

# Ectopic eruption of maxillary first permanent molars in children with cleft lip

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**E**ctopic eruption of the maxillary first permanent molar represents an alteration of that tooth's eruption pathway and causes premature resorption on the distal surface of the primary second molar. If the ectopic molar frees itself from the resorption cavity and spontaneously erupts, it is considered reversible. However, if it becomes impacted on the distal surface of the primary second molar root, it is an irreversible case.<sup>1,2</sup> The problem occurs in the very beginning of the mixed dentition stage of dental development, around the age of 6 years.<sup>3</sup> By 7 years, most of the reversible ectopically erupting molars have freed themselves. Only a few of the molars that are still impacted at 7 years erupt spontaneously later.

Studies of the prevalence of ectopic eruption of the maxillary first permanent molars indicate a prevalence of between 2% and 6% (Table 1).<sup>4-11</sup> Kurol and Bjerklin<sup>12</sup> reported that 19.8% of the siblings of affected children also had ectopic

eruptions, confirming the hypothesis that ectopic eruption shows a familial tendency.

Epidemiological studies also reveal that the ectopic eruption of maxillary first permanent molars is more frequent among cleft lip and palate children than among noncleft children, with rates from 19.6% to 26.3%, as shown in Table 2.<sup>13-17</sup>

The irreversible type of such alteration in the eruptive pattern, if not treated, may lead to a decrease in arch perimeter and subsequent crowding or impaction of the adjacent premolar. Therefore, special attention should be paid during eruption of the maxillary first permanent molars, especially in cleft lip and/or palate patients. The purpose of this study was to evaluate the incidence of ectopic eruption of the maxillary first permanent molars in patients with cleft lip only (primary palate).

Carr and Mink<sup>14</sup> studied 72 cleft lip and/or palate patients (48 boys, 24 girls; ages 4 to 10 years).

## Abstract

The purpose of this study was to determine the incidence of ectopic eruption of the maxillary first permanent molars in cleft patients. Panoramic radiographs of 70 Brazilian Caucasian children, 6 to 8 years old and with complete unilateral cleft lip and alveolus, were assessed. Fourteen of 70 patients (20%) presented with ectopic eruption of one or both maxillary first permanent molars. Sixteen of 19 ectopically erupted molars (85%) were of a reversible type of ectopic eruption and 3 (15%) were irreversible. No significant differences were found between sexes or between cleft sides.

## Key Words

Cleft lip • Molar • Tooth eruption • Ectopic

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**Table 1**  
**Prevalence of ectopic eruption of maxillary first permanent molars in noncleft patients.**

Authors	Year of study	Country	Total number	Age range	Children with ectopic eruption	
					N	%
Cheyne, Wessels <sup>5</sup>	1947	USA	500	4 y 8 m to 9 y 10 m	9	2.0
Young <sup>11</sup>	1957	USA	1619	-	52	3.1
O'Meara <sup>7</sup>	1962	USA	315	4 y 3 m to 11 y 7 m	6	2.0
Pulver <sup>8</sup>	1968	USA	831	-	26	3.1
Bjerklin, Kurol <sup>4</sup>	1981	Sweden	2903	7 y	126	4.3
Wackerle-Heporauta <sup>10</sup>	1981	Switzerland	543	-	32	5.9
Kurol, Bjerklin <sup>12</sup>	1982	Sweden	81*	7 y	16	19.8
Kimmel et al. <sup>6</sup>	1982	USA	5277	5 y to 11 y	200	3.8
Rinderer <sup>9</sup>	1984	Switzerland	3515	-	200	3.8

\*Sibs to patients with ectopic eruption of the maxillary first permanent molars

**Table 2**  
**Reported prevalence of ectopic eruption of the maxillary first permanent molars among children with cleft lip and palate.**

Authors	Year of study	Country	Cleft type	Sample		Patients with ectopic eruption	
				Number	Age range	N	%
Carr, Mink <sup>14</sup>	1965	USA	Lip and/or palate	72	4 y to 10 y	18	25.0
Ranalli et al. <sup>15</sup>	1986	USA	Lip and/or palate	118	mean 9.3 y	31	26.3
Silva Filho et al. <sup>16</sup>	1990	Brazil	Complete unilateral lip and palate	184	6 y to 8 y	36	19.6
Silva Filho et al. <sup>17</sup>	1993	Brazil	Isolated cleft palate	107	6 y to 8 y	22	20.6
Bjerklin, Kurol <sup>13</sup>	1993	Sweden	Lip and/or palate	225	7 y	49	21.8

