

Impaction of the central maxillary incisor associated with supernumerary teeth: Initial position and spontaneous eruption timing

Dalia Smailiene, Antanas Sidlauskas, Jevgenija Bucinskiene

SUMMARY

The aim of the retrospective study was to evaluate the influence of the initial vertical position of the impacted maxillary incisor on spontaneous eruption frequency and timing after surgical removal of the supernumerary tooth. Records of 33 patients with unilateral impaction of upper central incisor caused by supernumerary teeth with the average age 9.58 ± 1.54 years were analyzed. Impacted teeth were distributed into 3 groups on the basis on their initial vertical position on the orthopantomograms. The results indicate that impacted maxillary central incisors spontaneously erupt in 63.6% of cases after removal of supernumerary teeth. The average time of the spontaneous eruption of impacted maxillary central incisors was 16.05 ± 9.3 months (from 3 to 30 months). Statistically significant differences in the spontaneous eruption time were found between the groups with different initial vertical position of the impacted central maxillary incisor. Maxillary central incisor impacted at the projection level of the apical third of the contralateral completely erupted central maxillary incisor should be treated by the surgical-orthodontic approach, because spontaneous eruption is unlikely to expect.

Key words: impacted maxillary incisors, supernumerary teeth, spontaneous eruption.

INTRODUCTION

Impaction of maxillary permanent incisors is not a frequent case in dental practice, but its treatment is challenging because of these teeth importance to facial esthetics. Supernumerary teeth are the main cause of the impaction of upper incisors (Figure 1). 56-60% of premaxillary supernumerary teeth cause impaction of permanent incisors [1,2] due to a direct obstruction for the eruption, tipping of the adjacent teeth towards the place of the impacted tooth, narrowing of the dental arch, displacement of the permanent teeth bud, or malformations of the unerupted tooth root [3,4,5,6,7].

Spontaneous eruption of impacted maxillary incisors occurs in 54-76% of cases when supernu-

merary tooth is removed and there is enough space in the dental arch [8,9,10,11]. However, research data indicate that the spontaneous eruption of impacted maxillary incisor may take up to 3 years and sometimes orthodontic treatment is necessary to achieve adequate alignment of the erupted tooth in the dental arch [10,11,12].

Nevertheless, in some instances, eliminating the cause of the maxillary incisor impaction by removing supernumerary tooth, would not lead to a spontaneous resolution of the problem. It is therefore necessary second surgical exposure of the unerupted tooth by removing any hard or soft tissue obstruction, placement of the attachment on the tooth crown and application of the directional traction by the orthodontic appliance [1,13,14]. But such extensive procedure on the soft tissue and underlying bone may have an impact on periodontal prognosis, poor gingival contour of the erupted teeth [10,14,15].

In clinical practice, the treatment of the impaction of permanent teeth caused by supernumerary teeth is frequently prolonged. This requires the setting of certain guidelines in the treatment of tooth

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Fig. 1. Impacted central maxillary incisor due to supernumerary tooth: A – orthopantomogram with impacted upper left central maxillary incisor; B – intraoral roentgenogram with clear view of supernumerary tooth; C – supernumerary tooth.

impaction caused by supernumerary teeth. Spontaneous eruption of the impacted maxillary incisors there are no doubt has an advantage over its surgical-orthodontic treatment approach. But is it possible to predict spontaneous eruption of impacted maxillary incisor and its timing after removal of the supernumerary tooth? There is no clear answer yet, because a lot of factors, such as initial location and axial inclination of impacted teeth, lack of space in the dental arch and many others can influence the process [10,11].

