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Facilitating orthodontic teeth extraction—A technique suggestion



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KEYWORDS

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Abstract *Introduction:* Extractions are routinely used in orthodontics as a method of gaining space. Sometimes the closures of these extraction spaces become problematic for the treating clinician. Many causes have been cited for such a mis-happening, one of it being narrowed out ridge due to fractured cortical plate, which often occurs during a traumatic extraction. Hence, any technique that facilitates teeth removal atraumatically and thus decreases the possibility of such a complication is welcome. *Aims and objectives:* To test a novel method utilizing localized inflammatory response in easing orthodontic extractions. *Material and method:* 40 individuals were included in this split mouth prospective clinical study. In all these subjects, teeth destined for extraction were bonded and engaged with arch wire on one side of the arch and the other side was used as control. Ease of extraction was compared and assessed by the dentist and the patients using four point Likert scale. The values obtained were used for statistical analysis. *Result:* Both the dentist and the patients perceived the extraction on the test side being easy, with less discomfort postoperatively with the difference between the test and the control being statistically significant. *Conclusion:* Localized inflammatory response in the periodontium of teeth destined for extraction can be used to facilitate their removal, thereby easing out the procedure both for the dentist and the patient.

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1. Introduction

Orthodontic treatment often involves the extraction of teeth to gain space for the correction of crowding or proclined teeth. While, for the patient and the general practitioners (GP)

performing the procedure the principal concern is to successfully complete the procedure atraumatically, for the orthodontist there is an additional prospective to preserve the cortical plates from breaking during extraction which can lead to ridge narrowing. Fractured cortical plates can lead to narrowed out ridges that may interfere with complete closure of extraction space closure.¹ Therefore, any technique that eases tooth removal with minimal trauma to the cortical plates is welcome. No such technique was found in the literature search by the author that specifically addresses orthodontic tooth extractions. Background orthodontic extractions are conventionally done preceding the formal banding and bonding procedure. However, in most if not all cases it is possible to delay it by

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ten to fifteen days following strap up. Also, it is a known fact that placement of bracket and engaging wire in the slot applies force to the tooth and leads to a slight widening of periodontal space due to a localized inflammatory response (also called as regional acceleratory phenomena or RAP) that sets in as a response to force application and is clinically observed as a slight increase in tooth mobility.²

1.1. Aim and objective

The aim of this study was to explore the possibility of utilizing this localized inflammatory response as a mean of facilitating orthodontic tooth extraction for the dentist and make it less traumatic for the patient. The null hypothesis propounded that there was no difference in response perceived by the dentist or the patients between the test (tooth bonded) and the control side (tooth not bonded).³

1.2. Material and methods

A split mouth prospective clinical study was designed to include 40 orthodontic patients treated by the author from December 2011 to September 2014. Individual who met the following criteria were included in this study:

1. Malocclusion group: class I bimaxillary protrusion or class I crowding cases with crowding not exceeding 6 mm in the labial segment.
2. Treatment involved extraction of all first permanent premolars as a part of treatment plan.
3. Full complement of permanent teeth present and erupted (from first molar to first molar in both the arches). Second molars must be present. Individuals were included even if the second molars were still erupting and had not reached the occlusal plane due to a generalized delay in dentition without any underlying systemic or local cause.
4. Healthy first premolars or with minimal caries/restorations and definitely no endodontic treatment. Care was taken that the cases included had a relatively standard root form and shape which were symmetrical on both the sides of the arch and were free from dilacerations or any other malformation that is a documented causative of difficult extraction.
5. The teeth on both the sides must be in occlusion and free from cross bite, as it is a known fact that there is a widened periodontal space around non occluding teeth. Also, the teeth should be positioned in the arch in a way making them feasible to bracket bonding.
6. Individuals with any gross distortions in the arch form unilaterally or bilaterally were excluded from the study.
7. Relatively good oral hygiene and a healthy periodontium.
8. Patient's with bilateral mandibular tori in the premolar region were included in this study; however, if the torus was unilateral the subjects were excluded.
9. Age: 15–25 years old individuals who were apparently free from any underlying medical conditions as revealed by their medical history.⁴
10. Gender: neutrality was maintained since every subject served as their own control.

11. Individuals gave a signed consent to be included in this study. As a token of gratitude, for participation in the study the extractions were done at half the price of the normal procedural charge to the participants.

