Aesthetic Dentistry and Orthodontics

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This article has been selected by the Editorial Board of the Hong Kong Medical Diary for participants in the CME programme of the Medical Council of Hong Kong (MCHK) to complete the following self-assessment questions in order to be awarded one CME credit under the programme upon returning the completed answer sheet to the Federation Secretariat on or before 31 August 2006. One credit will be awarded for the Dental Council’s CPD Program for Practising Dentists and one credit under the CDSHK CME Program (both subject to approval).

Aristotle said “Beauty is a greater recommendation than any letter of introduction”. A statement that is true nowadays where attractive people have a much better chance of being successful. Dentists and orthodontists can greatly contribute to enhancing patient’s smile, appearance, and subsequently self-confidence (Fig. 1).

Harmony between the dominant features of a face contributes to creating a beautiful face. The “Facial Dominant Features” are the smile with its components, teeth, gingiva and lips; eyes and facial frame.

Dentists and specialists in the dental profession are dealing with two out of the three dominant features of the face. They can greatly improve and alter the smile and greatly improve or alter the facial frame with orthodontics and/or orthognathic surgery (Fig. 2). In the following section we will review what constitutes a beautiful smile.

One begins to subconsciously analyse an object when one looks upon it, whether it is a face or a painting. Eyes are attracted first to a single location in the composition, most likely the most dominant, or bright, or moving part. In a face, the smile contains contrasts of bright teeth against red lips and is active in speech and expression. Thus, it is dominant and attracts one’s attention first. Dentists can plan these visual channels in his/her composition using line, contrast and the size of objects by attending to the many details of a smile, including tooth position and the development of the smile to establish self-esteem, harmony and symmetry.

Malposed teeth, damaged by trauma or congenitally malformed teeth are in need of orthodontics and/or aesthetic reconstruction (Fig. 3). Therefore it is essential that the clinician has a comprehensive knowledge of the elements and basic principles of aesthetics and the specific characteristics of the individual’s teeth.

The term aesthetic refers to an understanding of beauty. Therefore it is required to have an understanding of beauty and the artistic tools available to develop a beautiful smile.¹

"Golden Proportion" and "Beautiful Proportion" demonstrate a desire to find a rational, physically measurable definition of beauty. “Beauty is that pleasant experience seen with subjective senses, interpreted by our associations, filtered by a philosophy of life, capturing our imagination through variety and distortion, and felt by intuition. The essence of beauty has been sought since the beginning of time”.¹

Lombardi² defined ‘dental aesthetics’ by the way things were perceived visually. Visual perception could be divided into two categories: composition and proportion. Composition was the way colour, contour and texture are related to one another. Proportion was defined as balance, symmetry, parallel lines, curves and how they work together. The aesthetics of the face were said to encompass three views: the facial, the dentofacial and the dental views.³

The most important element is the facial composition. This composition influences most patients’ concept of an aesthetic smile. From the normal distance at which one focuses on a person’s face, the dentition appears white and straight. However, upon closer examination, the teeth are not straight they exhibit distinct proportions, characterisations and embrasures.

The second component in anterior dental aesthetics is the dentofacial composition (i.e., orofacial view). The constituents of the element are the oral orifice, the highly vascularised red lips, and the teeth, which act as a gate or entrance to the oral cavity.⁴

The dentofacial view involves the teeth and the surrounding structures of the gingivae and the lips. Rufenacht⁵ described this view as a coincidence of curves created by the contact points, incisal edges and the lower lip. It is important to evaluate the amount of teeth that are exposed when smiling and at rest.

The smile line is an imaginary line that extends from the incisal edges of the maxillary incisors and is parallel to the curvature of the lower lip. It should not be confused with the lip line, which is the position of the upper lip during smile formation. It is the lip line that determines the display of teeth and gingiva. Proper placement of the incisal edges maintains the...
harmonious patterns that we see in natural smile lines.\textsuperscript{6} The anterior and lateral negative spaces act as a border to the dental elements, while the lips represent the frame.\textsuperscript{4}

Tjan and Miller\textsuperscript{7} pointed out the average smile revealed 75\% to 100\% of the maxillary anterior teeth; the incisal curve of the teeth should be parallel to the lower lip and the incisal curve of the maxillary teeth should touch or just fail to touch the lower premolars. On average, women expose twice as much of their maxillary teeth as men (3.40mm vs. 1.91mm).\textsuperscript{3}

To sum up, the perfect smile is aligned with the interpupillary line and centred on a perpendicular midline of the face.

