

Extraction vs Non Extraction Controversy: A Review

*Adeeba Khanum¹, Prashantha G.S.², Silju Mathew³, Madhavi Naidu⁴ and Amit Kumar⁵

*Corresponding Author Email: adeebakhanum0912@gmail.com

Contributors:

¹ Postgraduate, ² Professor, ³ Professor and Head, ⁴ Assistant Professor, ⁵ Ex Postgraduate, Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences, M.S. Ramaiah University of Applied Sciences, Bengaluru - 560054

Abstract

Orthodontics, is rich in its history as well as controversies. Controversies unlike disputes, never end and cannot be resolved completely validating any one side of the argument through scientific evidence. One such controversy is extraction vs non-extraction. The last two decades has seen noticeable decline of extraction in orthodontic treatment. This is augmented with increased pressure from the referring dentist to treat the patient without extraction treatment modality, being unaware of the literature supportive of extractions in specific cases. This review provides a summary of historical background of the controversy, the perspectives of various authors, the reasons for decline in extractions and the present understanding of the debate.

Keywords: *Orthodontics, Extraction, Non-extraction, Controversy, TMD*

1. INTRODUCTION

In the common man's perspective, crowding, more often than spacing constitutes malocclusion. Treatment of a crowded arch requires space gaining. This has been achieved through two ways of treatment – extraction or non-extraction modality. Extraction to create space for accommodation of the remaining teeth of crowded dental arches was written up in the dental literature as long as 1771. It was a new idea then and certainly is not so now.

2. HISTORICAL PERSPECTIVE

Extraction of deciduous teeth has been in practice since ancient civilizations. There was little or no opposition to extraction of deciduous teeth to clear the way for permanent successors when Celsus and Pierre Fauchard recommended it.¹ (Fig. 1). The disagreement arose when dentists started removing permanent teeth for the treatment. Hunter (Natural History of Teeth, 1771), was the foremost author, who opposed it on the basis that it inhibited growth. In the early 1800s, class II division 1 malocclusions were usually treated by extraction of maxillary first premolars. But Delabarre in 1818, warned against its unwanted sequelae. He said, "It is much easier to extract teeth than to determine if it is absolutely necessary".² In 1887, Isaac B. Davenport

delivered a lecture in New York against extractions, stating that extractions caused "A loss of an important organ".³

Edward H Angle was the most dominant, dynamic and influential figure in orthodontics. (Fig. 2) He is regarded as the "Father of Modern Orthodontics".⁴ Initially, Edward Hartley Angle believed that extraction of teeth was necessary to solve orthodontic treatment problems. Angle's book, "Treatment of Malocclusion of the Teeth and Fractures of the Maxillae- Angle System" sixth edition, was published in 1900, containing an enormous amount of material and case reports in which the extraction of teeth was involved. Angle advocated extraction to improve facial appearance.⁵

Rousseau, a philosopher, believed that many of the ills of the modern man owed to the environment we now live in. He emphasized on the perfectibility of man. Consequently, from an orthodontic viewpoint, a perfect occlusion could never be achieved by extracting teeth. This became an article of faith for Angle and the early orthodontists, that every person had the prospective to attain an ideal relationship of all thirty two natural teeth, and therefore extraction for orthodontic purposes was never needed.

In the early 1900s, a German anatomist and



surgeon, Julius Wolff demonstrated that bone trabeculae arrange in reaction to the stress lines on the bone ("Wolff's law of bone"). Angle was impressed by the discovery that the architecture of bone responds to the stresses placed on that part of the skeleton and thereby reasoned that, forces transmitted to the teeth would cause bone to grow around, if teeth were placed in a proper occlusion. He described his edgewise appliance as a 'bone growing appliance'. Any relapse observed in any of his treated cases was considered to be a result of inadequate occlusion. Angle believed that the relationship of the dentition to the face, and with it the esthetics of the lower face, would vary. But for each individual, ideal facial esthetics would result when the teeth were placed in ideal occlusion. So accordingly, his treatment for every patient involved expansion of the dental arches and elastics as needed to bring the teeth into occlusion, and extraction was not necessary for stability of result or esthetics.⁶



Fig. 1 Pierre Fauchard Fig. 2 Angle E.H.

