

# Ectopic eruption of the permanent maxillary first molar: Study in a population of 505 South European children

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## ABSTRACT

**Aims:** Ectopic eruption is a change in the normal path of eruption of a tooth. The aim of this study is to determine the prevalence of ectopic eruption of the permanent maxillary first molars in a Spanish subpopulation of 505 children, its distribution as regards age and gender, unilateral and bilateral occurrence and loss of space. **Methods:** Periapical and panoramic X-rays were taken of the patients, with six-monthly check-ups to evaluate development. A statistical analysis of the data was performed using the chi-square test ( $p < 0.05$ , 95% C.I). **Results:** A prevalence of 6.7% was obtained being the most common age of presentation was seven years and bilateral occurrence (67.6% of cases) with no statistically significant differences as regards to the gender. Only 14 of the 505 explored patients required treatment for ectopic eruption. **Conclusion:** This study provides information regarding treatment needs and prevalence regarding molar

ectopic eruption in a Spanish population. It is essential for professionals to be familiar with the diagnostic factors, clinical consequences and therapeutic options for ectopic eruption of permanent molars.

**Keywords:** Ectopic eruption, Molar, Children

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## INTRODUCTION

Ectopic eruption of the permanent maxillary first molars is defined as a disturbance in the eruptive path of the tooth in an abnormal position or orientation, so that it erupts towards the distal aspect of the crown of the primary maxillary second molar. It results in premature, atypical resorption of the distal root of the primary maxillary second molars and its complications are possible locking and, consequently, delayed eruption of the permanent molar, premature loss of the primary second molar and loss of space in the dental arch [1, 2].

Dental eruption is a complex process involving many factors from the intrasosseous development of the tooth to its appearance in the mouth, so that eruption can be

affected in various ways, as in the case of ectopic teeth [2].

Young described two types of ectopic eruption in 1957 [3],

(1) Reversible ectopic eruption (or “jump”): the permanent molar recovers its eruptive path spontaneously and erupts in the normal position in the dental arch, but with a more or less pronounced atypical resorption of the distal root of the primary second molar.

(2) Irreversible ectopic eruption (or “hold”): the permanent maxillary first molar remains in contact with the distal part of the primary second molar in the cervical area, preventing eruption in its normal position.

When ectopic eruption is diagnosed, a period of observation of 3–6 months is recommended to determine whether the ectopic eruption is reversible or irreversible [4].

The causes of ectopic eruption of the permanent first molars are unknown, but its aetiology is thought to be multifactorial [5]. Various hypotheses on the aetiology of ectopic eruption have been put forward in literature since 1923, and in most cases it is attributed to small maxillary size with large primary and permanent molars and with a more pronounced mesial angle of eruption of the permanent first molar [6], combined with too small a dental arch [4]. Other factors may be the hereditary component of ectopic eruption or iatrogenic causes, from incorrect restoration of the primary second molar [7, 8]. Mooney et al. and Baccetti associate the ectopic eruption of the permanent first molars with other anomalies, such as infraocclusion of primary molars and cleft palate and Becktor et al. state that patients with ectopic eruption of the permanent maxillary first molar have a higher risk of ectopic eruption of the permanent maxillary canine with root resorption of the permanent maxillary incisors [9–11].

In ectopic eruption, the tooth most commonly affected is the permanent maxillary first molar, with a prevalence of 2–6% depending on the population studied [12].

Various clinical signs, such as delayed eruption of one or both permanent maxillary first molars of the same arch or the appearance of the distal cusps without the mesial cusps of the same permanent molar, suggest ectopic eruption, with radiography providing a definitive diagnosis [1, 3].

