

Extract or Not to Extract: A Review

Prachi S. Hundiwale*, Ramiz Khan, Binny Dogra, Ranjit Pawar, Amit Handa, Aditi Sarda

Department of Orthodontics and Dentofacial Orthopedics, Aditya Dental College, Beed, Maharashtra, India.

Abstract

Orthodontics as a branch have evolved since many years and since then there has been many subjects for controversies and disputes which cannot be resolved completely validating any one side of argument through scientific evidence. One such never ending debate is regarding extraction and non-extraction. There has been a decline in the trend of extraction since last few decades. But the fact that, some cases can be treated with extraction which cannot be denied. This article provides a summary on the historical background of the extraction, the perspective of various authors on the debate of extraction, the reason for decline in extraction and the present understanding of extractions.

Keywords: Controversy, Extraction, Non-extraction, Orthodontics.

INTRODUCTION

Extraction of teeth before 19th century was indiscriminate and prevalent for gaining space for correction of malocclusion.^[1] From the turn of the century to the mid-thirties, angle moved the specialty away from extraction to a relatively rigid non-extraction treatment philosophy. Dissatisfied with the relapsing Class II cases, recurrence and aggravation of crowding and what he felt were bimaxillary full faces, Tweed and other Circa 1935, redirected the profession back to extraction with more disciplined approach to extraction all four premolars.^[2] Extraction to relieve crowding was written in dental literature as long as 1771. It was a new concept then but is not so now.

HISTORICAL PERSPECTIVE

Extraction has been practiced since long times. There was little or no opposition since ancient times for extraction of deciduous teeth to clear the way for permanent teeth to prevent further malocclusions as was recommended by Celsus and Pierre Fauchard. However, there was little opposition from fellow dentists when permanent teeth were removed for treatment. Hunter (Natural history of teeth, 1771) opposed extraction of permanent teeth as it inhibited growth. In the early 19th century, the treatment of Class II Division I was carried out by extraction of maxillary first premolars. But later, in 1818, Delabarre warned against the unwanted sequelae in his paper saying, "it is much easier to extract teeth than to determine if it is absolutely necessary".^[3] In 1887, Isaac B. Davenport delivered a lecture in New York against extractions, stating that extractions caused "A loss of an important organ."^[4]

Angle is regarded as the father of modern orthodontics. He is regarded as one of the influential figures in orthodontics. Initially, Dr. E. H. Angle believed that extraction of teeth was necessary to solve the problem of malocclusion.^[5] Angle published case reports in his book named "treatment of malocclusion of the teeth and fractures of the Maxillae-Angle's System." Sixth edition in 1990. He was of the believe that extraction is necessary for improvement of the facial appearance.^[6]

Rousseau, a philosopher believed that complete set of teeth was necessary for perfectibility of man. This led to the believe that all the natural 32 teeth were necessary to attain an ideal occlusion and that extraction should not be carried out. In the early 1900s, a German anatomist and surgeon, Julius Wolff gave the Wolff's law which demonstrated that the bone trabeculae arrange in reaction to the stress lines on the bone.

The question of tooth removal has been a controversial subject since the Edward Angle (Non-extraction) and his student Calvin. S. Case (Extraction) debate in the early 1905. The role of extractions in orthodontics was recognized by John Hunter in 1771 in his natural history of the teeth. Spooner, in 1839,

Address for correspondence: Prachi S. Hundiwale,
Department of Orthodontics and Dentofacial Orthopedics,
Aditya Dental College, Beed, Maharashtra, India.
E-mail: prachihundiwale19@gmail.com

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advised the extraction of four premolars or 1st molar when defective. Farrar, in 1888, considered judicious extractions an essential requisite “For the prevention and correction of irregularities.” He recognized that indiscriminate extraction may “create a new difficulty while removing the original one.”