3. The EXTRACTION DEBATE

Angle's concepts did not go unchallenged. His great professional rival, Calvin Case, argued that even if the arches were expanded to bring all the teeth into alignment, the stability and esthetics would not be satisfactory in the long run for most of the patients. (Fig. 3). The controversy culminated in a widely publicized debate between Angle's student Martin Dewey and Calvin Case (Fig.4). The battle commenced in 1911 that culminated as "The Extraction Debate of 1911." In 1911, at a meeting of the National Dental

Association, Calvin Case presented an article, "The Question of Extraction in Orthodontia", in which he strongly disapproved the creationist belief of the Angle School, considering their ignorance on heredity as a cause of malocclusion, their thought that local factors were responsible for malocclusion and replacing teeth in their planned positions would result in a harmonious face.^{4,7}

Calvin Case further presented a patient to prove his point. He stated that the patient's dental protrusion would have deteriorated if a non-extraction treatment was done. Thereby highlighting that non-extraction treatment cannot be done in all the cases, to achieve a harmonious face. Even though Case had better argument by far, Angle's followers won the day, and extraction of teeth for orthodontic reasons gradually declined from the American orthodontic scene in the period between World Wars I and II. (Fig. 5)



Fig. 3 Calvin S. Case Fig. 4 Martin Dewey

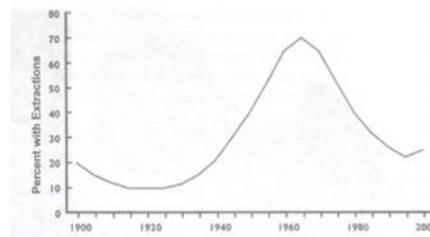


Fig. 5 Graphical representation of extraction trends

4. The RE-INTRODUCTION of EXTRACTION in MID - 20th Century

In the 1930s, relapse after non-extraction treatment was frequently observed. In 1952, Charles Tweed, a student of Angle, presented



case reports on patients who were treated by non – extraction initially using Angle’s treatment philosophies and were later re treated with first premolar extractions.(Fig. 6) Four first premolar teeth were removed and the teeth were aligned and retracted. After the retreatment, Tweed observed that the occlusion was much more stable. This gave rise to the Tweed philosophy owing to the scientific evidence he provided towards extraction treatment modality. Extractions were eventually accepted into orthodontics.⁸ During the same period, Raymond Begg in Australia was developing an appliance system based on therapeutic extraction as well (Fig. 7). His appliance was based on the theory of attritional occlusion. This theory was strengthened by Professor Stockard’s breeding experiments which indicated that malocclusion could be inherited, rather than developing the potential within each patient. It appeared necessary for the orthodontist to recognize genetically determined disparities between tooth size & jaw size, or to acknowledge that the lack of proximal wear on teeth produced tooth size – jaw size discrepancies during development. In either case, extraction was frequently necessary.⁹



Fig. 5 Charles Tweed Fig. 6 Raymond Begg

The era of 1970-1990’s saw the revival of non-extraction treatment. There came a period in orthodontics when premolars were extensively being extracted for correction of malocclusion with Tweed edgewise philosophy and the Begg appliance. This resulted in unattractive facial features. Subsequently, facial harmony and esthetics was given more importance by orthodontists thereby reducing the rate of

indiscriminate premolar extractions. Studies by Little et al in 1981 and Mc Reynolds et al in 1991, supported the fact that premolar extraction does not guarantee stability of tooth alignment. Overtime, change from fully banded to largely bonded appliances made it easier to expand arches, therefore, border line case were generally treated better without extraction.^{10,11}

Hence extraction of teeth for orthodontic purposes was rare in the early 20th century, peaked in the 1960s, declined to about the levels of the early 1950s, in 1990s, and has remained there for first few years of the 21st century.⁷

