

CPD

This article is equivalent to one hour
of verifiable CPD. See page 20 for
further details

In the third part of
the series, Paul
Tipton looks closely
at treatment of the
spaced dentition

The art and science of aesthetic dentistry. Part three: Aesthetic- restorative treatment of anterior spacing using alternative treatment options and strategies

By Paul Tipton BDS, MSc, DGD(UK)

Anterior tooth spacing
(diastemas) is one of
the many problems

that patients routinely attend at
our offices for correction.
Orthodontics is the usual route

forward in such cases - but often
the patient is unwilling to go
through lengthy orthodontic

CASE ONE



Figure 1: Diastemas present after orthodontic treatment and teeth not in the golden proportion



Figure 2: Minimal tooth preparation involving slice preparation



Figure 3: Veneers cemented in place using golden proportion calipers



Figure 4: Veneers now showing the correct golden proportion

treatment and opts for the shorter restorative phase instead. Closing of the spaces will often mean that several teeth need to be made wider in order to fill the necessary spaces. Usually between four and eight teeth are sufficient to complete the process with the necessary aesthetic outcome. Case One shows an example of a patient who was referred by her orthodontist for closure of residual spacing after initial orthodontic treatment where six porcelain veneers were used to close anterior spacing between the upper incisors and canines (Figures 1 to 3). However, gap closure by increasing the width also means that the ideal length to width ratio (75-80%) and the golden proportion (1:1.618:1) may be affected (Figure 4). If the length cannot also be changed then the technician needs to



Paul Tipton BDS MSc DGD (UK) is a specialist in prosthodontics and runs private referral aesthetic, restorative and implant practices at the St Ann's Dental Clinic in Manchester and the Birkdale Clinics in Sheffield and Liverpool. He also runs one-year practical aesthetic, restorative and implantology courses

create the illusion of narrower teeth.

Shapes and contours

When tooth lengthening cannot be accomplished as an adjunct to widening of the teeth because of aesthetic or occlusal factors, then the technician needs to use subtle contouring and shading in order to give the illusion of a thinner tooth where, in fact, a fatter tooth is actually visible. These models' faces (Figures 5 to 8) show how the

combination of shadow and colour give the appearance of a thinner face. A similar effect can be produced by subtle changes in the porcelain restorations, including:

- Minimal incisal translucency
- Minimal gingival shading
- Bringing in the line angles (mesially and distally) towards the centre of the tooth
- Moving the contact areas more palatally
- Introducing vertical crack lines and texture (stripes makes one look thinner)

- Making the labial surface more rounded
- Putting more shading mesially and distally into the embrasures.

The opposite scenarios can be performed when you wish to make narrower teeth wider as in the case of correcting imbrication.

Narrow teeth

On occasions the original tooth width is inadequate and by simply closing the spaces by widening the teeth the golden

