

Clinical Techniques in Prosthodontics

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The Maxillary Central Incisal Edge: A Key to Esthetic and Functional Treatment Planning

In developing an esthetic treatment plan, five areas need to be addressed: tooth position, gingival levels, tooth arrangement, contour, and color. As in denture prosthetics, the starting point for tooth position is the maxillary central incisor.^{1,2} This incisor becomes critical in developing the occlusal treatment plan because it, along with the lower incisors, determines the pattern of protrusive guidance. This article reviews the critical elements used in determining the vertical position of the incisal edge of the central incisor. Three methods for evaluating and placing the incisal edge of the central incisor are reviewed.

The first method I use is to evaluate the central incisal edge relative to the other teeth in the maxillary arch.^{3,4} In a normal class I occlusion, the incisal edge of the central will be approximately on the same plane as the tips of the canines and the buccal cusp tips of the premolars and molars (Figure 1). When this arrangement exists, the central is esthetically pleasing and the smile line has good symmetry with the lower lip (Figure 2).⁵

When the central incisal edge is placed more coronally than the plane of the posterior teeth, it is often a problem of overeruption of the centrals as a result of a class II malocclusion (Figure 3) or the tooth being too long. Visually, the teeth look too prominent for the face, and the curvature of the smile line is exaggerated. Bringing the edges apically to the level of the posterior teeth is an excellent starting point when treating the

patient whose front teeth appear too long. After the teeth are placed on the same plane as the posteriors, either through orthodontics or provisional restorations, the position can be refined for the most pleasing appearance.

The other option is that the centrals appear apical to the plane of the posterior teeth, giving the appearance of a reverse smile line (Figure 4). Common causes of this would be undereruption resulting from a class III malocclusion, ankylosis from an earlier trauma, or a patient habit (tongue thrusting, thumb sucking, etc.). However, the most common cause for this appearance is wear on the anterior teeth from a protrusive bruxing habit or chemical erosion while the posterior teeth get minimal wear (Figure 5). Visually, when the centrals are placed either orthodontically or restoratively with provisionals at the plane of the posteriors, the majority of the esthetic problems will be solved, and minor refinements can then be made (Figure 6).

This article addresses the esthetic considerations of the central incisal edge, but clinicians should recognize that any changes made to the central position must address the functional etiology which caused the central incisor to be in that position and how the occlusion will be altered to produce a predictable result with the new incisal edge position.

Using the posterior teeth as described above is useful for starting to position central incisal edges; however, it cannot always be used. In many patients, the posterior teeth may be missing, worn away, overerupted, or improperly restored, so other methods are necessary.

The second method I use is phonetics,

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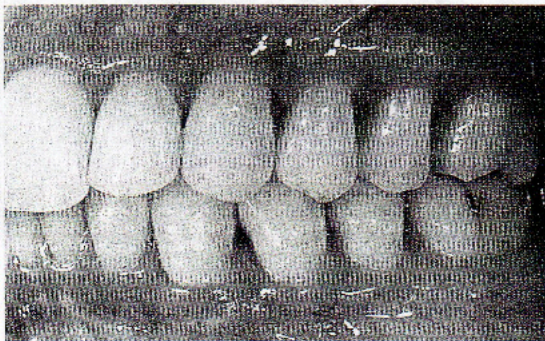


Figure 1— In a class I occlusion, the central incisal edge is on the same plane as the buccal cusps of the posterior teeth.

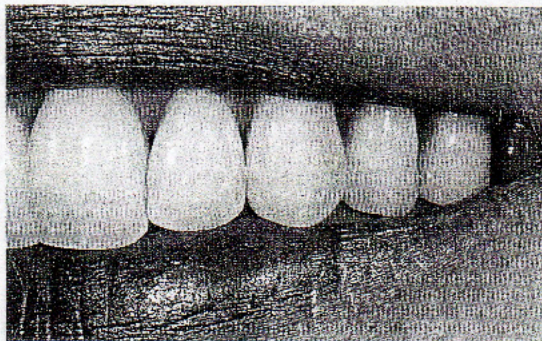


Figure 2—Note the pleasing symmetry of the centrals, cuspids, and posterior teeth when they are on the same plane.