5. REASONS FOR CONTROVERSY

Facial Profile

The major concern in choosing between extraction and non-extraction treatment modality is the effect it has on the soft tissue profile of the patient. Non extractionists believe that extractions result in “dish in” of the face, while extractionists claim that without extractions in certain cases the periodontal health will be compromised and the profile will appear full. Studies conducted by Rushing et al in 1995, Stephens et al in 2005 and Erdinc et al in 2007, support the fact that general dentists and orthodontists were unable to distinguish between the facial profiles of subjects treated with extraction and non-extraction.¹²⁻¹⁴ A three-dimensional soft-tissue analyses by Solem et al in 2013 following treatment by extraction revealed that, distinct changes were observed in patients who had protrusion, and the retraction of the lip was directly associated with retraction of the upper and lower incisors.¹⁵ Therefore, extraction in few patients with fuller profiles, does not necessarily cause “dish-in” of the face, and in fact can result in better esthetics than non-extraction treatment in such patients. Hence, clinicians have to plan the cases suitably, to avoid over-retraction of the anterior segment leading to unfavourable profile changes. The mandible grows more than the maxilla, which tends to straighten the profile over-time, throughout adulthood. This was attributed to the fourth dimension “time”, as termed by Sarver and Ackerman in 2003. This



could be a confounding factor. They advised the orthodontists to give adequate emphasis on the growth of soft tissues, maturation and aging in their treatment planning.^{7,16-20}

Extractions & Temporomandibular Joint Disorders (TMD)

A radical district court case in 1987, involved a sixteen year-old girl, diagnosed with Angle's Class II, division 1 malocclusion. Her orthodontist planned the treatment with premolar extractions and the use of headgear. Subsequently, her family claimed that the treatment had caused TMD and sued the orthodontist. Their family dentist debated that the extractions and use of headgear caused excessive incisor retraction resulting from distal displacement of the mandible and thereby, internal derangement. The orthodontist was convicted by the jury for mistreatment, and the case was widely conversed among the dental professionals. Most orthodontists did not believe that premolar extractions could lead to TMD, yet their fear of malpractice suits was heightened if they advocated extraction treatment modality. In the early 1990s, the orthodontic scientific community took charge and put forth high-quality evidence stating that there is no direct relationship between TMD and orthodontic treatment. The literature also discusses and supports the contention that any type of orthodontic treatment has a neutral effect.^{21,22}

Buccal Corridors

Few orthodontists are of the belief that extracting maxillary premolars leads to narrowing of the dental arch, resulting in broader buccal corridors which is not esthetic.

To the contrary, studies by Janson et al in 2011, Ioi et al in 2012, and Meyer et al in 2014 are of the opinion that the dental arch does not become narrow with maxillary premolar extraction and more importantly, broader buccal corridors are not always unattractive.^{23,24}

Stability and Impaction Risk

In 1999, Bowman cautioned that adhering to a non-extraction protocol would not always be the best for many patients. Since the patients most likely to experience ineffective orthodontic treatment are those with crowding and protrusion, a non-extraction approach may not provide optimum esthetics, function, periodontal health, and stability in such cases. On the contrary, Erdinc et al in 2006, suggested that the extraction of premolars for orthodontic treatment to alleviate crowding may not enhance stability.^{25,26}

According to Casetta et al 2013, an increased prevalence of mandibular second-molar impactions may be correlated with the increasing fame of non-extraction therapy. A study by Turkuz et al in a Turkish population in 2013 associated increased risk of third-molar impactions with non-extraction protocols. 81.8% of the patients who did not undergo extractions had impacted third molars, compared to 63.6% of the patients who underwent premolar extractions. Saysel et al in 2005, found angulation of third molars to be more favorable, as well as increased third-molar eruption space, following extraction treatment.²⁷⁻²⁹

6. REASONS FOR DECLINE IN EXTRACTIONS

Bonding

Bonding of fixed appliances that replaced banding to quite an extent, permitted non-extraction treatment in more patients, since band thicknesses tended to promote crowding.