**Table 3**  
**Distribution of patients with isolated cleft lip (primary palate) according to sex and cleft side.**

Sex	Left side	Right side	Total
Male	21	11	32 (45.7%)
Female	23	15	38 (54.3%)
Total	44 (62.8%)	26 (37.2%)	70

The diagnosis of ectopic eruption was aided by interproximal radiographs and, in some cases, lateral radiographs. These authors found that 18 of the 72 patients (25%) presented ectopic eruption of the maxillary first permanent molar (11 boys, 22.9%; 7 girls, 29.1%). Tendencies for bilateral ectopic eruption in boys and unilateral ectopic eruption in girls were verified, along with the higher prevalence of irreversible ectopic eruption (77.8%) compared with the reversible form (22.2%).



Figure 1A

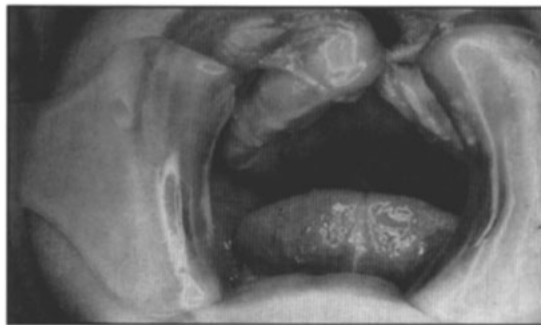


Figure 1B



Figure 1C



Figure 1D



Figure 1E

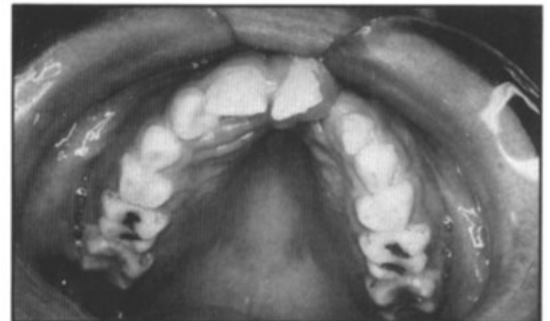


Figure 1F

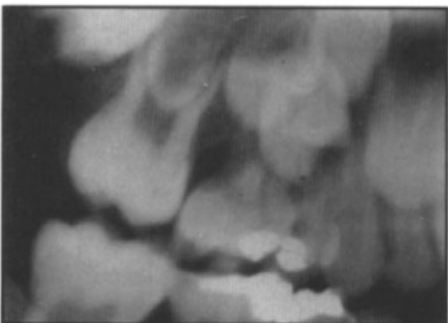


Figure 2A

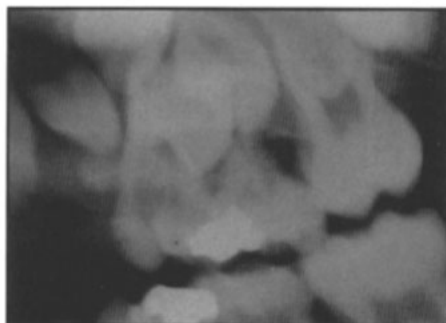


Figure 2B

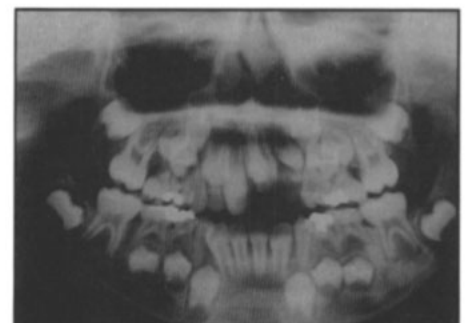


Figure 2C

Ranalli et al.<sup>15</sup> diagnosed ectopic eruption with the help of interproximal and orthopantomographic radiographs in a group of 118 cleft lip and/or palate patients (71 boys and 47 girls, mean ages 9 years 3 months) and found a prevalence of 26.3% (31 of 118). No statistically significant difference in specific prevalence was found among the different cleft types. Among the 49 ectopically erupted first molars, 77.6% were reversible and 22.4% were irreversible.

