

# EVALUATION OF CORRELATION FOR ALL 4 EXTRACTIONS IN ORTHODONTIC PRACTICE IN CASE OF DISHED IN FACES: AN ORIGINAL RESEARCH

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## ABSTRACT

**Aim:** Purpose of our research was to assess the outcome as well as correlation after extraction of four premolar teeth for orthodontic treatment and will it result in dished in facial profile.

**Methodology:** Pretreatment and posttreatment records of 73 patients were chosen at random from completed cases in the practice of one experienced orthodontist. Eighteen involved the extraction of upper first premolars, and 55 involved the extraction of upper second premolars. Of these 55, 29 involved the extraction of upper first premolars and 26 involved the extraction of upper second premolars. In the upper first premolar group, however, all 18 involved the extraction of upper first premolars. Pretreatment factors that recommended a foundation for the extraction option in this group of patients who had incisal overjet, molar relationship, and fundamental upright facial outline.

**Results:** A wide variety of arch dimensional changes was found with different upper premolar extraction patterns. There was evidence, however, of more intermolar arch width reduction after the extraction of upper second premolars than upper first premolars. Orthodontic treatment with the extraction of premolars did not steadily

*cause a retraction effect on the incisors. In fact, examples of proclination of the incisors happened inside all of the extraction groups.*

*Conclusion: A large amount of individual variation in incisor and molar changes accompanied treatment involving all upper premolar extraction patterns but It didn't result in dished facial profile in our study.*

*Keywords Soft tissue, fixed orthodontic treatment, first premolar extraction*

## **INTRODUCTION**

The specialty of orthodontics has a long history of concern for facial form and appearance. Edward Angle who's also father of modern orthodontics and a devout non-extractionist, saw Apollo Bevedre as the epitome of facial beauty and the gold standard that guided his treatment. The fear of the "dished-in" profile, said commonly to result from the extraction of premolar teeth, is derived largely from a few isolated lawsuits in the United States and carefully selected reports of unfavorable results. Orthodontists are very much concerned about not creating flatten facial profiles which will drastically hinder orthodontic issues addressal.<sup>1</sup> Substantial previous research regarding the response of the soft tissue to tooth retraction has been performed, but few have examined cases with minimal arch length deficiency and maximum anterior retraction required. Even fewer have focused on patients who might benefit from surgical mandibular advancement but who opted to proceed with maxillary first premolar extraction. Burstone has suggested that the way anchorage is managed, not the mere extraction of the teeth, determines the magnitude of anterior dental retraction and the resulting change in lip position.<sup>2</sup>

In general, an orthodontic fixed treatment consists of arch expansion in non-extraction treatments, and extractions in instances of severe crowding and protrusion.<sup>3,4</sup> In cases with arch size/tooth size discrepancy of 5-9mm, non-extraction and extraction treatment is possible and the treatment plan depends on the hard and soft tissue characteristics of the patient but if the discrepancy is 10 mm or more, extraction is almost always required. Four first premolars or possibly upper first premolars are the extraction option usually. Infrequently, second premolar or molar extraction is suitable because it does not offer sufficient space in extremely crowded patients. There are still ongoing debates on the effects of extraction on vertical height dimension, profile changes, jaw position, TMJ health and periodontal situation after treatment.<sup>5-11</sup>

The horizontal relationship of the lips has been proposed as an important characteristic in esthetics.<sup>12</sup> Upper lip length increases during orthodontic treatment. Partially due to development changes and the outstanding is due to the bite modifications during treatment. E-line or aesthetic plane was introduced by Ricketts to evaluate the position of lips.<sup>13</sup> Other planes such as S-line, B-line, H-line, also were introduced to assess soft tissue alterations.<sup>13,14</sup> There are different studies with controversial results on evaluating soft tissue after orthodontic treatments. Assuncao et al. described that the upper lip length didn't show noteworthy variations due to backward movement incisors in adult patients.<sup>15</sup> Bishara and Jacobson in a comparable study stated that, orthodontic treatment either by extraction or not, improve soft tissue profile of the patients.<sup>16</sup> Lai et