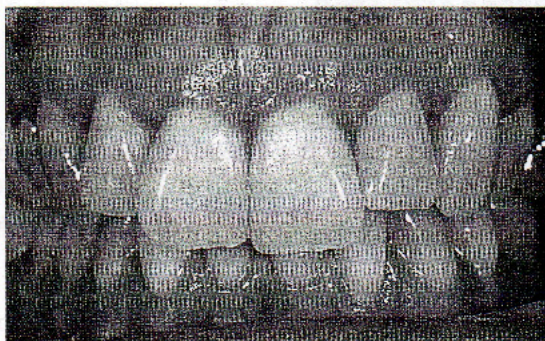


Figure 3—Typical overeruption of the centrals as a result of a class II malocclusion. The centrals are coronal to the posterior occlusal plane.

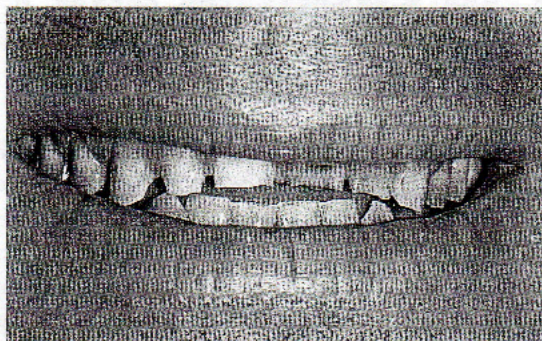


Figure 4—The classic reverse smile line caused by the centrals being apical to the plane of the posterior teeth.

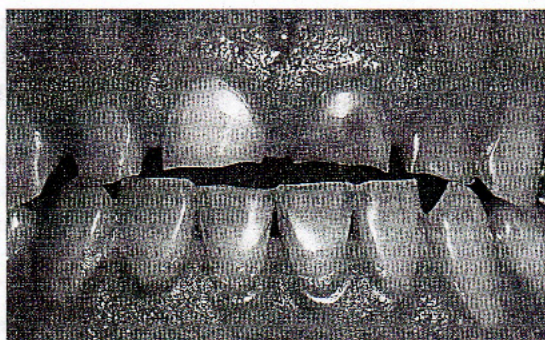


Figure 5—Tooth loss as a result of chemical erosion has caused the anterior teeth to be apical to the posteriors.

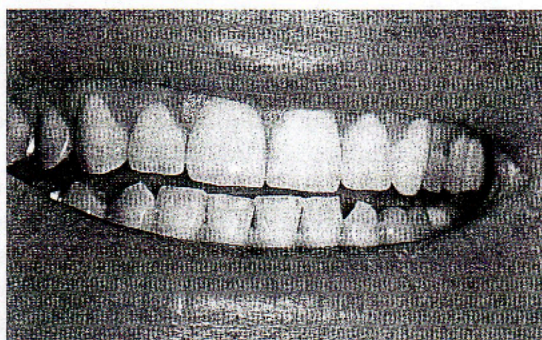


Figure 6—The final restoration with the centrals on the plane of the posterior teeth corrects the esthetic problem.

specifically the "F" or "V" sounds as described in classic prosthodontic texts.^{6,7,8} Others mention using "S" sounds, but the "S" sound is the result of the interaction between the upper and lower incisors.⁹ In my system of treatment planning, I first position the upper incisors for ideal esthetics, then modify the lower incisors or the lingual of the upper incisors to correct the "S" sound, depending on how the patient moved his or her mandible during speech.