Airotor Stripping (ARS)

Dr. Jack Sheridan promoted ARS or interproximal enameloplasty. He believed that if nature could reduce the interproximal enamel, without resulting in increased caries risk or periodontal problems, orthodontists could also do the same, if they exploit the advantages of full-arch bonding, which opens the interproximal areas and allows for reshaping. Around 6-8mm of the space can be gained to resolve protrusion, crowding or a combination of both.^{30,31}



Expansion

Expansion has been promoted since long to treat posterior crossbite. In the 1980s, it became popular as a substitute to extraction treatment to resolve crowding even without the presence of posterior crossbite. Advocates of rapid maxillary expansion (RME) claim resolving of borderline crowding of 3-6mm in the mandible in patients with narrow transpalatal widths. They contend that RME will result in reciprocal mandibular expansion because the mandibular arch form is dictated by the maxillary arch form. McNamara Jr. et al reported that a favourable change in the sagittal occlusal relationships between maxillary and mandibular teeth can be facilitated by RME. Fields cautioned that “to date, there is no credible long-term post retention evidence that early intervention to prepare, develop, balance, or expand arches by any other name has any efficacy in providing a less crowded permanent dentition later”.³²

Stability of expansion, particularly in the mandible, has little evidence demonstrating the same. Many authors support the contention that intercanine expansion is unstable. A study by Housley et al in 2003 concluded that in patients who underwent mandibular expansion, intercanine widths were maintained in only 8% of patients, for six years and three months after fixed retention.³³ Additionally, prospective complications of expansion include the risks of creating a dehiscence (loss of alveolar bone on the facial aspect of a tooth that leaves a characteristic oval, root-exposed defect from the cemento-enamel junction apically) as a result of overexpansion. (Fig. 8). Anterior teeth tend to move labially, when treated by expansion of the arches to alleviate moderate-to-severe crowding. Extractions on the other hand, allow the teeth to move along the alveolus.³⁴

Self-Ligating Brackets

There have been assertions that the efficacy and effectivity of self-ligating brackets is better than conventional brackets. It reduces treatment time and avoids the need for extractions in most cases. From an evidence-based standpoint, self-ligating

brackets are as beneficial as conventional brackets except for two advantages they offer: reduced chairside time (insertion and removal of wire is easy), and control of mandibular incisor proclination.^{35,36}

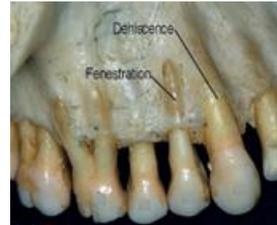


Fig. 7 Dehiscence and fenestrations

Preservation of Leeway Space

According to Gianelly, about 75% of Class I and II cases with mild-to-moderate crowding can be treated without expansion or extractions. This can be done by conserving the leeway space of the primary second molars, also called as E-space. (Fig. 9) Brennan and Gianelly observed that, in the mixed dentition, around 5mm of crowding in incisor region can be resolved with the use of a lingual arch. In cases of moderate-to-severe crowding, coupled with protrusion, in which leeway space has been lost, molars have drifted forward, and expansion is no longer an option, extraction may be the only choice of treatment.^{37,38}

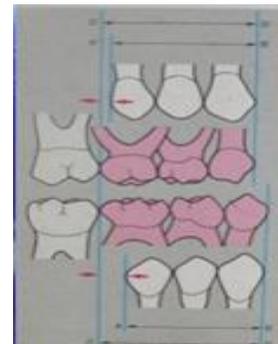


Fig. 8 Leeway space

Autonomy

The patients in this era are more actively involved in their treatment decisions than at any time in the



past. The fear of pain and loss of teeth overpowers the patient's thinking. Unfortunately, this may result in a competing practitioner to offer a more "conservative" non-extraction option, even if it is not in the best interest of the patient.³⁹

Contemporary extraction guidelines:⁴⁰

<4mm arch length discrepancy—extraction rarely indicated.

5-9mm arch length discrepancy – non-extraction (posterior expansion) /extraction.

10mm or more arch length discrepancy – extraction almost always required to obtain enough space.

7. CONCLUSIONS

Identifying guidelines for the extraction vs non-extraction decision in orthodontic treatment is a complex task. Presently, the controversy is not afflicted by as much beliefs as it was almost 100 years ago and both treatment options are still open. The option to treat with extraction or non-extraction should be made objectively for each case based on strong evidence with equal attention on the soft tissue paradigm.

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