al. showed that soft tissue's response was not predictable and so did Zarringalam and Arash.<sup>17,18</sup> Conley also found this result for his patients treated by extraction of upper premolars. Akyalcin and Hazar reported that, extraction for orthodontic treatment retruded the lips but non extraction treatments didn't affect the profile too much.<sup>19</sup> Tadiac et al. declared that by extraction of upper first premolars, nasolabial angle, upper and upper lip sulcus depth and position of upper incisors changed proportional to previous soft tissue characteristics and pre-treatment incisor position and all of them relates to the ANB angle alterations.<sup>20</sup>

### **AIM OF THE STUDY**

Purpose of our research was to assess the outcome as well as correlation after extraction of four premolar teeth for orthodontic treatment and will it result in dish in facial profile.

### **METHODOLOGY**

The sample comprised of pretreatment and posttreatment records of 73 extraction cases treated by one skilled orthodontist with preangulated fixed appliances ( $0.018 \times 0.028$  inch), All cases consisted of a minimum of pretreatment and posttreatment lateral cephalographs and study casts and details of the treatment history. The average length of treatment in fixed appliances was 2.2 years with a range of 1.2 to 3.7 years. (Table 1) All patients had undergone maxillary premolar extraction as part of a comprehensive orthodontic treatment plan. The group differences were quantified using a one-way analysis of variance (ANOVA). Three measurements were identified as significantly different, among the groups at the 95% confidence level. These areas included two study model measurements, incisal overjet and Class II molar relationship, and one cephalometric measurement, the facial axis.

In case of cephalometric measurements, Absolute distances were measured from point to point. Horizontal and vertical distances between points were measured relative to the X and Y coordinates of those points. After digitization, all data were stored in an Excel spreadsheet. The mean error for angular and linear cephalometric measurements ranged from  $0.02^\circ$  to  $0.6^\circ$  and 0.01 to 0.5 mm, respectively. Various occlusal landmarks were identified for each upper study cast so that a digital caliper (Mitutoyo Digimatic Caliper) could be used to measure distances between points. The results were then directly entered into an Excel spread sheet.

### **RESULTS**

The mean intercanine width in each group experienced minor alterations. In the overall female and the upper first premolar extraction groups, the mean represented a slight increase in intercanine width compared with other groups, but the mean arch. depth and chordal arch length decrease were curiously alike for all groups. The only statistically significant difference found was for the reduction in intermolar width. (Table 2) The mean of 2.8 mm ( $\pm 1.9$ ) in the upper first premolar group was smaller than the upper second premolar group, which had a mean reduction of 4.4 mm ( $\pm 2.0$ ). There was an

overall mean reduction of 1.3 mm of the upper incisors in relation to the APo reference line when any upper premolars were extracted. The mean upper incisor angulation changes on the bone itself (corpus axis superimposition) showed similar trends, with more retroclination after the extractions of upper first premolars than upper second premolars. The mean upper dental height from the upper incisor tip to menton increased in all groups; the increase was greater in the upper first premolar extraction group with little difference between the two upper second premolar groups. Mean changes in estimated molar movement were then calculated for each group and found not to be significantly different. The means for all groups ranged from 4 to 4.5 mm of forward upper molar movement. The incisors were actually retracted from their pretreatment positions but not resulted in a flat face profile (dished facial profile). (Table 3)

**Table 1- Population sample**

Group	N	Mean treatment time in years (months)
Total	73	2.3 (27)
Male	36	2.3 (27)
Female	37	2.2 (26)
Extraction of maxillary 1 <sup>st</sup> premolars	18	2.3 (28)
Extraction of maxillary 2 <sup>nd</sup> premolars	55	2.2 (26)