The aim of the study

The aim of present retrospective study was to evaluate the influence of the initial vertical position

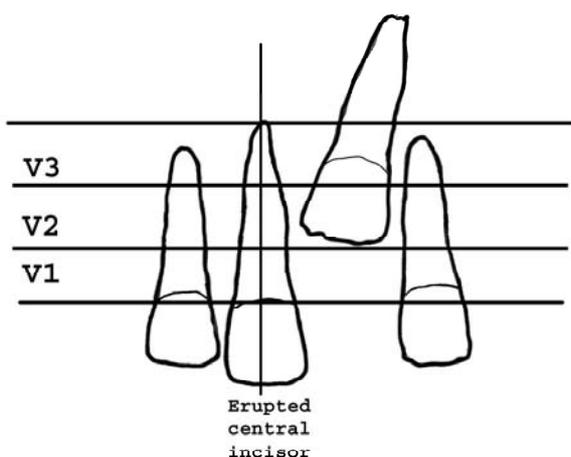


Fig. 2. Vertical positions of impacted central maxillary incisor in relation to the contralaterally erupted homonym tooth root length: V1 – sector at the level of gingival third of the root; V2 – sector at the level of middle third of the root; V3 – sector at the level of apical third of the root.

of impacted maxillary incisor on spontaneous eruption frequency and its timing after surgical removal of the supernumerary tooth.

MATERIAL AND METHODS

The study group consisted of 33 patients with unilaterally impacted maxillary permanent central incisor with an average age 9.58 ± 1.54 years. The distribution of the patients according to their gender was the following: 19 boys (57.6 %) and 14 girls (42.4 %).

The criteria for the case inclusion to the study:

- the unilateral impaction of permanent upper central incisor caused by supernumerary teeth;
- space available or created by fixed or removable appliance in the dental arch for the impacted central incisor at least 7 mm;
- favourable axial inclination of impacted maxillary central incisor for spontaneous eruption;
- incomplete root formation of impacted maxillary central incisor;
- good quality initial orthopantomograms and plaster casts available.

– the duration of waiting for the spontaneous eruption of impacted tooth was not less than 30 months after removal of supernumerary tooth;

The vertical position of impacted permanent central incisors was evaluated on the orthopantomograms in relation to the contralaterally erupted central incisor. To determine initial vertical position of impacted tooth, the thirds of the root length of the erupted contralateral central incisor were used. Three possible vertical positions of impacted incisor have been defined (Figure 2).

Table. Timing of the spontaneous eruption of impacted central incisors

Vertical position of the impacted tooth	n of cases	n of erupted teeth	Time of the spontaneous eruption (months)					Level of significance
			Mean	SD	Median	Max	Min	
V1	7	6	8.17	7.99	5.5	24	3	$p_{12}=0.05$
V2	19	13	17.77	7.54	19	30	6	$p_{13}=0.01$
V3	7	2	28.5	0.71	28.5	29	28	$p_{23}>0.05$

The space available or created for the impacted central incisor in the dental arch was measured on the study models.

The time (in months) of spontaneous eruption was registered as a time from surgical removal of the supernumerary tooth till visible emergence of impacted central incisor. The patients have been examined once per month over period of 30 months. After that period the impacted central incisors have been considered as spontaneously unerupted and treated by surgical re-opening and orthodontic traction.

The statistical analysis was performed using the Statistical Package for the Social Sciences for Windows (SPSS v. 13.0). For every variable the mean, standard deviation and minimum and maximum values were calculated. The tooth eruption time be-

tween groups was compared using the Student's t-test for paired variables. Logistic regression analysis was used to assess the probability of eruption.

RESULTS

The spontaneous eruption of impacted central incisors was registered in 21 (63.6%) of cases following removal of the supernumerary tooth and the expansion of the dental arch. On the average time of spontaneous eruption for the study group was 16.05 ± 9.3 months (from 3 to 30 months).

