

Eruption disturbances in Japanese children and adolescents

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Abstract The aims of this report were to determine the nature of eruption disturbances and to establish the pattern of management for these teeth in a group of Japanese children and adolescents. Data were collected from the clinical records of patients in the Pediatric Dental Clinic of Niigata University Medical and Dental Hospital. There were 700 patients (364 males and 336 females) and 748 teeth (26 primary teeth and 722 permanent teeth) who were treated for eruption disturbances between 1979 and 2002. During this period, 17,365 new patients visited the clinic, of whom approximately 4% had eruption disturbances. The most frequently affected permanent teeth were the maxillary central incisors (38.6%), followed by the maxillary canines (15.4%). Of the permanent teeth, 52.5% were in males and 47.5% in females. Although there were more cases of maxillary central incisors in males than in females, the number of cases involving maxillary canines was higher in females. Whereas delayed eruption was noted in 76.7% of maxillary central incisors, 18.6% were impacted and 4.7% demonstrated abnormal direction/position which required treatment. In contrast, a higher percentage (64.8%) of maxillary canines that showed abnormal direction/position was treated. Eruption disturbances were found in 40% of the patients during routine examinations. This suggests that regular routine examinations are important for pediatric dentists to detect and treat eruption disturbances early.

Key words

Ectopic eruption,
Eruption disturbance,
Impaction,
Odontoma,
Supernumerary tooth

Introduction

It is extremely important to diagnose and manage any eruption disturbances that may occur during the transition from the primary to the permanent dentition. Consequently, 12 papers about eruption disturbances appeared in only the Pediatric Dental Journal between 1992 and 2005^{1–12)} and 73 in the Japanese Journal of Pediatric Dentistry. The eruption disturbances which were described were of various types and affected different teeth. Most of those papers were case reports; however a few of the articles presented the analysis of a large numbers of cases^{1,2,7,8,12–26)}. There were also a few articles on the frequency of the eruption disturbance^{23,24,26)}.

The aim of this report is to determine the incidences and types of eruption disturbances in the primary and permanent dentitions and to establish a course of management for these teeth in Japanese children and adolescents. This report describes the eruption disturbances treated in the Pediatric Dental Clinic of Niigata University Medical and Dental Hospital. The treatment procedures were commenced between 1979 and 2002. In addition, the frequency, condition, and treatment of the cases are described.

Materials and Methods

In the Pediatric Dental Clinic of Niigata University Medical and Dental Hospital, 700 patients (364 males and 336 females) and 748 teeth (26 primary teeth and 722 permanent teeth) were treated for

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Table 1 The types of primary teeth treated for eruption disturbances

	Incisor				Canine		Molar				Total	
	Central		Lateral		n	%	First		Second		n	%
	n	%	n	%	n	%	n	%	n	%	n	%
Maxilla	3	11.5	1	3.8	2	7.7			7	26.9	13	50.0
Mandible	4	15.4					1	3.8	8	30.8	13	50.0

(teeth)

Table 2 The types of permanent teeth treated for eruption disturbances

	Incisor				Canine		Premolar				Molar				Total	
	Central		Lateral		n	%	First		Second		First		Second		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Maxilla	279	38.6	43	6.0	111	15.4	11	1.5	32	4.4	66	9.1	6	0.8	548	75.9
Mandible	3	0.4	8	1.1	25	3.5	35	4.8	55	7.6	25	3.5	23	3.2	174	24.1

(teeth)

eruption disturbances between 1979 and 2002. During this period, of the 17,365 new patients who visited the clinic approximately 4% had eruption disturbances.

Among these patients with eruption disturbances, 20% were self referrals, 40% were referred from their general practitioner or from a clinic within the hospital (*e.g.*, orthodontics, oral surgery), and 40% were patients who were identified during periodic examinations. Their ages ranged from 1 to 16 years. Cases that were only monitored or were referred to other clinics (*e.g.*, orthodontics or oral surgery) were not included in the first analysis.

We observed and checked the presenting condition and management of eruption disturbances in 700 patients with 748 affected teeth. Although we treated two patients with cleidocranial dysostosis, they were not included in this report. In addition cases with systemic conditions known to create disruptions to the eruption of the tooth were excluded from this report.

Results

Types of teeth treated for eruption disturbances

Of the teeth which received treatment because of eruption disturbances 26 were primary teeth and 722 were permanent teeth. In the primary dentition, the mandibular second primary molar was the most frequently affected tooth, followed by the maxillary

second primary molar (Table 1).

In the permanent dentition, the maxillary teeth accounted for approximately three-quarters of all the treated teeth (Table 2). Treatment for eruption disturbances in the permanent dentition was administered to 279 maxillary central incisors (38.6%), 111 maxillary canines (15.4%), 66 maxillary first molars (9.1%), and 55 mandibular second premolars (7.6%).

Although the mandibular first molars had a lower incidence of eruption disturbances than the maxillary first molars, the mandibular second molars experienced eruption disturbances more frequently than the maxillary second molars. In the premolar area, the mandibular premolars were more often affected than the maxillary premolars; it was the mandibular second premolar that was particularly affected (55 teeth).