Silva Filho et al.<sup>16</sup> selected 184 patients (79 girls and 105 boys) with exclusively complete unilateral cleft lip and palate, comprised of 111 left-sided clefts and 73 right-sided clefts. These patients were 6 to 8 years old and their lips and palates had been operated on during childhood. Panoramic radiographs were used to diagnose ectopic eruption. The prevalence of maxillary first molar ectopy was 19.6% (36 of 184 patients.) No statistically significant sex dimorphism was found (18 females, 22.8%, and 18 males, 17.1%).

Most of the ectopic molars were reversible (72.2%). Moreover, the authors concluded that no direct relationship existed between the side of the ectopically erupted molar and the side of the cleft.

Silva Filho et al.<sup>17</sup> grouped 107 children with isolated cleft palate, aged 6 to 8 years, and found 22 children with ectopic eruption of the maxillary permanent first molars, corresponding to 20.6% of the studied subjects. Twelve children showed bilateral ectopic eruption and 10 showed unilateral ectopic eruption (six right-sided and four left-sided). No statistically significant sex dimorphism was found, and reversible ectopic eruption was more frequent (64.7%) than irreversible (35.3%).

Bjerklin et al.<sup>13</sup> studied the frequency of ectopic eruption in 225 Swedish cleft lip and/or palate children. They found a prevalence of ectopic eruption of 21.8%, compatible with the literature. The prevalence of this problem among children

**Figure 1A-F**  
This cleft lip and alveolar ridge patient underwent cheiloplasty during childhood. He shows an irreversible ectopic eruption of the maxillary right first permanent molar. A-C, 6 months; D-E, 7 years; F, 8 years 6 months.

**Figure 2A-C**  
Panoramic radiograph of a 7-year-old patient with cleft lip and alveolus on the left side. Atypical resorption of the maxillary second primary molar distal root indicates an earlier reversible ectopic eruption of permanent molars.

**Table 4**  
Distribution of ectopic eruption of maxillary first permanent molars among 70 children with complete unilateral cleft lip (primary palate) according to sex.

Sex	Number	Patients with ectopic eruption		Test	Ectopically erupted teeth		Test
		N	%		N	%	
Male	32	5	15.6	n.s.	7	11.0	n.s.
Female	38	9	23.7	n.s.	12	15.8	n.s.
Total	70	14	20.0		19	13.6	

 $\chi^2=0.29$  $\chi^2=0.35$ 

**Table 5**  
Prevalence of ectopic eruption of maxillary first permanent molars among 70 children with complete unilateral cleft lip (primary palate) according to side.

Cleft side	Number	Patients with ectopic eruption		Test	Ectopically erupted teeth		Test
		N	%		N	%	
Left side	44	10	22.7	n.s.	15	17.0	n.s.
Right side	26	4	15.4	n.s.	4	7.7	n.s.
Total	70	14	20.0		19	13.6	

 $\chi^2=0.19$  $\chi^2=1.71$ 

with isolated cleft lip was 15.4% for the 65 patients studied. For the 94 cleft lip and palate patients, the prevalence was 21.3%. For the 66 isolated cleft palate subjects, a higher prevalence was found, 28.8%. The authors considered genetic influence to be the main etiology.

#### Materials and methods

The sample comprised 70 Caucasian patients. The selection was based on the following criteria:

1. All subjects were enrolled at the Hospital de Pesquisa e Reabilitacao de Lesoes Labio-Palatais (Hospital for Research and Rehabilitation of Cleft Lip and Palate), University of Sao Paulo, in the city of Bauru, state of Sao Paulo, Brazil (Table 3).

2. All patients had unilateral cleft lip and alveolar process only (Figure 1); left-sided clefts were found in 44 patients (63%) and right-sided clefts in 26 (37%).

3. All patients had been operated on before the

age of 3 years.

4. All patients were between the initial and intermediate mixed dentition stages (the latter showing the first permanent molars and the permanent incisors fully erupted);

5. All patients had orthopantomograms available at the chronological and dental ages studied (Figure 2).

The diagnosis of ectopic eruption of the maxillary first permanent molars was made on orthopantomograms. The radiographs were taken when the patients were 6 to 8 years old. (A diagnosis of ectopic eruption based on observed teeth is possible in this age range.) All molars impacted until the intermediate mixed dentition stage were considered as irreversible ectopic eruption.