When an impacted first permanent molar has not erupted through the alveolar bone, it should be watched carefully. Although most ectopic teeth will eventually erupt into normal position, intervention is advisable immediately after the tooth penetrates the alveolar crest. It has also been shown that at age seven most children’s permanent molars with reversible ectopic eruption laid freed themselves. Therefore, postponing treatment to a later age is not recommended. Sim stated that early treatment may prevent a space loss of 6–8 mm [13]. Several methods of treating ectopically erupting maxillary permanent first molars have been suggested,

(1) Interproximal wedging: after the occlusal surface of the first permanent molar becomes exposed in the oral

cavity, the eruption path of the impacted tooth can often be favorably influenced by inserting a brass ligature wire gingival to the contact of the permanent and primary molars [13, 14].

(2) Distal tipping: there are different appliances for disimpaction.

The objectives of this study is to determine the prevalence of reversible and irreversible ectopic eruption of the permanent maxillary first molars, and their distribution in terms of age, gender as well as their unilateral or bilateral occurrence in a Spanish children subpopulation.

## MATERIALS AND METHODS

### Subjects

This prospective study was performed in a subpopulation of Spanish children at a private pediatric dentistry office in Seville, Spain.

Inclusion criteria for this study were children between five and eight years old, and it was determined by a longitudinal study by Ekstrand et al. [15], which concluded that the eruption of the permanent maxillary first molars occurs between those ages for both sexes. Patients without primary second molars and those who had any genetic syndrome or systemic disease affecting the mouth were excluded from the study.

The sample size was 505 patients of whom 261 were male and 244 female.

### Clinical and radiographical monitorization

For the purposes of patient selection, clinical and radiographical examinations were performed by periodic appointments every six months over a period of two years by one operator. The clinical examination consisted of inspection and palpation. The radiographic examination included six intraoral periapical X-ray films and one panoramic X-ray. Periapical radiographs were taken in the anterior and lateral sectors by the paralleling technique to evaluate with more precision the tooth eruption and the direction by the operator. With the examinations, the same operator diagnosed the ectopic eruption of the permanent maxillary first molar.

### Statistics

We performed a descriptive analysis of quantitative variables to assess differences between groups using the chi-square test to compare frequencies of each variable studied and defining a significance value of  $p < 0.05$  with a 95% confidence interval. The data was obtained using the statistical software SPSS 17.0 for Windows (LEAD Technologies, Chicago, Illinois, USA).

## RESULTS

The prevalence of ectopic eruption in the population of the present study, was of 6.7% (34 patients of the 505 studied). As regards to the gender, very similar distribution was observed for males and females: 52.9% versus 47.1%, respectively. This small difference was not statistically significant ( $p > 0.05$ ), especially bearing in mind that the study included slightly more male patients. Regarding the age of diagnosis from the established inclusion criteria, the most common age of presentation of ectopic eruption was eight years of age, (41.2%), followed by seven years of age (32.4% of cases) (Table 1).

In 67.6% of cases, the ectopic eruption occurred bilaterally in both permanent molars simultaneously. None of the patients diagnosed with this pathology had symptoms either at diagnosis or at subsequent check-ups (Table 1).

After clinical and radiographical monitoring the progression of the cases, it was found that 58.8% of cases did not require treatment (reversible ectopic eruption)-a total of 20 patients (Table 2). The remaining 41.2% required different treatments: 6 out of 12 treated patients required the use of brass ligatures for up righting of the impacted permanent molars; five patients underwent hemisection of the primary second molar and subsequently started orthodontic treatment; two patients were fitted with a Hexahelix distalizing appliance, after extraction of the primary second molars; one patient required extraction of the primary second molar owing to severe root resorption and the fitting of a space maintainer (Table 2).

The largest space lost for the sample was of 4 mm in the whole of the upper arch. In cases where space was recovered, no relapse was found in any of the patients (Table 2).

## DISCUSSION

The frequency of ectopic eruption of the permanent maxillary first molar observed in this study was 6.7% (Table 1). Other studies show a lower prevalence, as Kuroi and Bjerklin [3] and Barbería et al. [5] obtained a similar frequency in their studies (4.3%), nevertheless other authors have found a prevalence of as low as 0.75% as that conducted by Chintakanon and Boonpinon [2] in 1998 in an Australian population. The frequency in our study may be higher due to the age range used, between five and eight years of age, which is wider than established by other authors [15].

