

A review on Extraction versus Non-extraction on Facial and Smile Esthetics

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ABSTRACT

Since years it has been a key question in planning orthodontic treatment whether the teeth are to be extracted or not. Two major reasons to extract are: To provide space to align the remaining teeth in the presence of severe crowding and to allow teeth to move for protrusion to reduce or camouflage for skeletal Class II or Class III problems can happen. The alternative to extraction in treating dental crowding is to expand the arches; the alternative for skeletal problems is to correct the jaw relationship, by modifying growth or surgery. All other things being equal, it is better not to extract-but in some cases extraction provides the best treatment. Opinions as to the indications for extraction have changed remarkably over the years, from one extreme to the other and back as shown in the following figure, and it seems likely that this particular pendulum still is swinging. This review is based on extraction versus nonextraction on facial and smile esthetics.

KEYWORDS: Extraction, Nonextraction, Smile, Facial esthetics, Orthodontic treatment

INTRODUCTION

Therapeutic extractions peaked in the 1960s with extraction occurring in a majority of orthodontic patients, and declined around 1990s. An increase (dashed line) probably will occur in the early 2000s.¹ In the pre-1900 era, extractions always been challenged. This is continued till late 1700s and early 1800s. By late 1800s- Kingsley found that it was judicious to extract. It is difficult to recreate the thought processes of a brilliant man many years ago, but it seems clear that Angle was influenced by both the philosophy of Rousseau and the biologic concepts of his time. Rousseau emphasized the perfectibility of man. In an era when teeth could be saved by dental treatment, extraction of teeth for orthodontic purposes seemed particularly inappropriate, especially if man was inherently capable of having a perfect dentition. It became an article of faith for Angle and the early orthodontists that every person had the potential for an ideal relationship of all 32 natural teeth, and therefore that extraction for orthodontic purposes was never needed. Secondly, Angle was impressed by the discovery that the architecture of bone responds to the stresses placed on that part of the skeleton. In the early 1900s, the German physiologist Wolff demonstrated that bone trabeculae were arranged in response to the stress lines on the bone. This led Angle to two key concepts. The first was that skeletal growth could be influenced readily by external pressures. If bone remodeled when stressed, the etiology of Class II or Class III problems must be abnormal stresses on the jaws, but different patterns of pressure associated with treatment could change growth

so as to overcome the problem. Angle came to believe that skeletal structures were so adaptable that just rubber bands connecting the upper to the lower teeth could overcome improper jaw relationships, stimulating growth where it was needed. The second concept was that proper function of the dentition would be the key to maintaining teeth in their correct position. Angle reasoned that if the teeth were placed in proper occlusion, forces transmitted to the teeth would cause bone to grow around them, thus stabilizing them in their new position even if a great deal of arch expansion had occurred. He soon saw that merely tipping the teeth to a new position might be inadequate and sought ways to move the teeth bodily. He described his edgewise appliance, the first bone growing appliance. This too became an article of faith: if a correct occlusion had been produced, the result would be stable; therefore if the orthodontic result was not stable, the fault was that of the orthodontist, not the theory. Finally, the problem of dentofacial esthetics was solved, at least for Angle, through his interaction with a famous artist of the day, Professor Wuerpel. Early in his career, Angle devoted much effort to a search for the ideal facial form, in parallel with his search for the ideal dental occlusion. When he consulted the art professor for advice about the perfect face, he was ridiculed-the artist's response was that the tremendous variety in human faces makes it impossible to specify any one facial form as the ideal. Whether the patient liked the outcome or not, by definition the best facial appearance for him or her would be achieved when the dental arches had been expanded so that all the teeth were in ideal occlusion. Therefore, for

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Angle, proper orthodontic treatment for every patient involved expansion of the dental arches and guiding elastics as needed to bring the teeth into occlusion, and extraction was not necessary for stability of result or esthetics. These concepts did not go unchallenged. Angle's awesome expert adversary, Calvin Case, contended that in spite of the fact that the curves could simply be extended with the goal that the teeth could be set in arrangement, neither feel nor soundness would be tasteful in the long haul for some patients. The discussion finished in a generally announced level headed discussion between Angle's understudy Dewey and Case, completed in the dental writing of the 1920s. Angle's devotees won, extraction vanished between World War I and II.²