What we look for when using "F" and "V" sounds is light contact of the centrals on the "wet-dry" line of the lower lip (Figure 7). Any impingement by the teeth as evidenced by dimpling or trapping of the lower lip would

indicate the teeth are too long and should be shortened (Figure 8). The difficulty with using the "F" and "V" sounds is that, although they tell us whether the teeth are too long, they don't offer much insight as to whether the teeth are too short. Even with teeth that are severely worn, the "F" and "V" sounds will look correct. Utilizing phonetics is an excellent check, however, for determining if teeth have been lengthened too much when restoring the patient who starts with short teeth.

The final method I use when positioning the incisal edges of central incisors is a combination of two elements: the amount of tooth displayed at rest and lip mobility, which is the



Figure 7—Correct contact of the incisal edge with the lower lip during the “F” sound.

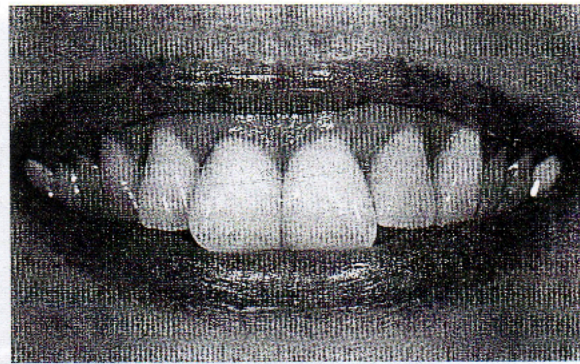


Figure 8—An incorrect clinical appearance of the “F” sound. Both centrals are impinging on the lower lip. The lateral incisors, which are on the same plane as the posterior teeth, touch the lip correctly during the “F” sound. This is the same patient as in Figure 3.

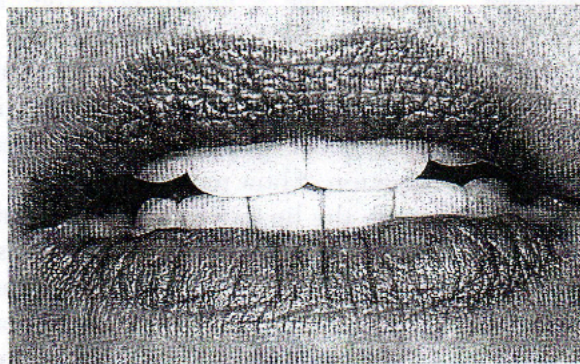


Figure 9—Average amount of central displayed for a 30- to 40-year-old woman with correctly erupted centrals. This is the same patient as in Figures 1 and 2.

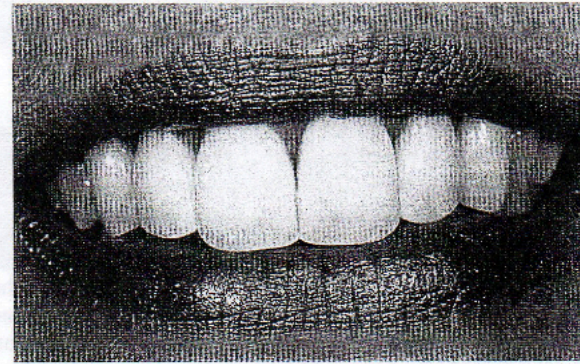


Figure 10—Average lip mobility of 6 to 7 mm combined with a resting display of 3 mm gives 10 mm of central displayed in a high smile.

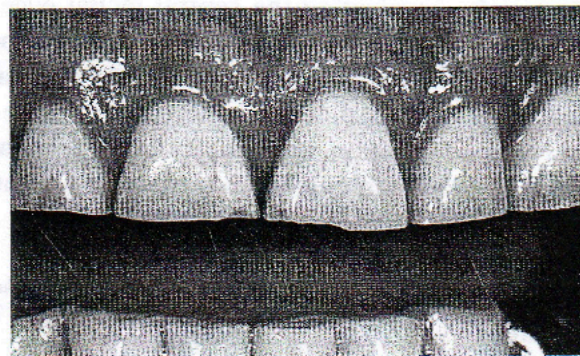


Figure 11—This patient presented with the complaint that his anterior teeth are too short.