1.3. Procedure

All the teeth were bonded at the time of strap up in case of bimaxillary protrusion patient and those possible in case of crowding cases. The first premolars on one side of the mouth were always included in the initial bonding. The other side was excluded from the bonding and acted as control. All the inclusions had premolars bonded alternately on right and left side (example, if subject 1 had upper and lower first premolars bonded on the right side, subject 2 had it on the left side and subject 3 again on the right side and so on). This was done to eliminate the confounding factor of ease which the dentist has while performing extraction due to their being right handed or left handed (e.g. a right handed dentist finds right side extractions easy). The initial wire placed in all the patients was either 0.014" HANT (heat activated nickel titanium) or 0.016" HANT wire (3M Unitek Corporation, Monrovia, California, USA) in both the arches. The patients were recalled after one week of strap up for initial check up and teeth extraction. The side to which brackets were bonded on premolars destined for extraction was always extracted first. This was done to prevent the GP from identifying the difference between the two sides being tested. On the extraction appointment, the patient was examined by the orthodontist who de-bonded the bracket and cleaned the tooth surface of any residual composite before handing over the case to the GP dentist for extraction. All the extractions were carried out using 2% 1:100000 Xylocaine™ Dental (Dentsply Pharmaceutical, 3427 Concord road, York) using infraorbital and palatal infiltration for maxillary tooth and mental nerve block for mandibular tooth. The patient's were prescribed with routine analgesics and antibiotics post extraction. The contra lateral side was extracted after 15 days at the time of monthly orthodontic adjustment appointment.⁵ After removal of teeth the GP dentist was asked to rate on a four point Likert scale their perception of extraction as: 1. Very difficult, 2. Difficult, 3. Easy, 4. Very easy. The same scale was also used to assess the patient's perception of the discomfort level after three days on the recall appointment for check up post-extraction and was asked to compare which one they found easy and/or had less discomfort post extraction (Table 1).

1.4. Statistical analysis

Mann Whitney *U* test was used to compare the patient's and the dentist's perception of extraction at two extraction appointments (T: When the test side was extracted; C: When the control side was extracted) Wilcoxon Sign Rank test was used to compare the direction of response of the patient and the dentist on the test and the control side independently. GraphPad Prism™ (GraphPad Software, Incorporation, California, USA) statistical software was used for data analysis. The result of this study has been tabulated in Tables 2–5. A look at the response of both the patient and the dentist shows that extraction on the test side (where bracket bonding and

Table 1 Likert scale score response data of the patient's and the dentist on the test and the control side.

Test side (T)		Control side (C)	
Patient's perception	Dentist's perception	Patient's perception	Dentist's perception
2	4	2	2
2	4	2	2
3	3	2	3
3	3	2	3
3	3	1	2
2	4	3	2
1	3	1	3
2	2	1	2
3	3	2	2
3	2	2	3
2	3	1	2
2	2	1	1
3	4	2	2
3	2	2	3
2	4	3	2
1	4	1	3
2	2	2	2
2	3	2	3
3	3	4	4
1	3	2	3
4	3	4	2
4	3	3	3
3	4	1	2
4	4	3	2
3	4	2	4
2	2	1	2
3	3	1	4
2	3	2	4
3	3	2	2
4	4	2	2
4	2	3	3
1	1	1	2
1	2	1	2
2	2	2	1
2	3	1	3
3	3	2	1
2	1	3	1
4	4	1	3
2	3	2	2
4	3	2	3

wire engagement was done) was perceived as easy or less traumatic by the dentist and the patient alike (Tables 2 and 3) and this difference between the test and the control was statistically significant ($p < .05$).

Furthermore, an assessment of patient's and dentist response using Wilcoxon Sign Rank test showed that both their responses tailed in the same direction and corroborated with each other significantly, that is, what was perceived difficult by the dentist was perceived difficult by the patient also (Tables 4 and 5).

2. Discussion

The null hypothesis was refuted in this study as a statistically significant ease was experienced by both the dentist and the patient during extraction. Moreover patients also reported less

Table 2 Comparison of Dentist's response between test and control side using Mann Whitney U test.

Table analyzed	Unpaired t test data
Column B vs. Column A	B- (DENTIST)* vs. B+ (DENTIST)**
Mann Whitney test	
P value	0.0148
Sum of ranks in column A, B	1859, 1381
Mann-Whitney U	561
Difference between medians	
Median of column A	2.000, $n = 40$
Median of column B	2.000, $n = 40$

* B-: bracket absent (control side).

** B+: bracket present (test side).

Table 3 Comparison of patient's response between test and control side using Mann Whitney test.

Table analyzed	Unpaired t test data
Column B vs. Column A	B- (PATIENT'S)* vs. B+ (PATIENT'S)**
Mann Whitney test	
P value	0.0022
Sum of ranks in column A, B	1918, 1322
Mann-Whitney U	502
Difference between medians	
Median of column A	2.500, $n = 40$
Median of column B	2.000, $n = 40$
Difference: actual	-0.5000
Difference: Hodges-Lehmann	-1.000

* B-: bracket absent (control side).

** B+: bracket present (test side).

Table 4 Comparison of patient's and dentist's response between test side (T) using Wilcoxon Sign Rank test.