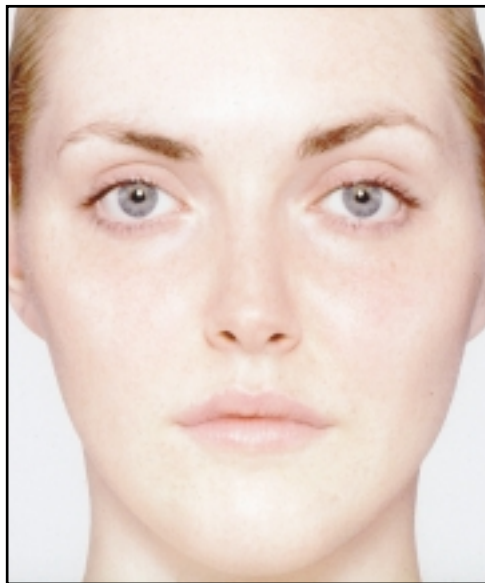


Figure 5: Model's face

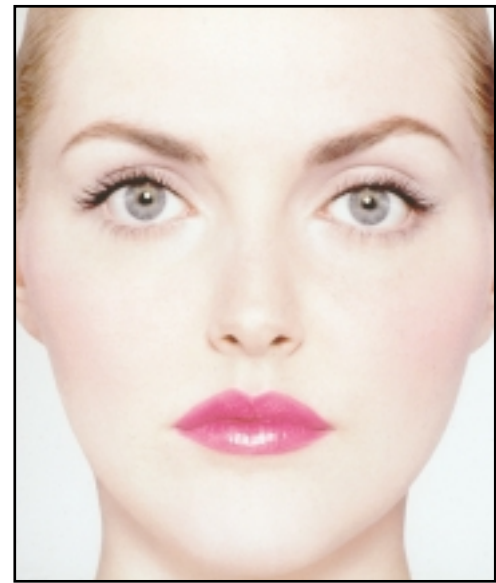


Figure 6: Appearance after make-up to give a thinner facial appearance

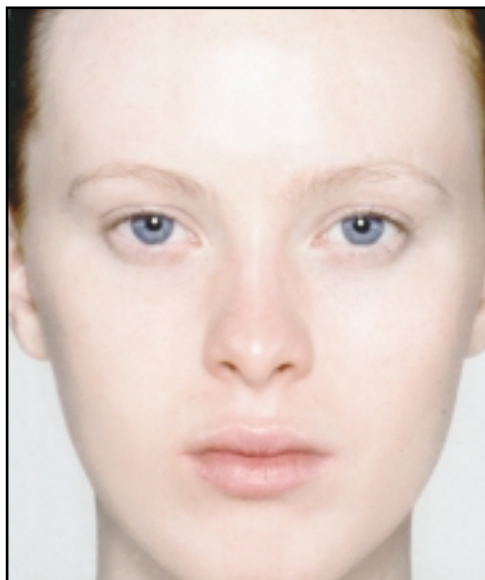


Figure 7: Model's face with no make-up

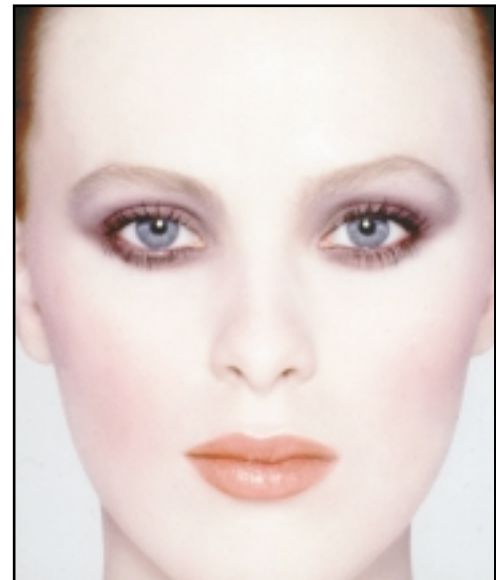


Figure 8: Facial appearance after shading of the cheek bones to produce a thinner facial appearance

RESTORATIVE & AESTHETIC

CASE TWO



Figure 9: Thin teeth with large midline diastema



Figure 10: Removal of non-restorable tooth and replacement with implant



Figure 11: Final aesthetic result of four Procera crowns



Figure 12: Pre-operative smile



Figure 13: Post-operative smile



Figure 14: Facial appearance after treatment

proportion and correct width-to-length ratio can be established. Case Two also shows a patient with narrow teeth where closing the spaces between the centrals by widening of all four incisors allows the establishment of the

The GDC Lifelong Learning Scheme. In October 2000, the GDC launched the preparatory scheme for its lifelong learning initiative. The scheme requires that dentists will have to accumulate 250 hours of CPD credits over five years. 75 of these hours must be verifiable. The GDC also suggests that these hours be spread evenly over the five years. In other words, therefore, dentists can be expected to perform approximately 15 hours of CPD per year. The *R&AP* CPD Programme will enable practitioners to guarantee hitting this annual level of CPD in one go.