Pierce, writing in the Dental Cosmos in 1859, advocated extraction in tooth in crowding as a means for simplifying orthodontic procedure. Angle also advocated extraction to avoid “collapse” and to improve facial appearance. Considerations for extractions according to Angle in class I malocclusion were as follows:

- Where jaws are small either due to the arrested development, whereby there is an increase in the angles of inclination, that is, the procumbence of incisors.
- Where extraction is necessary from the requirements of the facial lines for the developments of the arches such as to afford room for malposed teeth.
- He advocated the choice of extraction of 1st or 2nd PM usually but some 1st molars if affected by caries and few lateral incisors.

Angle in Class II Division 1 and its subdivision, he advised extraction of one PM preferably 1st from each half to establish harmony in size of the arches and improve occlusion. Although he was against extraction of 1st molars, canines and lateral incisors, he advocated 1st PM extraction in Class III malocclusions except when there is lingual inclination of incisor and canine teeth. At the 1911 meeting Calvin. S. Case presented an article “The question of extraction in orthodontia” which was followed by discussions by Mathew. H. Cryer, Martin Dewey, H. Clay Ferris, J. P. Buckley, G. F. Bowman and Thomas P. Hinnman. (Case’s-Rational school and Angle’s-New school).

According to Calvin Case’s observation in 1921, he stated that aligning malposed teeth without extraction might markedly affect stability.^[7]

Margolis, in 1943, stated that the most effective extraction strategy to relieve crowding is extraction of premolars closest to the site of crowding.

In 1945, Tweed found that a group of patients, he treated without extraction showed a great tendency toward dental collapse and he was unhappy with the faces that he was producing. Later, the idea of treating the patients with extraction formed the basis of his further works. By the early 1900’s, more than half of the orthodontic patients had extraction of some teeth, usually but not always the 1st premolars.^[8]

REINTRODUCTION 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 retreated with first premolar extractions. 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 due to the scientific evidence that he provided toward extraction treatment modality.^[9] Extractions were eventually accepted into orthodontics. During the same period, Raymond Begg in Australia was developing an appliance system based on therapeutic extraction as well. 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 and 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.^[10]

REASON FOR CONTROVERSY

Facial profile

Extraction or non-extraction treatment modality is chosen on the basis of soft-tissue profile of the patient. The orthodontist who had been practicing extraction believe that non-extraction results in face fullness and periodontal health issues, whereas those who practiced non-extraction believed that extraction gave ‘dish in ‘face appearance.^[11] Stephens *et al.*, in 2005, and Erdinc *et al.*, in 2007, stated the fact that general dentists and orthodontists were unable to distinguish between the facial profiles of subjects treated with extraction and non-extraction.^[12-15]

Extraction and temporomandibular joint disorder (TMD)

A radical district court case in 1987, involved a 16-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.^[16,17]

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 are not aesthetic. 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.^[18,19]

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 aesthetics, 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.^[20,21] 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. About 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. Saisel *et al.*, in 2005, found angulation of third molars to be more favorable, as well as increased third-molar eruption space, following extraction treatment.^[22-24]

REASONS FOR DECLINE IN EXTRACTIONS

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 6–8 mm of the space can be gained to resolve protrusion, crowding, or a combination of both.^[25]

Expansion has been promoted since long to treat posterior cross-bite. In the 1980s, it became popular as a substitute to extraction treatment to resolve crowding even without the presence of posterior cross-bite. Advocates of rapid maxillary expansion (RME) claim resolving of borderline crowding of 3–6 mm in the mandible in patients with narrow trans palatal widths. They contend that RME will result in reciprocal mandibular expansion, because the mandibular arch form is dictated by the maxillary arch form. McNamara *et al.* reported that a favorable 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.” 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 6 years and 3 months after fixed retention. In addition, 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. 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.^[26,27]

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.^[28]

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. Brennan and Gianelly observed that, in the mixed dentition, around 5 mm 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.

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.

CONCLUSION

Identifying guidelines for the extraction versus non-extraction decision in orthodontic treatment are 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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