RE-INTRODUCTION OF EXTRACTION IN MID-CENTURY

By the 1930s, relapse after non-extraction treatment was much of the time watched. Right now not long after Angle's demise, one of his last understudies, Charles Tweed, chose to re-treat with extraction some of his patients who had encountered a relapse. Four first premolar teeth were removed and the teeth were aligned and retracted. After the retreatment, Tweed watched that the impediment was substantially steady. Tweed's open introduction of successively treated cases with premolar extraction caused an insurgency in American orthodontic considering and prompted the far reaching reintroduction of extraction into orthodontic treatment by the late 1940s. Independently of Tweed but simultaneously, another of Angle's students, Raymond Begg in Australia, also concluded that non-extraction treatment was unstable. By the early 1960s, more than half the American patients undergoing orthodontic treatment had extraction of some teeth, usually but not always first premolars.¹ Recently it is seen that premolar extraction does not guarantee stability of tooth. The 2 major factors in extraction decisions are stability and esthetics, it is worthwhile to review existing data that relate these factors to expansion and extraction. For stable results, there is a limit to which the dental arches can be expanded. The lower arch is more constrained than the upper, and so its limitations for stable expansion may be somewhat constrained than the upper arch. Because the lower arch is more constrained, the limits of expansion for stability seem to be tighter for it than the maxillary arch. The accessible information propose that propelling lower incisors more than 2 mm is tricky for steadiness, likely on the grounds that lip weight appears to increment pointedly at about that point. A significant group of information demonstrates that development over the canines isn't steady, regardless of the possibility that the canines are withdrawn when they are extended. Expansion across the premolars and molars, in contrast, can be stable.

ESTHETIC CONSIDERATIONS

Consider esthetics first. Expansion of the arches moves the patient in the direction of more prominent teeth, while

extraction tends to reduce the prominence of the teeth. Facial esthetics can become unacceptable on either the protrusive or retrusive side. The choice between extraction and non-extraction (expansion) treatment is a critical esthetic decision for some patients who are toward the extremes of incisor protrusion or retrusion initially, but because there is an acceptable range of protrusion, many if not most can be treated with satisfactory esthetics either way. Similarly, expansion tends to make arches less stable and extraction favors stability, but the extraction-non-extraction decision probably is a critical factor in stability largely for patients who are toward the extremes of the protrusion retrusion distribution.³

When the prominence of the incisors creates excessive lip separation at rest, so that the patient must strain to bring the lips together, improves facial esthetics. More than 4 mm lip separation at rest is unesthetic. Note that this has nothing to do with the prominence of the teeth relative to the supporting bone. Incisor prominence in thick lips patients gives better esthetics than thin lips.⁴ Excessive protrusion of incisors requires lip strain to close the lips over the teeth, as in this patient, and therefore also is characterized by excessive lip separation at rest (lip incompetence). In patients with excessive incisor protrusion, retracting the incisors improves facial esthetics. The size of the nose has a profound effect on relative lip prominence. For a patient with a large nose and/or a large chin, the choices are to treat without extraction and move the incisors forward, is better. The incisors retracted to the point of adversely affecting facial esthetics too depends largely on the soft tissues. A concave profile with thinning of the lips, so that there is little vermilion border, is an anesthetic trait. In a patient with thin lips, proclining the incisors tends to create fuller lips with more vermilion show, and this is likely to be perceived as more attractive.²

IMPORTANCE OF EXTRACTION OR NON EXTRACTION TREATMENT DECISION

Classification of appearance and esthetics: Macroesthetics has vertical proportions, lip fullness, chin and nasal projections and big ears. Miniesthetics has incisor display, transverse smile, smile symmetry, crowding, smile arc, vermilion display. Microesthetics has gingival shape and contour, triangular holes, emergence profiles, spacing, tooth shade. Richard Don James did a comparative study of facial profiles in extraction and nonextraction treatment³ and compared the pretreatment and posttreatment facial profiles of patients who underwent premolar extraction (108) with those of patients who did not undergo extraction (62). The quantitative measurements selected were (1) an angular measurement—the Z-angle of Merrifield and (2) a linear measurement—the lower lip to the esthetic line of Ricketts, the “E-value.” Both the extraction and nonextraction group facial profile value averages were

