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Original Article

Incidence of Risk and Complications Associated with Orthodontic Therapeutic Extraction

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Abstract

Background: Extraction in orthodontics are carried out in the cases where there is space deficiency to align the teeth.The elective extraction of first or second premolars has been discussed in the literature for more than 50 years. In the 1940s and 1950s Nance, Dewel and Carey reviewed this as a useful option, and in the 1970s Logan and other leading orthodontists favoured the extraction as choice. It is not always the elective extraction of premolar is a smooth drive for the surgeon as well as to patient. Sometimes the elective extraction of premolar result in complications , which might be due to both anatomical and surgical factors. **Methodology:** The study sample consisted of 100 patients referred for one or more orthodontic extractions to the department of oral and maxillofacial surgery were included in this retrospective study at the vivekanandha dental college for women tiruchengode between November 2014 and May 2016. All referrals were from the department of orthodontics. A survey was carried out to record the intraoperative risks and correlated with its morbidity as when occured.All intraoperative morbities were managed appropriately as required. **Result and Conclusion:** Between November 2014 and May 2016, 100 patients had one or more premolar teeth removed by the oral surgeons.The sample size was 100 patients who had a total of 334 premolars removed.The sample's mean age was 11.4+\- 8.4 years,and 57.0% were male.The average number of teeth extracted per patient was 2.34 +\- 1.46, and 73.8% had complete root development.More than 93.4% of subjects had normal root and bone morphology,whereas 35.65% had variations in root forms and bone texture.The intra-operative and post operative complication rates were 7.4% and 1.9%, respectively. Complications were generally minor (91.9%) and were managed nonoperatively on an outpatient basis.There were no case of oral antral communication.

Keywords: *Altered root morphology, maxillary sinus, therapeutic extraction*

Introduction

Pain less removal of teeth is performed in order to gain space or relieve the crowding and in order to align the teeth in orthodontics. Extractions in orthodontics remain a relatively controversial area.[1] The role of extraction in orthodontics was introduced by John Hunter in his natural history of the teeth. Spooner in 1839 advised extraction of four premolar or first molar when defective. Farrar in 1888 advised judicious extraction as an essential requisite for the prevention and correction of tooth jaw irregularities.

The elective extraction of premolars sometimes associated with complications due to its anatomical and surgical trails. Here, in our study, we have discussed the factors contributing to the complications and its incidence in the therapeutic extraction.

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Methodology

The study sample consisted of 100 patients referred for one or more orthodontic extractions to the Department of Oral and Maxillofacial Surgery were included in this retrospective study at the Vivekanandha Dental College for Women, Tiruchengode, between November 2014 and May 2016. All referrals were from the Department of Orthodontics.

Demographic variables

The demographic variables included are age and gender of the patients.

Anatomic variables

The anatomic variables include unfavorable premolar functional anatomy (i.e., malopposed, unopposed, or supraerupted teeth), root development, and proximity to the floor of the maxillary sinus, root forms, texture of tooth supporting structures, loss of cortical outline, and altered root morphology.

Study design

All patients were clinically and radiologically examined, consent for the extraction was taken either from patient or parent if patient is minor, and therapeutic extraction of premolars was carried out under local anesthesia by oral surgeons as per advised by the Department of Orthodontics. A survey was carried out to record the intraoperative risks and correlated with its morbidity as when occurred. All intraoperative morbidities were managed appropraitely as required.

Results

Between November 2014 and May 2016, 100 patients had one or more premolar teeth removed by the oral surgeons. The sample size was 100 patients who had a total of 334 premolars removed. The descriptive statistics and the bivariate relationships between the predictor variables and complications for the sample are summarized in Table 1.

The sample's mean age was 11.4 ± 8.4 years, and 57.0% were male.

The average number of teeth extracted per patient was 2.34 ± 1.46, and 73.8% had complete root development. More than 93.4% of subjects had normal root and bone morphology, whereas 35.65% had variations in root forms and bone texture. All extractions were performed under local anesthesia. The following variables were statistically associated with complications and number of tooth extracted ($P < 0.53$), with dental factors ($P < 0.47$), and with anatomical ($P < 0.51$).

Table 2 summarizes the types and frequencies of intra- and post-operative complications, grouped into intra- and post-operative complications. The overall complication rates for therapeutic extraction sites and subjects were 5.3% and 9.6%, respectively.

The intra- and post-operative complication rates were 7.4% and 1.9%, respectively. Complications were generally minor (91.9%) and were managed nonoperatively on an outpatient basis. There was no case of oral antral communication.

