

# Extraction protocols for orthodontic treatment: A retrospective study

VAISHNEVI N. THIRUNAVUKKARASU, SRINIVAS SULUGODU RAMACHANDRA, DANIEL D. DICKSIT, KALYAN C. GUNDAVARAPU

## Abstract

**Background and Objectives:** Various extraction protocols have been followed for successful orthodontic treatment. The purpose of this study was to evaluate the extraction protocols in patients who had previously undergone orthodontic treatment and also who had reported for continuing orthodontic treatment from other clinics. **Materials and Methods:** One hundred thirty eight patients who registered for orthodontic treatment at the Faculty of Dentistry were divided into 10 extraction protocols based on the Orthodontic treatment protocol given by Janson *et al.* and were evaluated for statistical significance. **Results:** The descriptive statistics of the study revealed a total of 40 (29%) patients in protocol 1, 43 (31.2%) in protocol 2, 18 (13%) in protocol 3, 16 (11.6%) in protocol 5, and 12 (8.7%) in Type 3 category of protocol 9. The Type 3 category in protocol 9 was statistically significant compared to other studies. Midline shift and collapse of the arch form were noticed in these individuals. **Conclusion:** Extraction of permanent teeth such as canine and lateral incisors without rational reasons could have devastating consequences on the entire occlusion. The percentage of cases wherein extraction of permanent teeth in the crowded region was adopted as a treatment option instead of orthodontic treatment is still prevalent in dental practice. The shortage of orthodontists in Malaysia, the long waiting period, and lack of subjective need for orthodontic treatment at an earlier age group were the reasons for the patient's to choose extraction of the mal-aligned teeth such as the maxillary canine or maxillary lateral incisors.

**Keywords:** Extraction protocol, irrational extraction, Malaysia, orthodontic treatment

## Introduction

Extractions for orthodontic treatment had changing tendencies over time.<sup>[1]</sup> Extraction of teeth to gain space for the orthodontic movement was quite common in the late 19<sup>th</sup> century. With the advent of angle's era in early 20<sup>th</sup> century, nonextraction treatment became quite popular.<sup>[1]</sup> Angle opined that extraction destroyed the possibility of ideal occlusion and esthetics. Almost all the cases were treated without extraction as angle advocated that modern orthodontic treatment done correctly would allow function to stabilize the teeth in their new positions. However, nonextraction theory was proved wrong with more relapse cases. Extractions were reintroduced to orthodontics in 1930's and with the advent of Begg's

technique reached its peak in 1960's.<sup>[1]</sup> With the current soft tissue paradigm, the number of cases treated with extraction has reduced taking into consideration the profile of the patient. Different extraction protocols have been followed for successful orthodontic treatment.<sup>[1]</sup> Various studies have been conducted to evaluate the frequency of these extraction protocols. The aim of this study was to evaluate the extraction protocols in orthodontic patients reporting to the Faculty of Dentistry.

## Materials and Methods

Ethical approval for the study was obtained from the Institutional Ethics Board. Informed consent was obtained from the patients during the study. The study was conducted on a total of 138 patients registered for orthodontic treatment at the Faculty of Dentistry. Patients who were undergoing or have completed orthodontic treatment, new patients who were evaluated to start treatment and those who were referred in the mid-treatment stage from other centers to continue orthodontic treatment were included in the study. Patients without complete pretreatment records were excluded from this study.

Faculty of Dentistry, SEGi University, Selangor, Malaysia

**Correspondence:** Dr. Srinivas Sulugodu Ramachandra, Faculty of Dentistry, SEGi University, No. 9 Jalan Teknologi, Taman Sains Selangor, Kota Damansara, 47810 Petaling Jaya, Selangor, Malaysia.  
E-mail: periosrinivas@gmail.com

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Patients were divided into 10 groups (extraction protocols) based on the orthodontic treatment protocol given by Janson *et al.*<sup>[1]</sup> protocol 0 (nonextraction); protocol 1 (four first premolar extractions); protocol 2 (two first maxillary and two second mandibular premolars); protocol 3 (two maxillary premolar extractions); protocol 4 (four second premolars); protocol 5 (asymmetric premolar extractions); protocol 6 (incisor or canine extractions); protocol 7 (first or second molar extractions); protocol 8 (atypical extractions); and protocol 9 (agenesis and previously missing permanent teeth).<sup>[1]</sup> Protocol 9 was further subdivided into 3 groups: Type 1: History of missing permanent tooth due to agenesis; Type 2: History of extracted permanent tooth due to gross decay; Type 3: History of extracted permanent tooth to relieve crowding in that particular segment in preference to orthodontic treatment [Figure 1].

### Statistical analysis

Data collected from the study were tabulated and analyzed using the Statistical Package for Social Sciences Software (SPSS version 21.0) manufactured by IBM.

### Results

A total of 138 patients who received orthodontic treatment were categorized into the different extraction protocol based on the history of extraction or the current treatment plan. The data were tabulated under sex, ethnicity, and different extraction methods for orthodontic treatment. The descriptive statistics of the study [Table 1] revealed a total of  $n = 40$  (29%) patients in protocol 1,  $n = 43$  (31.2%) patients in protocol 2,  $n = 18$  (13%) patients in protocol 3,  $n = 16$  (11.6%) patients in protocol 5, and  $n = 12$  (8.7%) patients were in the Type 3 category of protocol 9. The gender statistics showed more of female patients compared to male patients [Table 2]. Ethnicity statistics showed more Chinese patients, followed by Malay, Indians, and others [Table 2]. Midline shift, collapse of the arch form,

derangement of occlusion, and functional shift on jaw closure were noticed as additional complications in these patients.