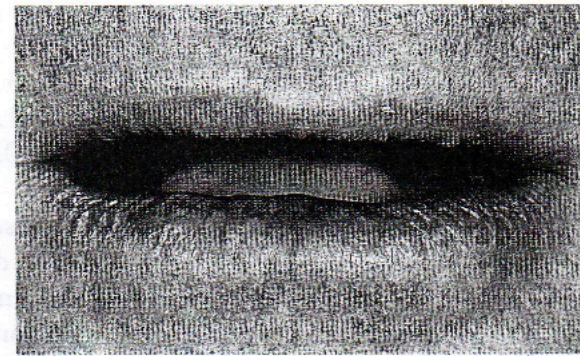


Figure 12—The patient's upper lip at rest. No tooth is visible. This 50-year-old patient would typically show 1 mm of tooth at rest.

amount of lip movement that occurs in a smile.¹⁰ Most people would describe an ideal smile as one that shows the full central incisor and a slight amount of gingiva apical to the central.¹¹ If this is true, then the amount of tooth that shows at rest will vary greatly depending on how much the patient's lip moves during the smile. For example, if the patient's central was 10.5-mm long (an average length) and the lip moved 6 mm from rest to a smile, to show the gingival margin during a high smile would leave 4.5 mm of tooth showing at rest. If the patient's lip moved only 4 mm to a high smile, it would require 6.5 mm of tooth showing at rest to get the same appear-

ance in the full smile. If the patient had a very mobile lip with 10 mm of movement, only 0.5 mm of tooth could show at rest to alleviate gingival display during the full smile.

In other words, where we place the incisal edge will be dramatically influenced by the patient's level of lip mobility and the final desired appearance of the smile regarding tooth exposure and gingival display (Figures 9 and 10). As a general rule, the more mobile the lip, the less we can show the incisal edge at rest; the less mobile the lip, the more we must show at rest to create a pleasing full smile. In 1978, Vig and Brundo¹² examined a sample of women and came up with the following aver-

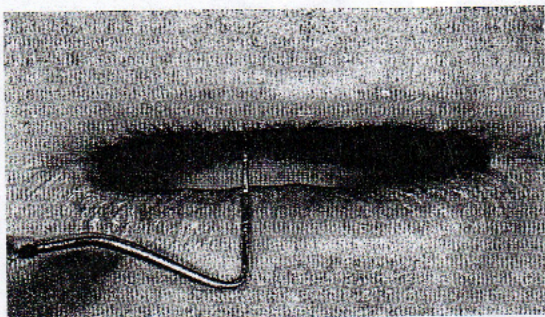


Figure 13—Measuring how many millimeters to add to the patient's centrals to achieve normal tooth display for his age.

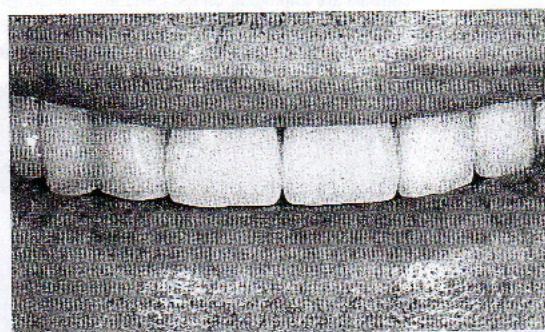


Figure 15—A full smile of the final restoration showing the chosen incisal edge position. The final position added 3.5 mm to the length of the patient's centrals to show 0.5 mm at rest. This was felt to be the best compromise considering esthetics, the patient's age, and occlusal concerns.

ages for the amount of tooth that is displayed at rest for different ages:

Age 30	3 mm to 3.5 mm
Age 50	1 mm to 1.5 mm
Age 70	0 mm to 0.5 mm

These changes are not the result of tooth wear as much as the facial tissues dropping on the skeletal base. I use this information with patients who think their teeth are too short (Figure 11). First, I evaluate how much tooth is exposed with the upper lip at rest. I then ask the patients to smile and evaluate how many millimeters the lip moves. Knowing the length of an average central and how much tooth the patients would like to show in a smile will then help determine where to place the incisal edge. This is especially useful for patients with extreme dental wear. Often, they show no tooth at rest (Figure 12). By taking their age and Vig and Brundo's averages, we calculate approximately how much to lengthen the teeth for an average resting-lip tooth display (Figure 13), which can be tried in a composite mock-up or provisional restorations (Figure 14). Ask the patient to smile fully with the mock-up in place, and see if the amount of tooth displayed is acceptable and then refine

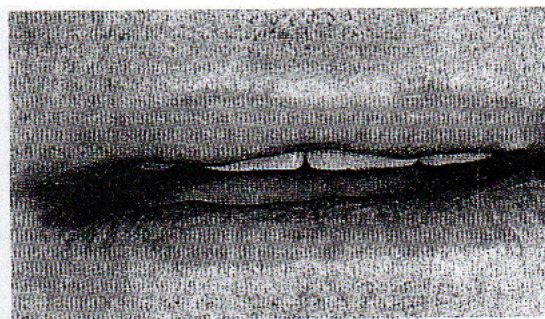


Figure 14—Provisional restorations placed to give the patient a 0.5 mm to 1 mm of tooth display.

(Figure 15). As in all conditions where the incisal edge is lengthened, the "F" and "V" sounds must be checked and the "S" sounds and occlusion modified for acceptability.

The ultimate position of the incisal edge for patients with extreme tooth wear is a combination of how much tooth shows at rest, how much the lip moves, age, and what the occlusion will tolerate. Vig and Brundo's averages of tooth display at rest are simply starting points at different ages. As a rule, I will always show at least the edges of both centrals at rest so the patient doesn't look edentulous.

This article has presented three methods of evaluating the central incisal edge. Given the importance of esthetics and the fact that ultimately the entire treatment plan can be altered when a decision is made to change incisal edge position, it is critical that we learn and use these techniques when evaluating patients.

References

1. Boucher CO, Hickey JC, Zarb GH: *Prosthetic Treatment for Edentulous Patients*. 7th ed. St. Louis, The C.V. Mosby Company, p 224, 1975.
2. Sharry JJ: *Complete Denture Prosthetics*. 3rd ed. New York, The McGraw-Hill Book Company, Inc, p 234, 1974.
3. Frush JP, Fisher RD: The dynesthetic interpretation of the dentogenic concept. *J Prosthet Dent* 8(4):558-581, 1958.
4. Lombardi RE: The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent* 29(4):358-382, 1973.
5. Lombardi RE: A method for the classification of errors in dental esthetics. *J Prosthet Dent* 32(5):501-513, 1974.
6. Pound E: Esthetic dentures and their phonetic values. *J Prosthet Dent* 1(1,2):98-111, 1951.
7. Watt DM: Tooth positions on complete dentures. *J Dent* 6(2):147-160, 1978.
8. Pound E: Recapturing esthetic tooth position in the edentulous patient. *J Am Dent Assoc* 55:181, 1957.
9. Rothman R: Phonetic considerations in denture prosthetics. *J Prosthet Dent* 11(2):215-223, 1961.
10. Martore AL: Anatomy of facial expression and its prosthodontic significance. *J Prosthet Dent* 12(6):1020-1042, 1962.
11. Tjan AH, Miller GD, The JG: Some esthetic factors in a smile. *J Prosthet Dent* 51(1):24-28, 1984.
12. Vig RG, Brundo GC: The kinetics of anterior tooth display. *J Prosthet Dent* 39(5):502-504, 1978.