Distribution according to gender of the teeth

Tables 3 and 4 show the distribution according to gender. Among the primary teeth, 8 (30.8%) were in males and 18 (69.2%) in females (Table 3). Of the eight mandibular second primary molars that required treatment, all of them were in females.

Of the permanent teeth, 52.5% were in males and 47.5% in females (Table 4). Although the incidence of cases with problems related to the maxillary central incisors and the mandibular first molars were markedly higher in males, the incidence

Table 3 Distribution according to gender of the primary teeth with eruption disturbances

		Incisor				Canine		Molar				Total	
		Central		Lateral		n	%	First		Second		n	%
		n	%	n	%	n	%	n	%	n	%	n	%
Maxilla	male	2	66.7			2	100.0			3	42.9	7	53.8
	female	1	33.3	1	100.0					4	57.1	6	46.2
Mandible	male							1	100.0			1	7.7
	female	4	100.0							8	100.0	12	92.3

(teeth)

Table 4 Distribution according to gender of the permanent with eruption disturbances

		Incisor				Canine		Premolar				Molar				Total	
		Central		Lateral		n	%	First		Second		First		Second		n	%
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Maxilla	male	169	60.6	25	58.1	39	35.1	6	54.5	14	43.8	31	47.0	2	33.3	286	52.2
	female	110	39.4	18	41.9	72	64.9	5	45.5	18	56.2	35	53.0	4	66.7	262	47.8
Mandible	male	2	66.7	6	75.0	10	40.0	21	60.0	25	45.5	18	72.0	11	47.8	93	53.4
	female	1	33.3	2	25.0	15	60.0	14	40.0	30	54.5	7	28.0	12	52.2	81	46.6

(teeth)

Table 5 Average age when treatment was commenced in the primary dentition

	Incisor		Canine	Molar	
	Central	Lateral		First	Second
Maxilla	1y 8m	2y 2m	4y10m		6y 0m
Mandible	2y 7m			5y 5m	5y 8m

Table 6 Average age when treatment was commenced in the permanent dentition

	Incisor		Canine	Premolar		Molar	
	Central	Lateral		First	Second	First	Second
Maxilla	7y11m	8y11m	10y 5m	12y11m	12y 0m	8y 0m	13y 7m
Mandible	6y 0m	9y 8m	10y 0m	8y11m	10y10m	9y 0m	12y 4m

of cases in the maxillary canines was higher in females.

Starting age of treatment

Tables 5 and 6 show the average age when treatment was commenced for each type of tooth. This age was

close to the average eruption age or slightly later. The youngest patient was 1 year and 2 months old, and the eruption disturbance was on the maxillary primary central incisor, while the oldest patient was 16 years and 10 months old, and the eruption disturbance affected the mandibular second molar.

Table 7 Nature of the eruption disturbances in the primary dentition

	Disturbance	Incisor		Canine	Molar		Total
		Central	Lateral		First	Second	
Maxilla	delayed eruption	1	1			5	7
	impaction	2		2		2	6
Mandible	delayed eruption	2			1	6	9
	impaction	2				2	4

(teeth)

Table 8 Nature of the eruption disturbances in the permanent dentition

	Disturbance	Incisor		Canine	Premolar		Molar		Total
		Central	Lateral		First	Second	First	Second	
Maxilla	delayed eruption	214	28	28	2	9	23	6	310
	impaction	52	10	9	4	2			77
	abnormal direction/position	13	5	72	5	19	1		115
	ectopic eruption						42		42
	cyst formation			2		2			4
Mandible	delayed eruption	3	5	9	14	14	11	3	59
	impaction		3	10		1	4		18
	abnormal direction/position			5	12	23	1	11	52
	ectopic eruption						9	7	16
	cyst formation			1	9	18		2	30

(teeth)

Types of eruption disturbances

Tables 7 and 8 show the nature of the eruption disturbances. The definitions of the various types of eruption disturbances were as follows.

- Delayed eruption: a situation where a tooth failed to erupt by the clinically expected time and would be delayed without treatment.
- Impaction: a situation where the tooth was affected by an odontoma or cyst, or in an inverted position and was unable to erupt spontaneously.
- Abnormal direction and position: a situation where the tooth was able to erupt spontaneously even in an abnormal direction and/or position, but was not going to erupt a right position without treatment.
- Ectopic eruption: this term was used to refer only to permanent molars.
- Cyst: the presence of cystic changes which caused the failure of a tooth to erupt.

In the primary dentition, delayed eruption was

noted in 16 cases and impaction in 10 cases (Table 7). In the maxillary permanent dentition, delayed eruption was the most frequently noted condition (310 teeth), followed by impaction (Table 8). For the maxillary central incisors, delayed eruption was noted in relation to 214 out of the 279 teeth (76.7%), impaction occurred on 52 (18.6%), and abnormal direction/position on 13 (4.7%). A similar trend was noted in the maxillary lateral incisors. However, when the maxillary canines were considered 72 teeth (64.8%) showed abnormal direction and/or position.