### Discussion

Maxillary canines are the second most commonly impacted teeth in the dental arch. Surgical uncovering and orthodontic alignment to the line of occlusion is the most desirable and recommended treatment approach for impacted or ectopically erupting canine.<sup>[2]</sup> Extraction of the impacted or ectopically erupting canine is the inevitable choice of treatment only when there is restriction to orthodontic treatment in relation to its location or anatomy.<sup>[3]</sup> It is evident that the presence of maxillary lateral incisor and canine are indispensable in the esthetic zone of the arch for good occlusion and facial expression. In contrast to this current treatment protocol, one of the protocols 9 Type 3 patients reported with a history of extracted right canine and premolar to relieve crowding in that segment. The patient had midline shift, collapse of the arch form, and deranged occlusion as additional complications [Figure 2].

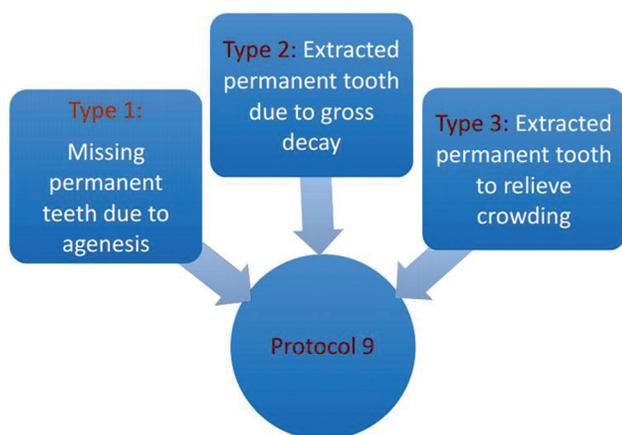
Maxillary lateral incisors are the most common congenitally missing permanent teeth in the maxillary anterior region. With missing maxillary lateral incisors, there is a visible and negative effect on the dentofacial esthetics apart from functional problems.<sup>[4]</sup> It is either managed by canine

**Table 1: Frequency of cases categorized into 10 extraction protocols for orthodontic patients. Protocol 9 is additionally sub-categorized to three types**

Extraction protocol	Number of cases	Percentage of cases
0	40	29.0
1	43	31.2
2	1	0.7
3	18	13.0
4	0	0.0
5	16	11.6
6	3	2.2
7	0	0.0
8	2	1.4
9, Type 1	1	0.7
9, Type 2	2	1.4
9, Type 3	12	8.7
Total	138	100

**Table 2: Gender and ethnicity distribution of extraction protocol 9 Type 3**

Extraction protocol 9 Type 3	Females	Male
Chinese	8	1
Malay	2	0
Indian	1	0



**Figure 1:** A schematic diagram which shows the subdivision of Protocol 9 into three different categories

substitution or opening of the space created by congenital absence and placement of the prosthesis.<sup>[5]</sup> One of the protocols 9 Type 3 patients reported with the history of extracted of right lateral incisor to relieve crowding in that segment. The patient had midline shift and crossbite as additional complications [Figure 3]. It is evident that the presence of maxillary lateral incisor and canine are indispensable in the esthetic zone of the arch for good occlusion and facial expression. Midlineshift and posterior crossbite can be appreciated in patients with history of extraction of both the premolars from the upper left quadrant to relieve crowding in that segment [Figure 4].

Orthodontic treatment needs for the Malaysian population has been high.<sup>[6-8]</sup> Age was found to be associated with orthodontic demand in Malaysia. The 16-year-old group was more interested in orthodontic treatment than the 12-year-old group.<sup>[8]</sup> To relieve crowding and for esthetic purpose, patients opt for extraction of the malaligned teeth as recommended by some general dentists in preference to orthodontic treatment. In many instances, maxillary canines and maxillary lateral incisors were extracted which is detrimental to the occlusion of the patient and affects the smile esthetics.

These patients have reported for orthodontic treatment at a later age, when collapse of the arch form, shift in the midline, and deranged occlusion are additional complications together with impairment of the patient's self-esteem and confidence level at a sensitive period of their lives. Reasons for the patients to choose extraction of the malaligned teeth in preference to orthodontic treatment are (i) limited number of orthodontists in Malaysia to cater to the high demand for treatment in Malaysia, (ii) escalated orthodontic treatment costs in dental clinics and the long waiting period at the university hospitals, and (iii) lack of subjective need for orthodontic treatment at an earlier age group.

#### Limitations of the study

The study was done on a small sample size of 138 patients. Moreover, changes in the trends of extraction protocol were not studied over a period of time as done in the study by Janson *et al.*<sup>[1]</sup>

#### Summary and Conclusion

Protocol 9 in Janson *et al.*<sup>[1]</sup> study broadly included all cases with previous dental absences. In this study, protocol 9 was subdivided into three types. All the protocols were in accordance with other studies except for Protocol 9 Type 3 which was found to be more compared to other studies. The percentage of the cases undergoing such irrational extraction instead of orthodontic treatment is still prevalent in dental practice. Awareness regarding correct orthodontic treatment in



**Figure 2:** Protocol 9 Type 3 patient: History of extracted right canine and premolar to relieve crowding in that segment



**Figure 3:** Protocol 9 Type 3 patient: History of extracted right lateral incisor to relieve crowding in that segment



**Figure 4:** Protocol 9 Type 3 patient: History of extraction of both the premolars from the upper left quadrant to relieve crowding in that segment

patients with orthodontic needs should be created. Complications associated with irrational extractions need to be explained.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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