual fixed retainers bonded at the same appointment. Interdental brushes were demonstrated for daily use. Upper and lower vacuum formed retainers were fitted for nocturnal

Figure 7: Bends to further reduce overbite

Figure 8: a – Pre-treatment smile

Figure 8: b – Smile at end of orthodontic phase

Figure 9: a-b – Temporary restorations

wear, and the patient advised to attend for retainer checks after any restorative procedures.

Restorative phase

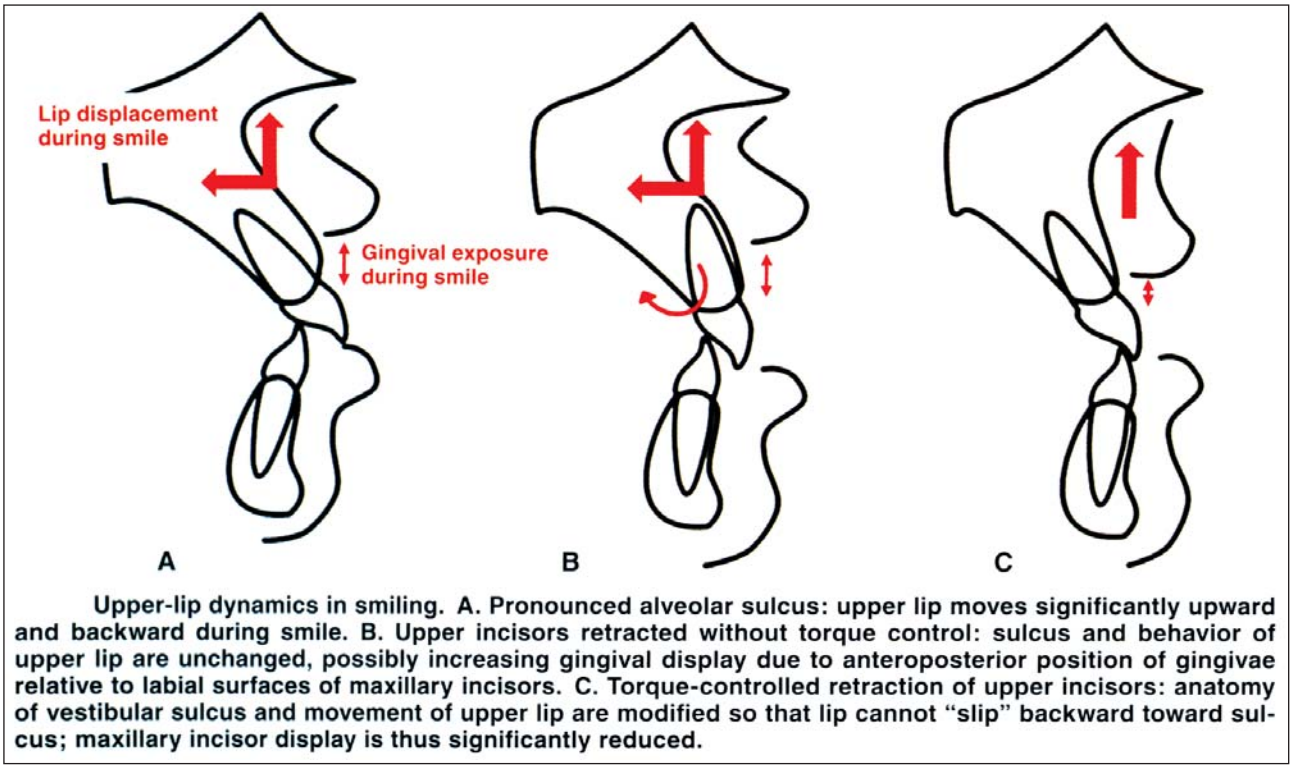
Nocturnal home bleaching with 10% carbamide peroxide was undertaken soon after debond.

Significant reduction in the gumminess of the smile occurred during the orthodontic phase (*Figure 8a* and *b*). It has been suggested2 that this might be due to changes in lip retraction resulting from palatal root movement (*Figure 8c*). This was refined by surgical crown lengthening, excluding 22.

Six months after the removal of fixed appliances, the upper incisors were prepared for full coverage crowns. The temporaries, fabricated from Luxatemp finished with Luxatemp glaze (*Figure 9a* and *b*), were joined to prevent orthodontic relapse.

The all-ceramic crowns (*Figure 10a-c*) were fabricated from Emax and cemented with Nexus Clear.

One week later a fixed retainer was refitted, extending from 13 to 23 and utilising hydrofluoric acid etch and silane bonding agent (*Figure 11a*).



Upper-lip dynamics in smiling. A. Pronounced alveolar sulcus: upper lip moves significantly upward and backward during smile. B. Upper incisors retracted without torque control: sulcus and behavior of upper lip are unchanged, possibly increasing gingival display due to anteroposterior position of gingivae relative to labial surfaces of maxillary incisors. C. Torque-controlled retraction of upper incisors: anatomy of vestibular sulcus and movement of upper lip are modified so that lip cannot "slip" backward toward sulcus; maxillary incisor display is thus significantly reduced.

Figure 7: c – Diagram of possible mechanism of reduction in gumminess (*from Costa et al.*[2])

Restoration of 35 space has been deferred by the patient and so nocturnal wearing of a vacuum-formed retainer is continuing in the meantime (*Figure 11b* and *c*).

Figure 11: a – Final fixed retainer

Figure 11: b-c – Vacuum formed lower retainer preserving 35 space

Figure 10: a-c – Final restorations

Discussion

This case illustrates some of the compromises and risks associated with masking aspects of a significant malocclusion by restorative means only. Such an approach may well be preferred by the patient, but a discussion of its shortcomings and risks should form part of the consent process.

Following an initial unstable restorative-only approach, orthodontic treatment produced an increase in the inter-incisal angle, overbite reduction, alignment, an increase in smile width and a reduction in the gumminess of the smile. This contributed to a greatly improved overall outcome (*Figure 12a* and *b*).

It should also be considered that once a restorative-only path is followed, subsequent orthodontic correction of other aspects of the malocclusion may be more difficult or impossible. The restorative dentist should be aware that the alternative of orthodontic treatment prior to restorative treatment can produce a range of improvements, and a far superior functional and aesthetic outcome in some situations. Where separate individuals provide these treatments, good communication and mutual understanding are essential to success.

Acknowledgements

I would like to thank Dr Dominic Hassall for providing the post orthodontic restorative treatment in this case.

References

1. Orthodontic management of the medically compromised patient. British Orthodontic Society Advice Sheet number 25.
2. Costa MO, Costa MC, Pinho C, Quintao C. Correction of severe overbite and gummy smile in patients with bimaxillary protrusion. *J Clin Ortho* 2010 4: 237-244.

Further reading

- *The Art of the Smile-Integrating Prosthodontics, Orthodontics, Periodontics, Dental Technology, and Plastic Surgery in Esthetic Dental Treatment*. Romano (ed). Quintessence Publishing.

Figure 12: a-b – Overall treatment change