

CPD

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In the first part of a series explaining the principles of aesthetic dentistry, Paul Tipton looks at smile design



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The art and science of aesthetic dentistry. Part one: smile design

By Paul Tipton BDS MSc DGDP(UK)

In today's health and image-conscious society, cosmetic or aesthetic dentistry is becoming much more of a 'must have'. This first article in a series on aesthetic dentistry explores the principles of smile design, such as centre-line, symmetry, smile line, incisal plane, gingival aesthetics, proportion and axial alignment.

CENTRE LINE

Maximum aesthetics often hinges around symmetry and symmetry starts with the establishment of the correct centre line (Goldstein, 1977) (Figures 1 to 4). A perfectly vertical dental midline reinforces the perception of order and organisation (Frush & Fisher, 1958). Miller et al (1979) found that the centre line of the upper central incisors coincided with the median line of the face only 70% of the time. A centre line if not in the median line of the face is acceptable if it is not too exaggerated and gives an illusion of a natural dentition. Recommendations have been to place the midline precisely in the facial midline or in the middle of the mouth using the lingual papilla or labial frenum as landmarks (Heartwell, 1968). Maxillary and mandibular midlines also fail to coincide in 75% of cases. This means that the

Figure 1: Centre-line is off to the LHS by the width of extra lateral incisor



Figure 2: Implant placed in exact location of new central incisor position



Figure 3: Procera crown placed on the implant (Nobel Biocare) and veneers fitted on the maxillary incisor teeth to correct the centre line discrepancy



Figure 4: Final smile showing a flattened male style smile line





Figure 5: Lateral incisors with old crowns and visible margins



Figure 6: New dentine-bonded crowns showing pleasing natural asymmetry

lower midline should not be used as a reference for the placement of the maxillary midline (Renner, 1985). The interpupillary line and the smile line of the incisal edges of the teeth create an overall sense of harmony with the centre line perpendicular to these two lines.

SYMMETRY

Subtle changes in symmetry are permissible in the form of char-

acterisation as one moves further laterally away from the centre line. Although a facial composition may give the feeling of symmetry, it is well known that variations between both sides of a face exist and when mirror images of one side are placed together an entirely new face is created. Maxillary central incisors must be kept as symmetrical as possible within reasonable limits (Chiche & Pinault,

1994), but maxillary lateral incisors, however, display more variations in shape than centrals and are often bilaterally asymmetrical in the same mouth. Variations in the diameter of lateral incisors are wide and of greater magnitude than centrals (Sanin & Savara, 1971). The diversity of the dental reconstruction, therefore, should rely on asymmetry of the lateral incisors (Figures 5 & 6).

Attractiveness in a smile results from a general sense of parallelism and symmetry (Figures 7 & 8).

SMILE LINE

The smile line also appears to be one the most important factors contributing to a beautiful smile. The smile line can be defined as a hypothetical curved line along the edges of the maxillary anterior teeth that has to coincide or



Figure 7: Uneven appearance of central incisors and general smile

Figure 8: Dentine-bonded crowns and veneers placed on the six maxillary anterior teeth to give even appearance



RESTORATIVE & AESTHETIC



Figure 9: Worn flat appearance of anterior teeth (female patient)



Figure 10: Flat smile line giving aged appearance



Figure 11: Maxillary anterior porcelain veneer restorations giving improved appearance



Figure 12: Curved smile line following lower lip giving more youthful appearance

run parallel with the curvature of the inner border of the lower lip. Observations show that the degree of curvature of the incisal line is more pronounced for women than for men. A flat or reverse incisal line deeply affects the degree of attractiveness of the female smile (Figures 9 to 13).

GINGIVAL AESTHETICS

In smiling, the position of the upper lip relative to the teeth is ideally located at the gingival margin of the maxillary central incisors and appears an important factor in attractiveness (Roach & Muia, 1988). Too much display of soft tissue results in the gummy smile (Figures 14 to 17).



Figure 13: Close-up of final restorations



Figure 14: Gummy smile and poor proportion of width to length (square teeth)



Figure 15: Crown lengthening procedures



Figure 16: New anterior Procera crowns (Nobel Biocare) showing correct width to length proportions



Figure 17: Final smile showing lip line resting at gingival margins

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Figure 18: Incisal plane drifting down to the RHS and incorrect centre line (maxillary cant)



Figure 19: Final smile showing white 'media smile' with correct incisal plane and centre line

INCISAL PLANE

A further principle of aesthetic dentistry is to create an overall sense of harmony and horizontal perspective by creating the occlusal anterior plane in the general direction of the interpupillary line (Roach & Muia, 1988). Many individuals exhibit some degree of canting of the maxilla which can easily be demonstrated by drawing an imaginary line across the gingival margins or cusp tips of the canines and comparing with the interpupillary line. Often, patient expectations for perfect alignment and symmetry are based on the media image (Miller, 1991). Full correction of the

canted gingival plane may be required for such 'media conscious' patients before crown reconstruction (Figures 18 & 19).