All radiographs were analyzed by two professionals. The maxillary first permanent molars, when impacted on the distal surface of the primary second molars at the moment of examination, were considered to be ectopically erupted, along with nonimpacted teeth whose neighboring primary molars showed radiographic evidence of ectopic resorption at the distal root, indicating that the permanent molar had presented a reversible ectopic eruption (Figure 2). No premature loss of deciduous teeth existed. When either or both of the maxillary first permanent molars were considered to be ectopic, a special form was completed and the data entered on a computer.

#### Results

The prevalence and distribution of ectopic eruption of the maxillary first permanent molars in patients with complete unilateral cleft lip and alveolar process (Figure 1) were analyzed. In the 70 children, 6 to 8 years old and operated on before the age of 3, 14 (20%) showed ectopic eruption (Tables 4 and 5). Five children showed bilateral ectopic eruption and nine showed unilateral ectopic eruption, for a total of 19 ectopically erupting teeth. The prevalence found in this study comes close to that found in Brazilian patients with complete unilateral cleft lip and palate (19.6%)<sup>16</sup> and isolated cleft palate (20.6%)<sup>17</sup> and Swedish patients with mixed cleft lip and/or palate (21.8%).<sup>13</sup> However, the prevalence is lower than that found in the U.S. literature for clefts in general (25% and 26.3%).<sup>14,15</sup>

The prevalence of ectopic eruption of the maxillary first permanent molars in this sample of Brazilian children with cleft lip and alveolar process only was higher than that found for Swedish children with cleft lip<sup>13</sup> (Table 6), although

the methodologies were similar, with the diagnosis made from orthopantomograms. Although sample sizes were similar, sample specifications differed. In this study, all 70 children with cleft lip had unilateral and complete clefts, i.e., a completely open lip and alveolar ridge (complete unilateral cleft of the primary palate) as shown in Figure 1, while in the Swedish group of 65 children, 31 had isolated cleft lip, 3 had total cleft lip, and 31 had a cleft in the alveolar ridge.

### Discussion

The high prevalence of ectopic eruption of maxillary first permanent molars in the cleft population has not yet been completely explained. Several etiological factors have been mentioned in the literature. One is the negative influence of reparative surgery affecting maxillofacial growth. In fact, the great negative influence of surgery is related only to complete clefts of the lip and palate.<sup>18,19</sup> Surgery does not influence spatial arrangement and maxillary extent in isolated clefts of the palate.<sup>17,19,20</sup> For the isolated cleft lip, the influence of cheiloplasty is limited to the alveolus.<sup>19,22</sup> Thus, reparative surgery would have more influence on ectopic eruption of the first permanent molars in patients with complete cleft lip and palate. However, similar higher prevalences of ectopic eruption have been found in patients with different types of clefts compared with noncleft patients. Therefore, reparative surgery may not be the main etiological factor in the ectopic eruption of the first permanent molars in cleft patients.

Another suggested hypothesis is the smaller maxillary length in cleft patients. The maxilla in cleft lip and palate patients is repositioned in relation to the cranial base and sagittal length is reduced.<sup>19,20</sup> Patients with isolated cleft palate show maxillary length reduction with repositioning related to the cranial base.<sup>19,20,23</sup> Although the cleft maxilla is shorter than the noncleft maxilla in cleft lip patients, there is no repositioning related to the cranial base. Anteroposterior maxillary involvement in isolated cleft lip and alveolus patients is proportionally smaller than in isolated cleft palate patients, the maxillae in the latter being shorter. Consequently, if the smaller maxillary length were the only or the main factor, the prevalence of ectopic eruption in isolated cleft lip and alveolus patients would be lower, but this is not the case.

In addition to discussing anatomical and surgical aspects of the maxilla, Bjerklin et al.<sup>13</sup> noted that genetic factors play an important role in the etiology of this condition.

**Table 6**  
Distribution of ectopic eruption of maxillary permanent first molars among children with complete unilateral cleft lip (primary palate).