Each clinical article featured in *R&AP* is equivalent to one hour of verifiable CPD. To receive credit, complete the five-question multiple choice test after each article and return for processing. Make sure to include the article reference code and your subscriber number.

The addresses to send answers to appear on page 14.

RESTORATIVE & AESTHETIC

CASE THREE



Figure 15: Previous PFMs showing poor shape and colour



Figure 16: Tooth preparation for Procera crowns



Figure 17: Procera crowns cemented in place



Figure 18: Final smile



Figure 19: Facial appearance showing new smile

correct width-to-length ratio (Figures 9 to 14). The patient had one tooth removed and replaced with a Steri-Oss Replace implant (Nobel Biocare) and Procera abutment and crown and three adjacent dentine-bonded restorations to recreate adequate aesthetics.

Incisal length

Diastema cases may, however, need anterior tooth lengthening to go with the widening, either from the gingival area by periodontal crown lengthening or by increasing the length of the

tooth at the incisal edge. This second scenario is acceptable as long as the anterior guidance is tried out first on prototypes and then copied in the definitive restorations or if the anterior guidance is copied from the patient's existing teeth via a custom-made incisal guidance table - and then the guidance is simply lengthened. Case Three (Figures 15 to 19) shows a case where anterior crowns have been made previously in a diastema case but the end result was square-shaped teeth that appeared too wide. By increasing the

Send CPD answers to: **R&AP** Verifiable CPD, FMC Ltd, FREEPOST NAT2688, Shenley, Herts, WD7 9BR

Fax: 01923 851778

Email: karen.sherwood@fmc.co.uk

The views and opinions expressed in the articles appearing in this publication are those of the author(s) and do not necessarily reflect the views of the editor, the editorial board or the publisher. The editors do not endorse any products or medical techniques and the appearance of material in this journal should not be interpreted as an endorsement. If authors have commercial interests relevant to materials or techniques featured in their articles, this will be made clear in the text.

RESTORATIVE & AESTHETIC



Figure 20: Pre-operative smile showing square shaped crowns and excessive gingivae



Figure 21: Crown lengthening procedures



Figure 22: New Procera and ceramic crowns - close-up



Figure 23: Final new smile showing correct length-to-width ratio of the teeth



Figure 24: Final facial appearance with new smile

length of the crowns and copying the anterior guidance, the correct proportion of width to length is again achieved, this time by eight Procera crowns (*Nobel Biocare*).

Increasing the length of the teeth from the incisal edge in order to gain the correct proportion may, however

cause these longer anterior teeth to impact on the lower lip when the patient smiles, which may in turn affect speech and phonetics. Determination as to whether lengthening in these cases is possible can only be achieved by the correct use of prototype plastic restorations.

Gingival contouring

Creating the correct proportion of the upper anterior teeth may also be achieved by crown lengthening and gaining the additional length at the expense of the gingival soft tissues and bone. A high lip line, causing a gummy smile, may be improved in this way and the opinion of a periodontist experienced in these procedures should be sought. Case Four (Figures 20 to 24) again shows a previous diastema case in which composite labial veneers have been built up to close the diastemas but at the expense of creating square shaped bulbous veneers. Periodontal crown lengthening re-establishes the correct width-to-length ratio, this time by bone and soft tissue removal, allowing the provision of six 'Procera' crowns (*Nobel Biocare*) to create a beautiful smile.