PROPORTION

Proportion implies geometry and associating beauty with numerical values. This preoccupation with mathematical formulas as the basis of art means that, up to a point, beauty can be rationally defined and taught to a student (Pevard, 1973). Lombardi (1973) pointed to the importance of the proportion between width and length in the dimensions of individual teeth (Figures 14 to 17) and between the respective size of anterior

teeth. This has been developed by Levin (1978), who observed that in pleasing dentitions viewed from the front, the width of the central incisor is in the golden proportion to the lateral incisor which is in the golden proportion to the canine. Using callipers

that open at a constant golden proportion, this can be verified and used when restoring anterior teeth (Figures 20 to 22).

AXIAL ALIGNMENT

This proportion is also in evidence as one moves further

Figure 20: Diastemas present in upper jaw



Figure 21: Porcelain minimal veneer restorations to correct spacing



Figure 22: Golden proportion callipers showing correct proportion of centrals to laterals (1.618:1)



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Figure 23: Buccal corridor problem with instanding canine and outstanding lateral incisor and canted maxilla



Figure 24: Side view showing instanding position of canine tooth



Figure 25: Porcelain veneer and dentine bonded crown placed to correct buccal corridor and axial alignment



Figure 26: Final smile showing correct buccal corridor proportions and axial alignments

away from the midline and out into the buccal corridor and should be used together with correct axial alignment to produce a beautiful smile (Figures 23 to 26). The axial alignment of the anterior tends to be more pronounced from centrals to canines and in the posterior segment responds to the phenomenon of balance of lines around a central fulcrum. The buccal corridor, or lateral negative

space, helps in achieving the gradation effect in progressively altering tooth illumination.

CONCLUSIONS

In our modern competitive society, a pleasing appearance often means the difference between success and failure in both personal and professional lives. And because the mouth is one of the focal points of the face, it should come as no surprise that the

smile plays a major role in how we perceive ourselves and oth-

ers (Goldstein, 1997) (Figures 27 to 29). Orthodontics is obviously

Figure 27: Worn old appearance of maxillary anterior teeth



Figure 28: Porcelain veneers and crowns placed to improve the shapes and give softer, sexier appearance



Figure 29: Final younger aesthetic smile



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one treatment modality available for centre-line and occlusal plane correction. There are a large group of patients, however, who refuse to undergo orthodontics and instead prefer a quicker restorative solution, especially when some of the teeth involved have had previous major restorations.

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REFERENCES

Chiche GJ, Pinault A (1994). *Esthetics*

of Anterior Fixed Prosthodontics.

Quintessence Pub Co: Chicago,

Frush JP, Fisher RD (1958). The dynesthetic interpretation of the dentogenic concept. *J Prosthetic Dent* **8**: 558

Goldstein RE (1977). Esthetic principles for ceramo-metal restorations. *Dent Clin North Am* **21(4)**: 803-822

Goldstein RE (1997). *Change Your Smile.* Quintessence Pub Co: Chicago

Heartwell CM (1968). *Syllabus of Complete Dentures.* Lea & Febiger: Philadelphia, PA

Levin EL (1978). Dental esthetics and the golden proportions. *J*

Prosthet Dent **40**: 244

Lombardi RE (1973). The principles of visual perception and their clinical application to denture aesthetics. *J Prosthet Dent* **29**: 358

Miller EL, Bodden WR Jr, Jamison HC (1979). A study of the relationship of the dental midline to the facial median line. *J Prosthet Dent* **41(6)**: 657-660

Miller L (1991). *Porcelain crowns and porcelain laminates: problems and solutions.* Presented at the International Ceramic Symposium, New Orleans, May 31, 1991

Pevard V (1973). Anatomy and

geometry. *J Prosthet Dent* **29**: 358

Renner RP (1985). *An Introduction to Dental Anatomy and Esthetics.* Quintessence Pub Co: Chicago

Ruefenacht C (1990). *Fundamentals of esthetics.* Quintessence Pub Co: Chicago

Roach RR, Muia PJ (1988). Communication between dentist and technician: an esthetic checklist. In Preston JD (ed). *Perspectives in Dental Ceramics. Proceedings of the Fourth International Symposium on Ceramics.* Quintessence Pub Co: Chicago

Sanin C, Savara BS (1971). An analysis of permanent mesiodistal crown size. *Am J Orthod* **59(5)**: 488-500

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This is one of six articles in this issue which will each be equivalent to one hour of verifiable CPD. See page 74 for application details.

Q1

Where an upper centre line discrepancy exists, should the centre line be lined up with:

- a) Centre line of the face?
- b) Centre line of the lower teeth?
- c) Upper labial frenum?

Q2

Should central incisors be:

- a) Symmetrical?
- b) Non-symmetrical?
- c) Same size as the canines?

Q3

Should lateral incisors be:

- a) The same width?

b) Differing widths?

c) Symmetrical?

Q4

What is the smile line?

- a) A curved line parallel to the upper lip
- b) A curved line parallel to the lower lip
- c) A straight line parallel to the interpupillary line

Q5

The purpose of crown lengthening is to:

- a) Correct the width/length ratio of the teeth
- b) Make all the gum margins level
- c) Place the gum margins at the lip line when smiling