The relationship from tooth-to-tooth is the next point that needs to be considered. It was the Greeks who tried to formulate beauty as an exact mathematical concept, they believed that beauty could be quantified and represented in a mathematical formula. This led Pythagoras to conceive the “Golden Proportion” (1/1.618=0.618), and Plato, the “Beautiful Proportion” (1/1.733=0.577), both concepts stated that a shape or object with specific proportion is perceived as having innate beauty. The most widely used concept in dentistry is that of the Golden Proportion, whose formula is as follows:

\[ \frac{S}{L} = \frac{L}{S+L} = \frac{2}{1+\sqrt{5}} = 0.618 \]

where \( S \) is the smaller and \( L \) the larger part. The uniqueness of this ratio is that when applied by three different methods of calculation (linear, geometric, and arithmetic), the proportional progression from the smaller to the larger to the whole part always produces the same results.\textsuperscript{8,9} Other researchers have indicated that in reality this Golden Proportion is not always evident, and variations are frequently apparent.\textsuperscript{10} If a clinician is to use the 0.75 ratio as a standard for determining the dimensions of a central incisor, then a progressive application of this ratio, from the central-lateral-mesial aspect of the canine tooth, will create an aesthetic composition.\textsuperscript{4}

To aesthetically restore a single anterior tooth is extremely difficult. By using a previsualised mock-up and knowledge of composite materials, the modifiers selected, and its shade and orientation, the definitive restoration can be visualised prior to completion. The transformation of this “vision” into an aesthetic creation that replicates natural variation constitutes the clinician’s final challenge.\textsuperscript{11}

The single most impressive aspect of a face is the smile. The smile captures another person’s attention, and its characteristics are critical to beauty (Fig. 4). There are repeating lines in a beautiful smile, the incisal edges of the upper teeth and the border of the lower lip form repeating lines that are referred to as the smile line. This repetition imparts harmony and unity to the smile, so too, does the repetition of vertical lines separating each tooth and the parallelism of the upper gingival line and lower border of the upper lip.\textsuperscript{1}

These elements are essential to dentists because they are common to virtually every conservative aesthetic dental procedure. Therefore, a basic knowledge and understanding of these artistic elements is required if a tooth or multiple teeth are to be restored in such a way as to attain an acceptable aesthetic result.

Tooth morphology, incisal edge position, emergence profile, contact points, incisal and cervical embrasures all play an important role in identifying and determining the aesthetic smile. These criteria must be evaluated during the planning and operative stages of aesthetic dentistry in order to achieve success with the final restorations.
Fig 3. Orthodontic treatment for upper teeth which stick out. Before (left) and after (right) treatment.

Fig 4. A smile that makes everything worthwhile. Before (left) and after (right) treatment.

References

MCHK CME Programme Self-assessment Questions

Please read the article entitled "Aesthetic Dentistry and Orthodontics" by Prof. A Bakr M Rabie and complete the following self-assessment questions. Participants in the MCHK CME Programme will be awarded 1 CME credit under the Programme for returning completed answer sheet via fax (2865 0345) or by mail to the Federation Secretariat on or before 31 August 2006. One credit will be awarded for the Dental Council’s CPD Program for Practising Dentists and one credit under the CDSHK CME Program (both subject to approval). Answers to questions will be provided in the next issue of The Hong Kong Medical Diary.

Questions 1-10: Please answer T (true) or F (false)
1. Eyes are attracted first to a single location in any composition, most likely the most dominant, or bright, or moving part.
2. Visual perception could be divided into two categories: composition and proportion.
3. The first component in anterior dental aesthetics is the dentofacial composition (i.e., orofacial view).
4. The smile line is an imaginary line that extends from the incisal edges of the maxillary incisors and is parallel to the curvature of the lower lip.
5. On average, women expose as much of their maxillary teeth as men.
6. It was the Romans who tried to formulate beauty as an exact mathematical concept. They believed that beauty could be quantified and represented in a mathematical formula.
7. The single most impressive aspect of a face is the smile.
8. The "Golden Proportion" is 1/1.733 = 0.577
9. Tjan and Miller pointed out the average smile revealed 75% to 100% of the maxillary anterior teeth.
10. Aristotle said "Beauty is a greater recommendation than any letter of introduction".

ANSWER SHEET FOR AUGUST 2006

Please return the completed answer sheet to the Federation Secretariat on or before 31 August 2006 for documentation. 1 CME point will be awarded for answering the MCHK CME programme (for non-specialists) self-assessment questions. One credit will be awarded for the Dental Council’s CPD Program for Practising Dentists and one credit under the CDSHK CME Program (both subject to approval).

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Answers to July 2006 issue

Current guidelines in the treatment of hypertension