Table 1: Incidence of risk and complications associated with orthodontic therapeutic extraction

Variable	Complication present (%)	Complication absent (%)	*P*
Tooth extracted			
Maxillary first PM (R/L)	8/2	92.6	<0.53
Maxillary second PM (R/L)	3/5	97.2	
Mandibular first PM (R/L)	1/0	96	
Mandibular second PM (R/L)	2/0	95	
Total PMs removed/patient	2.34±1.46	93.9±96.3	
Dental development			
Single rooted (U/L)	-	97	<0.47
Multiple rooted (U/L)	5/3	92	
Root formation			
Before bifurcation	-	93.6	
After bifurcation	3	91.3	
Complete root	2	89.9	
Root forms			
Convergent roots	1	97.5	
Divergent roots	5	91.1	
Anatomical position			
Palatally/lingually placed	4	91.6	<0.51
Bucally overlapped	5	73.7	
rotated	3	89.4	

PM: Premolar, R/L: Right/Left

Table 2: Complications associated with orthodontic therapeutic extraction

Complication	Episode	Percentage by tooth (*n*=334)	Percentage by subjects (100)
Over all	13	5.3	9.6
Intraoperative	9	3.7	7.4
Crown fracture	2	0.59	0.97
Root fracture	5	1.4	1.9
Oral antral communication	-	-	-
Fracture of alveolar cortices	2	0.59	0.97
Postoperative	4	1.3	1.9
Bony spicule	1	0.37	0.74
Alveololitis	1	0.37	0.74
Delayed healing	2	0.63	1.2

Discussion

Orthodontic treatment is usually associated with dental extraction, and maxillary/mandibular first premolar teeth

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are most commonly extracted teeth for this purpose.[2-6] Maxillary first premolars are usually thought to have two roots. However, there are numerous racial differences on the root form, number of root, and root canal system.[7-10] Proffit in a 40-year review of extraction patterns showed that 30% of cases were treated with extractions in 1953, 76% in 1968, and 28% in 1993. He suggested the decline in extractions since 1968. Nowadays, orthodontic treatment swifted to the straight wire technique, which seems to require fewer extractions.[11] The extraction of teeth is a potentially traumatic experience. The decision to extract should be made with an awareness of the risks of treatment, including the psychological impact of the procedure.[1] Certain teeth are extracted preferentially for orthodontic reasons. A survey of extraction patterns in various studies indicates that first premolars were most commonly extracted (59%), followed by second premolars (13%). The choice between first or second premolar depends on a number of factors, for example, degree of crowding, anchorage requirements, and overjet and overbite.[12]

The specific aims of this investigation were to identify (1) the types and frequency of complications after therapeutic/elective orthodontic premolar extractions and (2) risk factors associated with intraoperative as well as postoperative complications. The overall complication rate was 5.3%. A majority of complications were intraoperative and root fractures being the most common. Risk factors associated with overall complications were age, root morphology, and resilence of bone.

The complication rates documented in this study were within the ranges reported in the referenced literature. The three most common intraoperative complications reported in the literature were crown fracture, root fracture, and fracture of alveolar cortices. The reported frequency of root fracture ranged from 5% to 7% for all extractions but was as high as 30% in cases of dilacerated and divergent roots of maxillary premolars. Consistent with previous studies, root fracture was the most common complication identified in this study. The rate of root fracture was 1.4% of all premolar extractions and accounted for 31.1% of all complications. This rate is slightly higher than the cited range and probably reflects the liberal definition used.

Most reports focus on frequently occurring or seriously morbid complications. As such, there are sparse data available on the other complications. The rates of the other less commonly cited complications in this study are consistent with those reported in Calhoun *et al.*[13] Both studies found the rate of oroantral communication and excessive bleeding to be <1%. We did not, however, encounter complications such as oral antral communication and damage to the adjacent tooth, which was reported in their study.

This study's second major goal was to identify risk factors associated with adverse outcomes. Frequently cited risk factors for complications arising from premolar extraction include age, gender, site of extraction, anesthesia, and surgeon experience.[14] Other factors that may be associated with increased complications were anatomic position, variation in root morphology, and bone texture. Although many of these variables are often cited as risk factors, the relevant data are equivocal.

Conclusion

Based on the findings of the study, we conclude that the maxillary first premolars have a tendency to encounter root fracture when the root is slender dilacerated, divergent separate rooted. In orthodontic practice, therapeutic extraction of these teeth should be performed cautiously. When there is fracture of roots, extreme precaution should be taken to preserve the buccal cortical plate. If prior information about the number and curvature of the root should be taken into consideration, then necessary precautions instilled while performing any clinical procedures.

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Conflicts of interest

There are no conflicts of interest.

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