Spontaneous eruptions was recorded in 85.7% of cases than impacted incisors initially were located in the sector V1, 68.4% of cases than teeth were located in the sector V2 and only in 28.6% of cases than incisors were located in the sector V3. Differences in the spontaneous eruption time were found between the teeth groups with different initial vertical position (Table). Cox's regression analysis demonstrated that the probability of eruption of the impacted tooth situated in the more elevated vertical sector was by 0.45 times lesser than that of an impacted tooth that was situated lower. (95% CI: 0.229-0.902; regression coefficient $B = -0.79$, $p < 0.05$). The associations between the spontaneous eruption of an impacted tooth and its vertical position are presented in Figure 3 (the survival analysis function chart).

In general our study demonstrated that 25% of spontaneously erupted teeth erupt within 6,5 months, 50% – within 14 months, and 75% – within 25 months. Only two of seven central incisors impacted in the sector V3 erupted spontaneously and it took about 28 months. Meanwhile, teeth that were located in sector V1, started erupting already during the first six months from the beginning of the treatment.

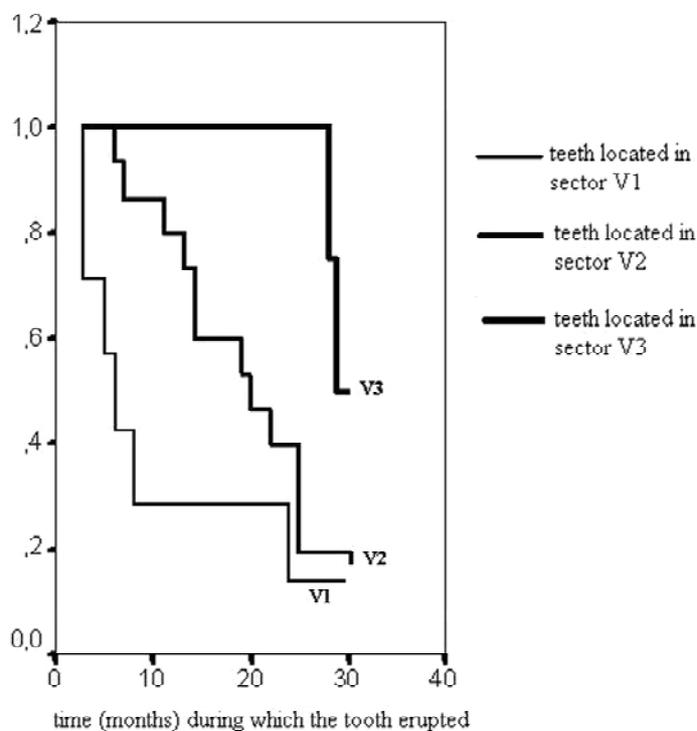


Fig. 3. The association between the initial vertical position of an impacted tooth and the probability of its spontaneous eruption

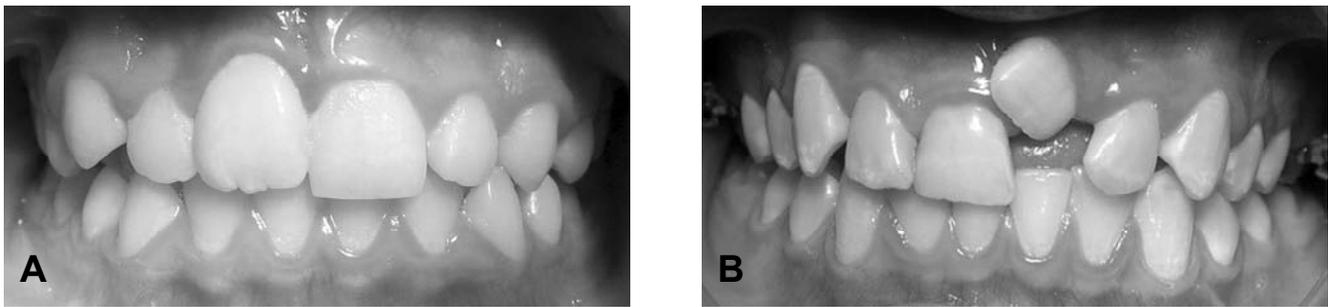


Fig. 4. Spontaneously erupted maxillary permanent central incisor. A – tooth erupted in the labial position. Gingival recession is observed; B – tooth erupts in the labial position.

