

**Review Article****Unusual extraction combinations in orthodontics – A literature review**Shresha Shetty<sup>1,\*</sup>, Anil Kumar<sup>1</sup><sup>1</sup>Dept. of Orthodontics and Dentofacial Orthopedics, A.J Institute of Dental Sciences, Mangalore, Karnataka, India**ARTICLE INFO***Article history:*

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**ABSTRACT**

Extractions in orthodontics has been an important area of consideration as it is one of the most important factors, responsible for the success of treatment. Conventionally, the premolar extractions are the most followed. But as years passed by, finishing of the case has been given utmost importance. A proper extraction decision is the key for a good case finish. In other words, traditional extraction considerations needs to be reconsidered to satisfy the patient needs. This paper provides a review of unusual extraction combinations which can be considered at various clinical situations.

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**1. Introduction**

The modern era orthodontics is based on the concept of paradigm shift, which was first identified by the American physicist and philosopher, Thomas Kuhn, which he expressed as a fundamental change in the basic concepts and experimental practices of a scientific discipline. Based on this concept, the current trend in orthodontics is that there is increased emphasis on the soft-tissue relationship while planning the orthodontic treatment with reduced emphasis on correcting the malocclusion and the final treatment outcome being face-centered. Sometimes, in spite of carrying out extractions and use of elastics, there seems no change in the facial aesthetics, since the skeletal problem remains uncorrected.<sup>1-3</sup> The clinicians have to determine the pattern of extraction, considering the overall health of the teeth mainly and not just in terms of easier biomechanics.<sup>4</sup> The teeth most commonly indicated for extraction in orthodontics, fall in this order of the first premolars, mandibular incisors, the second premolars, the first molars and the cuspids.<sup>4</sup> Slenderization of teeth, single incisor extraction and asymmetric extractions are some of the ways of correcting the existent asymmetries seen in

the face.<sup>5-10</sup> Garn, Lewis and Kerewsky found that tooth size asymmetries did not involve an entire side of the arch, generally.<sup>11</sup>

**2. Objective**

To review the literature, relating the advantages and dis-advantages of unusual extraction combinations in orthodontics.

**3. Materials and Methods**

Papers which are mentioned under the references, with keywords of dental and facial asymmetries, asymmetric extractions, asymmetric space closure, tooth size disharmonies, atypical orthodontic extraction, molar extraction, single incisor extraction, asymmetric premolar extraction and three premolar extraction. Papers of case reports and series, literature review, systematic review and randomized control trial were chosen for the review writing. A total of 45 articles were selected to brief the review topic.

**4. Literature Review/ Discussion**

The concept of asymmetry highlights the golden ratio, which was utilized during the European Renaissance,

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wherein the architects used it to map out their masterpieces. Thousands of years later, it was picked up by Pythagoras who proved that this ratio was the basis for the proportions of the human figure and it was concluded that face, when normal, had a ratio of 1 : 1.168 which is the golden ratio. Any discrepancy in the ratio, will conclude asymmetry in the face. One of the etiological factors of facial asymmetries, is linked with the asymmetries in the dentition in terms of showing midline deviation, subdivision cases, unilateral cross-bites, unilateral impacted teeth, arch form deviation, missing teeth, alteration in the shape and size of teeth etc. There are additional factors involved, which will aid us in deciding when to perform an unusual extraction combination.

#### 4.1. Premolar extractions

The commonest situations that require the premolar extractions include severe midline discrepancy or asymmetric molar relationships.<sup>12</sup> The sufficient mesio-distal crown diameter allows for the extraction of first premolars since the space obtained can be promptly utilized to facilitate orthodontic tooth movement with biomechanics for alignment and sufficient retraction of teeth.<sup>13</sup> Gianelly et al, concluded that extraction of first premolars would lead to easier control of anchorage and very beneficial to preserve the contact point between the second premolar and the first molar.<sup>8</sup> When there is severe arch discrepancy in the anteriors, first premolars are indicated for extraction and when it is necessary to correct the molar relationship, which in turn would correct the midline discrepancy, unilateral extraction of second premolars is beneficial. Hence, Vanden et al reported that extraction of first premolar on one side and second premolar on the other, can occur depending on the location of arch length discrepancy.<sup>14,15</sup>