within the normal range at the completion of treatment. J.C.Boley; J.P.Pontier: assessed facial changes in extraction and non-extraction patients⁵ and concluded that there is no significant difference between post treatment profiles in patients treated with extraction or non-extraction in both groups. Samir E. Bishara: compared dentofacial and soft tissue changes in Class II, Division 1 cases treated with and without extraction of four first premolars.⁶ Concluded that lip protrusion is an important pretreatment profile characteristic that influences the extraction decision in addition to the presence of a tooth size-arch length discrepancy. After treatment it was observed that the soft tissue and skeletal convexities were straighter in the extraction groups more than in the nonextraction groups; the upper and lower lips were more retruded in the extraction groups and more protruded in the nonextraction groups in both sexes; and the upper and lower incisors were retracted and uprighted more among subjects treated with four first premolar extractions than in the nonextraction groups.⁷ Premolar extraction patients showed greater improvement in facial profile compared with nonextraction patients in study performed by Hoi-Jeong Lim who compared esthetic impact of premolar extraction and nonextraction treatments on Korean borderline patients.⁸ Premolar extraction is more beneficial than nonextraction treatment in terms of facial profile improvement in Korean borderline patients.⁸ S. Jay Bowman compared esthetic impact of extraction and nonextraction treatments on Caucasian patients.⁹ Panels of 58 laypersons and 42 dentists evaluated randomly presented pre- and posttreatment profiles of 70 extraction and 50 nonextraction Caucasian patients. Results showed that extraction patients' faces were, on average, 1.8 mm "flatter" than the faces of nonextraction subjects. Study concluded that extraction as being potentially beneficial when the lips were more protrusive than 2 to 3 mm behind Ricketts' E-plane. Extraction treatment can produce improved facial esthetics for many patients who present with some combination of crowding and protrusion.

SMILE ESTHETICS

Contemporary orthodontists evaluate smiles in 3 dimensions: transverse, vertical, and sagittal. Fourth dimension, time, should also be considered.¹⁰ Three spatial perspectives of efficient assessment are frontal, diagonal, and profile. Fourth measurement is development and maturing.¹¹ Systematic measurements of resting relationships include commissure height, philtrum height and interlabial gap and incisor show at rest. Systematic measurements of dynamic relationships include crown height gingival display and smile arc relationships. In low smile relationships, percentage of incisor display on smile is measured.¹⁰ When the arch form is narrow or collapsed, the smile may also appear narrow and therefore present inadequate transverse smile characteristics.³ The wider the arch form in the premolar area, the greater the portion of the buccal corridor that is filled. Widening the arch form has 2 side effects: First,

the buccal corridor can be obliterated, resulting in a denture-like smile. Second, when the anterior sweep of the maxillary arch is broadened the smile arc may be flattened. This is particularly important today because of the trend toward broader arch forms.¹² In the frontal dimension smile is also evaluated for presence of any cant / roll deformity present. Roll is viewed as up and down deviations around the transverse axis. The two characteristics of the smile that are best visualized in the sagittal dimension are overjet and incisor angulation.¹¹ Maxillary incisor show on smile, and flatness/ steepness of maxillary occlusal plane relative to lower lip curvature.¹² In more than 3500 subjects, Dickins et al studied the changes in philtrum height and commissure height from age 6 years to their 40s and the relationship to the smile.¹³

EFFECT OF EXTRACTION ON SMILE ESTHETICS

Presumably, extraction treatment results in narrower dental arches which, in turn, are associated with a less esthetic smile.¹³ Arch width reduction creates unaesthetic triangles at corners of the mouth with 'negative' spaces lateral to the buccal segments. Documentation of the adverse effects of extraction treatment on smiles is scarce.² According to Dierkes appearance of unesthetic black triangles at the corners of the mouth during smiling are expected sequelae of 4 first-premolar extraction treatment. Premolar extraction treatment narrows the width of the dental arches and shrinks the arches, resulting in a dentition that is too small to fill the oral slit during a smile.⁶ Because arch width appears to be a determinant of smile esthetics, Eunkoo Kim, compared arch width changes in the anterior and posterior parts of the arches as well as smile esthetics in patients treated by extraction and nonextraction procedures.¹⁴ Study concluded that the average arch width of both arches was significantly wider in the extraction sample (1.8 mm wider in the mandible and 1.7 mm wider in the maxilla). Arch width is not decreased at a constant arch depth because of extraction treatment, and smile esthetics are the same in both groups of patients. Anna H. Meyer, found a significant increase in the posttreatment maxillary intercanine width in the extraction group.¹ Arch widths between the maxillary first molars and at the level of the posterior rugae were greater in the nonextraction group. No significant differences in any buccal corridor widths were measured between the extraction and nonextraction subjects. Erdal Isiksal, compared smile esthetics among extraction and nonextraction patients and a control group.¹⁵ The available data indicate that narrow dental arches are not the expected consequence of extraction treatment. Therefore, the esthetically compromising effect of narrow dental arches on smiles is not a systematic outcome of extraction treatment. Dustin Roden-Johnson, a determined the effects of buccal corridor spaces (BCS) and arch form on smile esthetics as perceived by lay people, general dentists, and orthodontists.¹⁶ Dentists prefer treated patients over