Implant surgery

A similar effect to crown lengthening can also be produced by using dental implants if teeth are missing as the surgical approach allows soft tissue repositioning and pontic site development prior to the restorative phase of treatment. In Case Five, two Steri-Oss implants (*Nobel Biocare*) were placed to replace a denture that had spaces between the denture teeth and a three unit bridge used to restore the space, also replacing an old porcelain-fused-to-metal crown on the upper left lateral incisor (Figures 25 to 30). Surgical repositioning of the soft tissues (with either connective tissue grafting from the palate or use of the 'palatal roll technique') during implant surgery (and abutment connection at second stage) allows for the creation of the correct width-



Figure 25: Initial appearance of partial denture in the mouth



Figure 26: Two implant abutments and connective tissue grafting



Figure 27: Final close-up of three unit bridge and single crown



Figure 28: Pre-operative smile



Figure 29: Post-operative smile



Figure 30: Final facial appearance

to-length ratio of the anterior restorations, keeping the incisal edge position the same as prior to treatment so that the patient's anterior guidance was not altered. An ovate pontic site was also developed during the connective tissue graft procedure to improve the appearance of the pontic area.

Interdental papilla

One final further difficulty in overcoming diastema closure is that of producing a thin pointed interdental papilla -

where once there was a blunted, wide papilla present. This is done by precise measurement of the position of the underlying interdental bone and then transferring this information to the technician. This can be accomplished by using a periodontal probe to measure the level of bone interdentally adjacent to each tooth surface by probing until the bone is sounded (heavy pressure) and measuring from this point to the incisal edge of the finished tooth preparation

and relaying this information to the dental technician. The technician can then measure the distance from the incisal edge to a point on the preparation that is 5mm from the interdental bone and that is where the coronal aspect of the contact area between adjacent teeth (restorations) should finish. In this way, black

triangle disease can be eliminated and the papilla fills the gap. Case Six shows a patient who presents with two old crowns on his central incisors with spacing and missing interdental papilla (blunted). One tooth was removed due to root resorption and failed endo/post and was replaced by a Steri-

RESTORATIVE & AESTHETIC

CASE SIX



Figure 31: Two old crowns too wide in appearance with diastema between them



Figure 32: One tooth removed and all ceramic Procera abutment placed and crown and veneer preparations



Figure 33: Final Procera all ceramic crowns and veneers placed



Figure 34: Pre-operative smile



Figure 35: Post-operative smile

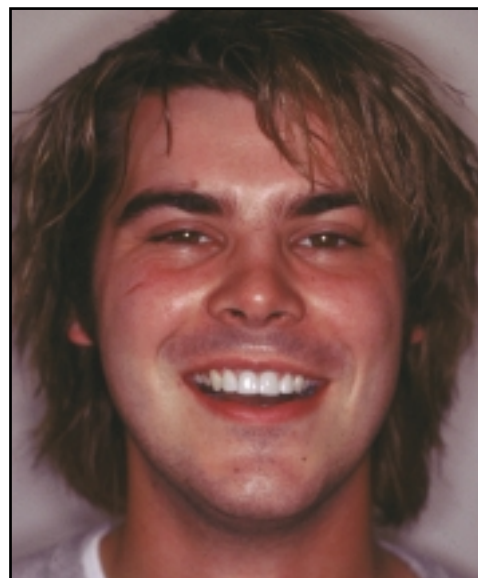


Figure 36: Final facial appearance showing new smile

Oss Replace Select implant (Nobel Biocare) together with an all-ceramic Procera abutment and crown (Nobel Biocare) and a further Procera crown and Procera veneers on adjacent teeth, maintaining the same length of the teeth as previously (Figures 31 to 36).

Conclusions

While orthodontic treatment is usually the optimal treatment to close diastema, restorative options are

available when patients decline such therapy (in particular due to time constraints). The patient should always receive a consultation from an orthodontic specialist, be fully informed of the more invasive nature of non-orthodontic treatment, and provide written consent to this type of procedure before preparation is initiated. When orthodontic therapy is not performed, the aesthetic correction of maxillary spacing relies upon

the combination of tooth preparation techniques, knowledge of tooth anatomy and dentine adhesion, technical support, and determination of bone levels in conjunction with correct contact area placement and expert surgical knowledge, training and protocol. The clinician's

understanding of these principals allows aesthetic results to be achieved with success and predictability, using an interdisciplinary team approach.