Column B vs. Column A	(B+) Dentist's perception** vs. (B+) Patient's perception*
Wilcoxon matched-pairs signed rank test	
P value	0.0272
Sum of positive, negative ranks	209.0, -67.00
Sum of signed ranks (W)	142.0
Number of pairs	40
Median of differences	
Median	0.0
rs (Spearman)	0.2380
P value (one tailed)	0.0696

* B-: bracket absent (control side).

** B+: bracket present (test side).

discomfort post extraction on the test side during the follow up appointment. The logic of bonding the tooth destined for extraction and engaging wire to it is simply based on the concept that orthodontic force is a kind of micro trauma which leads to localized inflammation in the periodontal ligament (PDL) space.²⁻⁵ This mild inflammatory response clinically

Table 5 Comparison of patient's and dentist's response between control side (C) using Wilcoxon Sign Rank test.

Table analyzed	Data 1
Column B vs. Column A	(B-) Dentist's perception* vs. (B-) Patient's perception**
Wilcoxon matched-pairs signed rank test	
P value	0.0118
Sum of positive, negative ranks	309.0, -97.00
Sum of signed ranks (W)	212.0
Number of pairs	40
Median of differences	
Median	1.000
rs (Spearman)	0.01720
P value (one tailed)	0.4581

* B-: bracket absent (control side).

** B+: bracket present (test side).

presents itself as widening of PDL space and slight increase in tooth mobility. It is a simple clinical observation that mobile tooth is easy to extract and thus the ease experienced by the dentist and the patients. Orthodontic force application and the consequential localized inflammation may also lead to an increase in bone pliability due to a localized decrease in trabecular bone density, which in turn would offer less resistance to tooth extraction and thus can be considered as the utilization of Regional Acceleratory Phenomena to facilitate tooth extraction.^{5,6} Though the topic of fractured cortical plate during difficult extraction is quite often discussed among the orthodontic fraternity as a possible cause of hindrance to space closure or narrowed-out ridge, no literature pertaining to the same was found by the author while researching this topic. The study design was kept to its simplest in view of the novelty idea being tested and its setting, being a private clinical practice. Hence, care was taken to minimize deviation from a conventional treatment protocol accepted in the area of practice, and yet reach the study goals. However, this came at a cost of certain inherent limitations acknowledged herein as: the sample size, case selection criteria, extraction pattern, antibiotic prescription and lastly the assessment scale and the possible bias introduction. This study used a small sample size and the result though statistically significant would have been more meaningful with higher statistical power and lower confidence interval had the sample size been larger. Besides, the cases selected involved a very specific group of malocclusion which prevented the creation of any subsets of malocclusion group and their comparison, leading to a further increase in relevance of the study findings.⁷ The protocol for teeth extraction involved extracting premolars on either side of the face at two subsequent appointments. A better protocol would have been to extract bilaterally once in the maxillary and then in the mandibular arch, to allow for better evaluation and elimination of selectors bias. However, such a protocol was not followed in spite of being superior since, following this protocol would have led to the anaesthetizing of complete upper or lower lip and carried a risk of lip biting and swelling which was undesirable at first place and could have added to the unnecessary anxiety of the patient for the extraction procedure and could have influenced the result of the study, besides, being detrimental for the reputation of the practice. Also, it

would have allowed the GP dentist to gain subtle cues about the interventional procedure and over a period of time he could have figured out what was being assessed and inevitably would have led to variation in assessment. The confounding variable of fear of first extraction could not be eliminated no matter which protocol was followed and could only be hoped to have influenced the result of this study to the minimal. Additionally, since extraction was always carried out on the bonded side first, logically it should have a worse scoring, with this confounding variable in play. However, since most patients rated the extraction on the bonded side to be less traumatic, had this confounding factor been absent, it would have further added to the statistical difference between the two groups, providing support to the premise being tested. The routine use of antibiotics post extraction is a much debated topic in the dental literature. While, some authorities recommend it, the others find it unnecessary in neat extraction cases where only analgesics are considered to suffice. Though, the author personally favors the latter opinion, antibiotics were still used in our patients post extraction in compliance with the conventional norms prevalent in the area of practice. Besides, antibiotic also acted as an additional safety measure against infection (as dry socket) which may interfere with the result of this study. This study involved the use of Likert scale which is usually a five point scale. However, a four point scale was used for this study eliminating the neutral response. This "forced choice" method, as the name implies is said to be advantageous in eliciting a relevant response from the subjects since the n-neutral option is considered as an easy option to take when a respondent is unsure, and so whether it is a true neutral option is questionable, and hence eliminated from the scale being used.⁷ Furthermore, all efforts were taken to minimize bias introduction in this study, however, their complete elimination was not possible owing to the nature and design of the study.

3. Conclusion

Bonding of tooth which is due for extraction and engaging it in the arch wire significantly eases the extraction for the dentist and the patient and has less post operative discomfort reported by the patient in this study. This simple modification can routinely be adopted in clinical practice and hence must be further tested for its suitability by using larger sample size and multicentric trials.

Support and conflict of interest

None.

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