#### 4.2. Mandibular incisor extractions

Rheude et al.<sup>16</sup> suggested the importance of study models to perform asymmetric extractions for the successful outcome of orthodontic treatment results. Anterior Bolton's discrepancy is the direct indicator of extraction;<sup>6</sup> in other words a tooth size arch length discrepancy of more than 5 mm in the anterior region, allows for the extraction of mandibular incisors.<sup>17–19</sup> Another criteria, as suggested by Riedel et al,<sup>20</sup> emphasizes on increased mandibular anterior tooth material when compared to that of the maxillary anteriors, which is a go to mandibular incisor extraction. Miller et al.<sup>21</sup> and Riedel et al. also concluded that the treatment stability is better with retention in the inter-canine width. This was similar to the conclusion given by Kokich et al and Owen et al.<sup>19,22</sup> In moderate to severe crowding, extraction of a single incisor will maintain the arch form without causing unwanted alteration in the intercanine width. A good torque control with correct monitoring

of the axial inclination of mandibular teeth, will prevent lingual tipping of mandibular cuspid and hence maintain the inter-canine width.<sup>19–21</sup> However, extraction of mandibular incisors are connected with formation of black triangles due to papillary defect.<sup>17,22,23</sup> As suggested by Bahreman et al and other authors mandibular incisor extraction shouldn't be carried out in a class II individual as it would result in an un-acceptable overjet.<sup>21,22,24,25</sup> But on contrary, extraction of lower incisors for a moderate class III case or an edge to edge bite would be beneficial.<sup>26</sup>

#### 4.3. Maxillary incisor extractions

Extraction of the upper central incisors are very uncommon in orthodontics. However, when we diagnose an upper central incisor with poor prognosis, may it be due to malformation or simply because of it being grossly decayed and has undergone irreparable damage.<sup>27</sup> Other factors that decide the confirmed extraction of maxillary central incisors will be the space requirements, shape, size and root height of lateral incisors and canines.<sup>28–33</sup> When it comes to maxillary lateral incisors, tooth agenesis is the commonest factor for its extraction.<sup>34</sup>

#### 4.4. Molar extractions

First molars are the permanent teeth that are prone to more damage as they are the first permanent teeth to erupt, with the posterior position which is involved in mastication.<sup>35,36</sup> According to De Oliveira et al, molar extractions are suitable to solve the problems of vertical growth as well as to attain a class I molar relationship at the end of treatment.<sup>37</sup> Some of the other authors, suggested to look for the presence of extensive caries, apical pathologies, severe crowding in the posterior region or anterior open bite as an indication for the extraction of first molars. But, it is important to notice the presence and position of third molars in the jaw, before undergoing the extraction.<sup>38</sup> A case requires an extraction of endodontically or periodontally compromised first molars when significant arch space is needed and the existing first premolars are healthy.<sup>39</sup> But it leads to an extended treatment period, with a tendency of mesiolingual inclination of the lower second molars.<sup>36</sup> Sandler et al.,<sup>38</sup> has emphasized on the clinical effect linked to the first molar extraction, that leads to mesial movement of the second and third molars, which in turn leads to counter-clockwise mandibular rotation with the closure of mandibular plane. However the effect is pronounced only when there is bilateral molar extraction.<sup>38</sup>

#### 4.5. Cuspid extractions

Cuspids are considered, the cornerstone of dentition. There are no much of scientific studies in the literature reporting the cosmetic importance of maxillary cuspids.<sup>40</sup> There are definite indications of extraction of impacted maxillary

cuspid, when they are in an unfavorable angulation to be brought into the alignment.<sup>41</sup> In such cases, while substituting the cuspid with the adjacent first premolar, the pre-existing inclination of the premolar should be good enough to provide an esthetic smile arc in the patient. In case of an ectopically positioned cuspid, there will be presence of loss of attachment which can only get better by moving them to an area of better bone support.<sup>42</sup>

#### 4.6. Second molar extractions

Lin and Gu claimed that second molar extractions are best done whenever there are situations of normalizing the molar relationship or for the correction of severe anterior cross bite, as long as there is presence of third molars posterior to them.<sup>43</sup> But in case of difficulty in closing the extraction space such as in horizontal growers with strong facial musculature, the extraction of lower posteriors is contra-indicated.

#### 4.7. Extractions of impacted teeth

According to Mc Sherry<sup>44</sup> and Pitt et al,<sup>45</sup> whenever impacted canines lie at an angle of  $> 60^\circ$  to the midline, it says that the canine is unfavourable to be brought into the alignment. Hence the need for extraction of such teeth. This is also the case for all the impacted teeth, which would exert unwanted pressure onto the adjacent tooth root, leading to root resorption of those teeth. This situation is most commonly seen with mesioangularly impacted third molars exerting pressure on the second molar tooth root.

### 5. Conclusion

As per the reviewed literature, considering asymmetric extractions have additional benefits to the patient, in terms of less tooth structure removal. Obtaining full diagnostic findings will help to obtain acceptable treatment results.<sup>21</sup> Always select the extraction pattern assessing the overall health of the dentition and not just depending upon the easier treatment biomechanics.<sup>4</sup> Retaining or minimum alteration in the inter-canine width plays a major role in achieving treatment stability.<sup>19,21,22</sup> However, the treating orthodontist need to have better knowledge and control of the treatment mechanics, in order to finish the case with the best possible results in terms of function and aesthetics, hence fulfilling the modern day criteria of face-centered treatment.

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### 7. Conflict of Interest

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