Although ectopic eruption in the maxilla was noted in relation to 42 first permanent molars, it affected on only 9 mandibular first molars and 7 second molars.

Cyst formation was noted on 4 maxillary teeth and 30 mandibular teeth. Eighteen second premolars were treated because of the cystic changes. In the mandibular arch, 23 second premolars were treated for abnormal orientation.

Table 9 Treatment procedures used in the primary dentition

	Treatment procedure	Incisor		Canine	Molar		Total
		Central	Lateral		First	Second	
Maxilla	removal of odontoma	2		2			4
	removal or extraction of affected tooth			1		1	2
	exposure of crown	1	1			6	8
	traction					1	1
Mandible	removal of odontoma					1	1
	removal or extraction of affected tooth	2				1	3
	exposure of crown	2			1	8	11
	traction				1	3	4

In combined cases, each kind of treatment procedure was counted separately.

(teeth)

Table 10 Treatment procedures used in the permanent dentition

	Treatment procedure	Incisor		Canine	Premolar		Molar		Total
		Central	Lateral		First	Second	First	Second	
	extraction of predecessor	26	3	47	2	22			100
Maxilla	removal of odontoma	7	7	7	2				23
	removal of supernumerary tooth	81		2		1		1	85
	removal of abnormal frenum								
	removal or extraction of affected tooth	23	4	6	2	2			37
	exposure of the crown	201	34	80	6	17	22	4	364
	enucleation of cyst			2					2
	space maintenance			12	1	4			17
	traction	40	6	54		8	2		110
	occlusal guidances	43	5	39	2	10	11		110
	guide for ectopic eruption						23		23
extraction of adjacent tooth	2		5			23	1	31	
	extraction of predecessor			6	12	21	4	1	44
Mandible	removal of odontoma		2	6	5		3		16
	removal of supernumerary tooth		1	5	2				8
	removal of abnormal frenum			1			1		2
	removal or extraction of affected tooth				2	1			3
Mandible	exposure of the crown	3	6	13	10	29	14	5	80
	enucleation of cyst				8	17		4	29
	space maintenance			3	3	16			22
	traction		1	4	1	13	6	5	30
	occlusal guidances		1	3		8		7	19
	guide for ectopic eruption						4	7	11
	extraction of adjacent tooth				2				2
	replantation					1			1

In combined cases, each kind of treatment procedure was counted separately.

(teeth)

Treatment

Tables 9 and 10 show the treatment procedures for each kind of eruption disturbance. In some cases, several treatments, such as exposure of the crown

and traction, were combined. For such combined cases, each kind of treatment was counted separately.

With reference to the primary teeth, exposure of the crown was most frequently carried out; overall, 19 primary teeth were exposed, 14 of which were

primary second molars. Traction was noted only on the primary molars (Table 9).

In the permanent dentition, 1,169 treatment procedures were administered for 722 teeth experiencing eruption disturbances. Each eruption disturbance required an average of 1.6 types of treatment (Table 10).

The most frequently administered treatment was exposure of the crown (444 teeth), and this treatment was applied to all kinds of teeth. Extraction of the primary predecessor was the next most frequent treatment (144 teeth), and traction was performed on 140 teeth.

Enucleation of a cyst was performed on 25 mandibular bicuspid. Treatment for ectopic eruption was performed on 23 maxillary first molars.

Occlusal guidance after eruption was necessary in cases of malalignment (*e.g.*, to make space, correct a rotation), and was performed most on maxillary central incisors and canines after traction.

There were cases in which supernumerary teeth were removed; most of which were in the maxillary central incisor region. Many of the odontomas affected in the maxillary anterior teeth, the mandibular canines and first premolars.

Discussion

Although several previous reports have indicated that eruption disturbance occurred most frequently in relation to the maxillary canines (except the third molar)²⁷⁻²⁹, the maxillary permanent central incisor is the most frequently affected teeth in paediatric patients^{23,24,30}. In this report, eruption disturbance occurred most frequently in relation to the maxillary permanent central incisor and then in the maxillary canines. Though eruption disturbances are rare in the primary dentition²⁷, 23 cases required treatment in this report.

Eruption disturbances can be divided into two types. One type is an anomaly of time of eruption, which can be further classified into two subtypes, delayed eruption and impaction. The other type is an anomaly of eruption direction, which may also be classified into two subtypes, ectopic eruption and impaction.

The diagnostic criteria and treatment techniques for eruption disturbances have been variously described^{1,27,29,31,32}. The treatment procedures have altered over the past 20 years and hence the kinds of treatment reported in this study have varied widely.

Various treatments (*e.g.*, removal of cause, extirpation, enucleation, traction, occlusal guidance) were administered. A wide range of treatment procedures involving surgeries to orthodontic therapy were administered, and were similar to those described by Andreassen³¹ and Becker³².

Given that eruptive disturbances were found in 40% of the patients in this series during routine recall examinations appear to be important not only for caries management but also for the monitoring of growth and development. Furthermore, this type of examination allows the early detection and treatment of eruption disturbances in the mixed dentition.

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