untreated ones but make no distinction in their preference of arch form in treated patients.¹⁶ Lay people have no preference between treated or untreated arch forms. The presence or absence of BCS had no effect on the ratings of the smiles in any of the 3 groups. Farhana Ghaffar and Mubassar Fida compared effect of extraction of first four premolars on smile aesthetics.¹² Smile aesthetics were evaluated by a panel of 10 laypersons, five males and five females, aged between 20 and 30 years.¹⁷

CONCLUSION

Assessment of facial profiles and facial adjust is a consistent, nonstop, long lasting examination and learning process for orthodontists. Tooth development and appropriate position of the teeth to guarantee great facial changes and to stay away from troublesome changes ought to be in the orthodontist's "symptomatic" personality from the principal examination.

REFERENCES

1. Anna H. Meyer, Michael G. Woods, David J. Manton. Maxillary arch width and buccal corridor changes with orthodontic treatment. Part 1: Differences between premolar extraction and nonextraction treatment outcomes. *Am J Orthod Dentofacial Orthop* 2014;145: 207-216.
2. William R. Proffit: contemporary orthodontics, revised fourth edition, Elsevier publications, diagnosis and treatment planning: limitation, controversies, and special problems. Pg 241-57.
3. Richard Don James. A comparative study of facial profiles in extraction and nonextraction treatment. *Am J Orthod Dentofacial Orthop* 1998;114:265-76.
4. Fletcher: begg technique. 1st edition, Mosby.
5. J.C. Boley; J.P. Pontier: Facial changes in extraction and non extraction patients. *Angle orthod* 1998;68:539-46.
6. Samir E. Bishara, David M. Cummins, Jakobsen, , and Abbas R. Zaher, Dentofacial and soft tissue changes in Class II, Division 1 cases treated with and without extractions. *Am J Orthod Dentofac Orthop* 1995;107:28-37.
7. Derya Germeç and Tulin Ugur Taner Effects of extraction and nonextraction therapy with air-rotor stripping on facial esthetics in postadolescent borderline patients. *Am J Orthod Dentofacial Orthop* 2008;133:539-49.
8. Hoi-Jeong Lim, Kwang-Taek Ko, and Hyeon-Shik Hwang. Esthetic impact of premolar extraction and nonextraction treatments on Korean borderline patients. *Am J Orthod Dentofacial Orthop* 2008;133:524-31.
9. S. Jay Bowman, Lysle E. Johnston Jr, The Esthetic Impact of Extraction and Nonextraction Treatments on Caucasian Patients. *Angle Orthod* 2000;70:3-10.
10. David M. Sarver and Marc B. Ackerman. Dynamic smile visualization and quantification: Part 1. Evolution of the concept and dynamic records for smile capture. *Am J Orthod Dentofacial Orthop* 2003;124:4-12.
11. David M. Sarver, and Marc B. Ackerman. Dynamic smile visualization and quantification: Part 2. Smile analysis and treatment strategies. *Am J Orthod Dentofacial Orthop* 2003;124:116-27.
12. Farhana Ghaffar and Mubassar Fida. Effect of extraction of first four premolars on smile aesthetics. *Eur J Orthod* January 12, 2011.
13. Dickins S, Sarver DM, Proffit WR. The dynamics of the maxillary incisor and the upper lip: a cross-sectional study of resting and smile hard tissue characteristics. *World J Orthod* 2002;3:313-20.
14. Eunkoo Kim, Anthony A. Gianelly. Extraction vs Nonextraction: Arch Widths and Smile Esthetics *Angle Orthod* 2003;73:354-358.
15. Erdal Isiksal, Serpil Hazar, and Sercan Akyalçın. Smile esthetics: Perception and comparison of treated and untreated smiles. *Am J Orthod Dentofacial Orthop* 2006;129:8-16
16. Dustin Roden-Johnson, Ronald Gallerano, and Jeryl Englishc The effects of buccal corridor spaces and arch form on smile esthetics. *Am J Orthod Dentofacial Orthop* 2005;127:343-50.
17. Dierkes JM. The beauty of the face: an orthodontic perspective. *J Am Dent Assoc* 1987;89-95.

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