Sex	This study Brazilian children			Bjerklin et al. <sup>13</sup> Swedish children		
	Total	Ectopic eruption	%	Total	Ectopic eruption	%
Male	32	5	15.6%	32	4	12.5%
Female	38	9	23.7%	33	6	18.2%
Total	70	14	20.0%	65	10	15.4%

**Table 7**  
Sample distribution test used to check tendency of ectopic eruption according to cleft side.

Cleft side	Number	Ectopically erupted teeth				Test
		Left side		Right side		
		N	%	N	%	
Left side cleft	15	6	40.0%	9	60.0%	n.s.
Right side cleft	4	2	50.0%	2	50.0%	n.s.
						$\chi^2=0.04\%$

$\chi^2=0.04\%$

Tables 5 and 7 show that the side of the cleft does not influence the statistical data. Table 5 shows that the side of the cleft does not influence either the prevalence of ectopic eruption or the number of ectopically erupted teeth. Table 7 shows no correlation between the side of the ectopic eruption and the side of the cleft.

Regarding the kind of impaction in our sample, a clear tendency for reversible impaction (85%) existed (Table 8). From a clinical point of view, the high incidence of ectopic eruption should not be considered excessive because most of it is reversible, with no need for mechanotherapy. This tendency was also observed in a previous study of Brazilian patients with complete cleft lip and palate<sup>16</sup> and isolated cleft palate.<sup>17</sup> Only Carr and Mink's<sup>14</sup> work disagrees with this tendency (Table 8). In studies comprising noncleft samples, reversible ectopic eruption shows a unanimous supremacy over the irreversible form.

<b>Table 8</b> <b>Distribution of ectopic eruption type among impacted teeth in individuals with clefts.</b>						
Authors	Cleft type	Ectopic eruption				Total
		Reversible N	%	Irreversible N	%	
Carr, Mink <sup>14</sup>	Lip and/or palate	4	22.2	14	77.8	18*
Ranalli <sup>15</sup>	Lip and/or palate	38	77.5	11	22.4	49**
Silva Filho et al. <sup>16</sup>	Complete unilateral lip and palate	39	72.2	15	27.8	54**
Silva Filho et al. <sup>17</sup>	Isolated palate	22	64.7	12	35.3	34**
Bjerklin, Kurol <sup>13</sup>	Lip and/or palate	44	62.9	26	37.1	70*
Present study	Isolated lip	16	85	3	15.0	19**
*N=number of patients with ectopic eruption						
** N=number of teeth with ectopic eruption						

Table 9 shows that in patients with cleft lip and alveolus, a tendency for a higher incidence of molar impaction occurs in females than in males (23.7% versus 15.6%), although the difference was not statistically significant. This same tendency was also observed in cleft lip and palate patients (22.8% versus 17.1%,<sup>16</sup> 24.5% versus 18%,<sup>13</sup> and 29.1% versus 22.9%<sup>14</sup>) and in isolated cleft palate patients (24.6% versus 14.3%).<sup>17</sup>

These data for the cleft population seem conflicting in light of the fact that impactions in noncleft individuals occur more frequently in males than in females.

### Conclusions

1. Ectopic eruption of the maxillary first permanent molars occurs in a high frequency in patients with complete unilateral cleft lip and

alveolus. This is an important alert for the general practitioner and the pedodontist who see these patients.

2. The prevalence of ectopic eruption was 20.0%, with no difference between the sexes; ectopic eruption was found more often on the left side, but again, with no statistically significant difference. No correlation was found between the unilateral cleft side and side of ectopic eruption.

3. Most of the ectopic eruption cases were reversible (85.0%) with no need to perform any therapeutic procedures in order to correct the pathway of the permanent molar eruption.

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**Table 9**  
**Distribution of ectopic eruption among cleft population according to sex**

Sex	Sample	Ectopically erupted teeth	
		N	%
This study - Cleft lip			
M	32	5	15.6
F	38	9	23.7
Total	70	14	20.0
Silva Filho et al. <sup>17</sup> Cleft palate			
M	42	6	14.3
F	65	16	24.6
Total	107	22	20.6
Silva Filho et al. <sup>16</sup> - Complete cleft lip and palate			
M	105	18	17.1
F	79	18	22.8
Total	184	36	19.6
Carr, Mink <sup>14</sup> - Cleft lip and/or palate			
M	48	11	22.9
F	24	7	29.1
Total	72	18	25.0
Ranalli <sup>15</sup> - Cleft lip and/or palate			
M	71	20	28.2
F	47	11	23.4
Total	118	31	26.3
Bjerklin, Kurol <sup>13</sup> - Cleft lip and/or palate			
M	100	18	18.0
F	125	31	24.5
Total	225	49	21.8

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