**Table 2- Upper incisor position and angulation changes with treatment**

Group	Upper incisor angulation	Upper dental height (mm)	Interincisal angulation (°)
Total	-1.7 ± 6.6	+2.2 ± 2.8	+5.4 ± 11.2
Male	-2.8 ± 7.1	+2.6 ± 2.4	+6.1 ± 12.0
Female	-0.6 ± 6.0	+1.8 ± 3.1	+4.7 ± 10.4
Extraction of maxillary 1 <sup>st</sup> premolars	-4.0 ± 7.4	+3.2 ± 2.6	+8.8 ± 14.1
Extraction of maxillary 2 <sup>nd</sup> premolars	-1.0 ± 6.8	+1.8 ± 2.8	+4.3 ± 10.0

\*ANOVA,  $P = .07$ . Student  $t$  test,  $P = .06$ .

**Table 3- X. Correlations with upper incisor movement (superimposition)-cephalometric analysis with the help of Pearson's correlation coefficient.**

Variable	Pearson's correlation (r)
Interincisal angulation change (°)	0.6*
APo to vertical reference change (°)	0.2

Estimated molar movement (mm)	0.8*
Residual space (mm)	-0.4

\*Significant correlation

## DISCUSSION

The success of treatment depends on the careful analysis of all diagnostic elements and establishment of an accurate treatment planning. Amongst numerous decisions, the professional should decide if the success of treatment needs dental extractions.<sup>21</sup> The extractions with orthodontic agenda, for rectification of tooth crowding or intermaxillary inconsistencies, are controversial since the concepts of normal occlusion were initially enhanced, within the early 20th century. Any tooth could also be extracted, counting on each case, to supply more satisfactory esthetic and functional outcomes. Within this sense, there's consensus that the design of treatment should be customized.<sup>22</sup> The extractions of second premolars permitted improved hold on movement of incisors and of the lip retraction, avoiding the marked concavity of the facial profile that happens after extractions of first premolars. Indicated in cases with moderate shortage of space, in individuals with balanced facial contours and well-positioned incisors in their dental arches, the extraction of second premolars is justified within the literature.<sup>23</sup> Nance indicated the extraction of maxillary first premolars and mandibular second premolars in borderline cases with mild biprotrusion, during which the extractions of first premolars may excessively retract the facial profile. This was later corroborated by other investigators.<sup>24</sup> James and Dewel described the moderate space deficiency, which is characteristic of borderline cases in individuals with balanced facial contours, together of the essential diagnostic requirements for indication of extractions of second premolars.<sup>25</sup> consistent with Carey, better results were achieved when malocclusions with discrepancies between 2.5 and 5 mm were treated by extraction of second premolars.<sup>26</sup> However, consistent with Schoppe, the most indication included cases with discrepancies up to 7.5 mm, in individuals with muscular balance, proportional facial contour and incisors well-positioned within the dental arches.<sup>27</sup> Confirming these findings, Castro described the benefits of extraction of second premolars for cases with need of extractions, especially for patients with satisfactory profile and favorable mandibular growth. Conversely, some authors didn't observe positive correlation between the tooth to be extracted and lip positioning. However, they agree that the pretreatment and growth characteristics cause different facial outcomes.<sup>28</sup> According to Burstone et al, many factors affect lips position, including several orthodontic and surgical procedures.<sup>29</sup> an honest position of the lip are often obtained by surgically or orthodontically protruding incisors, increasing/reducing the chin prominence, or both. Also, related with Legan et al, regulated retrusion of mandibular incisors associated to the extrusion of maxillary teeth preserve the lip support.<sup>30</sup>

## CONCLUSION

The extractions of second premolars may assure the profile integrity when the challenge is to realize space in cases of negative tooth-size discrepancy. The professionals should

remember of the diagnosis and planning of the perfect pattern of tooth extractions, to realize the esthetics of the profile and facial balance, also as functional occlusion and stability.

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