Acknowledgements

I would like to thank Dr Richard Brookshaw (implant surgeon)

RESTORATIVE & AESTHETIC

and Dr Jose Zurdo (periodontist) for their help with this article and Martin Fletcher (ceramist) for his beautiful ceramic creations. ■

References

- Bichacho N (1996). Cervical contouring concepts: Enhancing the dentogingival complex. *Pract Periodont Aesthet Dent* **8(3)**: 241-254
- Chiche G, Pinault A (1994). *Esthetics of Anterior Fixed Prosthodontics*. Carol Stream, IL: Quintessence Publishing
- Garber D (1993). Porcelain laminate veneers: Ten years later. Part 1: Tooth preparation. *J Esthet Dent* **5(2)**: 56-62
- Goldstein RE (1977). Esthetic principles for ceramo-metal restorations. *Dent Clin North Am* **21(4)**: 803-822
- Highton R, Caputo AA, Matyas J (1987). Photoelastic study of stresses on porcelain laminate preparations. *J Prosthet Dent* **58(2)**: 157-161
- Horn HR (1983). Porcelain laminate veneers bonded to etched enamel. *Dent Clin North Am* **27(4)**: 671-684
- Kanca J (1992). Improving bond strength through acid etching of dentin and bonding to wet dentin surfaces. *J Am Dent Assoc* **123**: 35-42
- Levin EL (1978). Dental esthetics and the golden proportion. *J Prosthet Dent* **40(3)**: 244-252
- Lombardi RE (1973). The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent* **29(4)**: 358-383
- Roach R (1988). Communications between dentist and technician: an esthetic checklist. In: Preston J, ed. *Perspectives in Dental Ceramics: Proceedings of the Fourth International Symposium on Ceramics*. Carol Stream, IL: Quintessence Publishing
- Shaini FJ, Shortall AC, Marquis PM (1997). Clinical performance of porcelain laminate veneers. A retrospective evaluation over a period of 6.5 years. *J Oral Rehab* **24(8)**: 553-559
- Shillingburg HT Jr, Grace CS (1973). Thickness of enamel and dentin. *J South Cal Dent Assoc* **41(1)**: 33-36
- Simonsen RJ, Calamia JR (1983). Tensile bond strength of etched porcelain. *J Dent Res* **62(7)**: 297

CPD

This article is equivalent to one hour of verifiable CPD. To receive credit, complete the five-question test and return by post, fax or email to the addresses on the right:

**R&AP Verifiable CPD,
FMC Ltd
Freepost NAT 2688,
Shenley, WD7 9BR**

Fax: 01923 851778

Email:
karen.sherwood@fmc.co.uk

Your name: _____

Subscriber number: _____

GDC registration number: _____

REF: R&AP/TIPT/SPR/04

Address: _____

Q1

What is the Golden Proportion?

- ☐ a) 2:1
- ☐ b) 1:0.618
- ☐ c) 1.618:1
- ☐ d) None of the above

Q2

How can a tooth be made to look thinner or fatter?

- ☐ a) Change incisal translucency
- ☐ b) Change proportion of marginal ridges
- ☐ c) Change shading
- ☐ d) All of the above

Q3

What is the correct width to length proportion of anterior teeth?

- ☐ a) 100%
- ☐ b) 75%-85%
- ☐ c) Less than 75%

Q4

What ways can soft tissue be changed prior to restoration?

- ☐ a) Connective tissue grafting
- ☐ b) Crown lengthening
- ☐ c) Flap surgery design
- ☐ d) None of the above
- ☐ e) All of the above

Q5

What determines whether a black triangle is present after restoration?

- ☐ a) Technician's skill
- ☐ b) Position of initial papilla
- ☐ c) Position of underlying bone