DISCUSSION

In our study we found that 63.6% of impacted incisors erupted spontaneously after removal of the supernumerary teeth, when it was sufficient space in the dental arch for the impacted tooth. The similar frequency of spontaneous eruption of impacted maxillary central incisors, varying from 54% to 64%, has been reported by L. Mitchell [10] and B. Witsenburg [11]. Manson C. in his study found that even 72% of impacted teeth with incompletely formed roots erupted spontaneously [12]. Percentage of spontaneously erupted teeth could be even higher, if we have observation period unlimited in time. But we restricted it to 30 months because of the requests from patients and their parents to complete all orthodontic treatment in 2,5-3 years period.

The majority of impacted maxillary central incisor spontaneously erupts after removal of the supernumerary tooth but it takes significant period of time. The average spontaneous eruption time in our study was 16.05 ± 9.3 months. ~25% of the impacted central incisors spontaneously erupted during 1st year after removal of the supernumerary tooth. About 18% erupted during the second year of the observation. But even after 2,5 years of observation 36.4% of central incisors were still unerupted. Very similar results have been reported by L. Mitchell [10] and W. Houston [16].

A lot of factors can affect spontaneous eruption of impacted maxillary central incisors. Such factors as axial inclination of impacted teeth, lack of space in the dental arch, degree of root formation, relation to the adjacent teeth roots, initial vertical position of impaction affects process of spontaneous eruption [11,12,17]. To avoid the bias of these different factors on the spontaneous eruption we conducted retrospective study using the criteria for case selection allowing us exclude all other factors except the initial vertical position of impacted maxillary central incisor. The results of our study demonstrate that spon-

aneous eruption of impacted central incisor is closely associated with its initial vertical position. Statistically significant difference in the spontaneous eruption time was detected between V1-V2 and V1-V3 groups. The impacted teeth located closer to the alveolar ridge (sector V1) mostly erupted spontaneously over the period of six months. But the impacted teeth that at the beginning of treatment were situated higher than 2/3 of the adjacent central incisor root, spontaneously erupted only in two case (28.6%) and it took ~28 months (i.e. 2 years) after the initiation of treatment. Taking into consideration these findings and experience, that as much as 90% of such teeth erupt in a wrong position (Figure 4), thus necessitating further orthodontic treatment, we suppose that in case of a high initial vertical position of the impacted maxillary central incisor conservative treatment is inexpedient. In such cases already during the first surgical intervention an attachment element should be fixed on the impacted tooth. H. Ibricevic [18] also recommends the surgical-orthodontic treatment technique in cases when the impacted tooth is located in the middle part of the alveolus or higher.

Most tooth eruption anomalies may be avoided via timely diagnosis and application of treatment-preventive measures. It is reported [19] that only 54% of mesiodens cases are diagnosed at the aged of 5-9 years, i.e. at the time when the eruption of permanent incisors should start. So, early diagnostics of the maxillary central incisor impactions and surgical removal of supernumerary tooth as well as adequate space for it maintained in the dental arch may facilitate spontaneous eruption of the impacted maxillary central incisors.

CONCLUSIONS

1. The study found that impacted maxillary central incisors spontaneously erupt in 63.6% of cases after obstruction elimination by the removal of supernumerary teeth.

2. The average time of the spontaneous eruption of impacted maxillary central incisors after the supernumerary teeth removal was 16.05 ± 9.3 months.

3. Statistically significant differences in the spontaneous eruption time were found between the groups with different initial vertical position of the

impacted central maxillary incisor.

4. Maxillary central incisor impacted at the projection level of the apical third of the contralateral completely erupted central maxillary incisor root, should be treated by the surgical-orthodontic approach, because spontaneous eruption is unlikely to expect.

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