Some studies have found an association between ectopic eruption of the permanent first molars and the presence of other dental abnormalities [9, 10]. However, we did not take this variable into account in our study, since the presence of any abnormality was an exclusion criterion. From the included range, the most frequent age for diagnosis was seven years, followed by eight years of

Table 1: Clinical characteristics of the sample

Variable	Subjects (n=505)	Proportion
Ectopic eruption	34	6.7%
–Unilateral	23	67.6%
–Bilateral	11	32.4%
Non-ectopic molar eruption	471	
D Age (5 y /6 y / 7y / 8y)	2 / 7 / 11 / 14	5.9% / 20.6% / 32.4% / 41.2%
Gender		
–Female	16	47.1%
–Male	18	52.9%

D Age: distribution of ectopic eruption by age, y: years

Table 2: Treatment needs of the included children sample

Type of treatment	Subjects (n=505)	Proportion	Space lost (mm)
No treatment required	491	58.8%	0
Brass ligature	6	17.7%	0
Distal slicing of 2TM	5	14.8%	0
Extraction of 2TM + distalization	2	5.8%	0
Extraction of 2TM + SM	1	2.9%	4

TM: Temporal molars, SM: space mantainer

age. This finding is similar to that found in the study by Barbería et al. in 2004, where the age was seven years and six months [5].

As regards frequency according to gender, the male and female ratio was 52.9% versus 47.1%. These differences are not statistically significant, indicating that ectopic eruption of the permanent maxillary first molar affects males and females equally, and our data are similar to other studies [5, 12].

Bilateral occurrence (67.6%) was more common than unilateral occurrence (32.4%). These data are very similar to those found by Barbería et al., where bilateral ectopic eruption occurred in 63.6% of cases compared with unilateral ectopic eruption in 36.4% [5], confirming that ectopic eruption is generally bilateral, although this difference is not statistically significant.

The diagnosis of ectopic eruption was, in most cases, made by radiography, with the exception of some patients in whom asymmetrical molar eruption could be observed visually and was then diagnosed radiographically. This confirms the belief that clinical examination is

fundamental, but that the definitive diagnostic tool is radiology [1].

Once the pathology is diagnosed as irreversible ectopic eruption, a treatment can be chosen. As we have seen from literature, there are different therapeutic options: interproximal wedging and distal tipping [16]. In our study, a high percentage of patients with ectopic eruption (58.8%) did not require treatment. Of the other 41.2% of patients, the main treatment was the fitting of brass ligatures to upright the permanent first molar. Nevertheless other options have been described [17].

We did not find any case with symptoms among the 34 patients with ectopic eruption in our study. We can conclude, therefore, that the primary maxillary second molar can be used as a space maintainer, even in cases with a high degree of both root and crown destruction, since these primary molars will show pulp or periapical problems in a very low percentage of cases [18].

## CONCLUSION

The prevalence of ectopic molar eruption was of 6.7% in a Spanish subpopulation of 505 children from 5–8 years old, being bilateral ectopic eruption in a 67.6% of the cases. It is essential for professionals to be familiar with the diagnostic factors, clinical consequences and therapeutic options for ectopic eruption of permanent molars. Periapical X-rays as a routine diagnostic tool is crucial in the early diagnosis of this eruptive disorder.

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## Author Contributions

Asunción Mendoza-Mendoza – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Guadalupe Villalon-Rivero – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Ernesto González-Mallea – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Carolina Caleza-Jiménez – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Beatriz Solano-Mendoza – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Rosa Yañez-Vico – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Alejandro Iglesias-Linares – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

## Guarantor

The corresponding author is the guarantor of submission.

## Conflict of Interest

Authors declare no conflict of interest.

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