Incisal overjet and traumatic injuries to upper permanent incisors

A retrospective study

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Järvinen, S. Incisal overjet and traumatic injuries to upper permanent incisors. A retrospective study. *Acta Odontol. Scand.*, 36, 359–362

The relationships between traumatic injuries to upper incisors and incisal overjet were studied in a sample of 1445 orthodontically untreated children aged 7 to 16 years. Traumatic injuries of the hard dental tissues and exarticulations of teeth were recorded. The frequency of injuries was 14.2 % in children with normal overjet (0–3 mm), 28.4 % in children with increased overjet (3.1–6 mm), and 38.6 % in children with extreme overjet (> 6 mm). The severity of injuries was also greater in children with extreme overjet than in children with overjet ranging from 0 to 6 mm. Furthermore, the range of injuries increased in relation to the overjet. Two or more injured incisors were found in 19.2% of the children with normal overjet, in 22.2% of the children with increased overjet, and in 46.7 % of those with extreme overjet.
Partly published in Finnish in Proc. Finn. dent. Soc. 73: Suppl. V, 1977.

Key-words: Orthodontics; dental occlusion; pedodontics

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The relationships between traumatic injuries to incisor teeth and types of occlusion have been discussed by various authors. A significant correlation between the occurrence of traumatic injuries and incisal overjet has been found (3, 5, 9, 10). The frequency of traumatically injured teeth has been reported as being higher in Angle's Class II, Division 1 dentitions than in other types of occlusion (4, 11).

The aim of this retrospective study was to examine the relation of overjet to the occurrence, severity and range of traumatic injuries to upper permanent incisors.

MATERIALS AND METHODS

The material used in this study was based on an epidemiologic material of 1614 children sampled for a previous study (8). Of this material, 88 children aged 6 years with early mixed dentition, 2 children with facial clefts, and 79 children with previous orthodontic treatment were excluded. The subjects of the present study were thus 1445 children aged 7 to 16 years, 719 girls and 726 boys (Table 1).

The children were examined in a dental clinic. Traumatic injuries of the hard dental tissues of upper permanent incisors and

Received for publication, March 30, 1978

exarticulations of these teeth were recorded in a visual and radiographic examination. The injuries were classified using the method of Andreasen (1). The following divisions were used in evaluating the severity of the injuries:

- Slight injuries: 1. Crown infraction, enamel fracture
  2. Enamel-dentin fracture
- Severe injuries: Complicated crown fracture (with pulpal lesion), crown-root fracture, root fracture, exarticulation.

The children were classified into four groups, based on the overjet measured with a millimeter-scaled gauge (Table 2):

- Group 1. Negative overjet (< 0 mm)
- Group 2. Normal overjet (0–3 mm)
- Group 3. Increased overjet (3.1–6 mm)
- Group 4. Extreme overjet (> 6 mm)

The statistical analysis of the material was performed using the chi-square test.

RESULTS

A definite relationship was found between the frequency of traumatic injuries of permanent upper incisors and incisal overjet (Table 3). In children with negative overjet, no injured upper incisors were found. Injuries were more common in children with increased overjet than in children with normal overjet, the ratio being 2.0/1. In children with extreme overjet, the ratio was even higher, 2.7/1. The respective ratios were 2.7/1 and 3.1/1 in girls, and 1.6/1 and 2.5/1 in boys. The difference between the overjet groups was statistically significant ($p < 0.001$).

Of the children with normal overjet, 80.3 % had crown infractions or enamel fractures only, 17.7 % had enamel-dentin fractures and 2.0% severe injuries. In children with increased overjet, the corresponding percentages were 77.2%, 20.3% and 2.5 %; and in children with extreme overjet, they were 57.1 %, 32.7 % and 10.2 %. The difference was statistically significant between the extreme overjet group and the other overjet groups ($p < 0.05$).

The number of injured teeth increased in relation to the overjet. Two or more injured incisors were found in 19.2 % of the children with normal overjet, in 22.2 % of the children with increased overjet, and in 46.7 % of those with extreme overjet. The difference between the extreme overjet group and the other overjet groups was statistically significant ($p < 0.01$).

DISCUSSION

The frequency of traumatic injuries to permanent upper incisors increased in relation to the increasing overjet. The present finding is in accordance with the results reported previously (5, 9, 10). An overjet greater than normal thus creates an obvious risk for injuries. In cases with normal occlusion, the energy of the trauma is decreased by the larger contact area, the occlusal contact of the upper and lower teeth, and the protecting effect of the lip closure. However, the calcultated relative risks (2.0/1 in the increased overjet group and 2.7/1 in the extreme overjet group, when compared with the normal overjet group) were lower than the ratio of 10/1 in children with overjet of more than 3 mm found by Berz & Berz (3). The present finding that the risk for injuries in increased and extreme overjet groups was higher in girls than in boys when compared with normal overjet groups, may be explained by the fact that injuries were generally more frequent in boys than in girls. The effect of the structural risk will therefore be decreased by the larger occurrence of injuries.

The severity of injuries was greater in children with extreme overjet than in child-

Table 1. *Age and sex distribution of the subjects*

	Age in years										Total
	7	8	9	10	11	12	13	14	15	16	
Girls	67	80	57	62	81	80	77	67	91	57	719
Boys	82	75	61	72	65	93	84	79	68	47	726
Girls and boys	149	155	118	134	146	173	161	146	159	104	1445

Table 2. *Distribution of the children in different occlusal groups by incisal overjet*

		Incisal overjet (mm)				Total
		< 0	0–3	3.1–6	> 6	
Girls:	N	3	526	128	62	719
	%	0.4	73.2	17.8	8.6	100.0
Boys:	N	5	506	150	65	726
	%	0.7	69.7	20.7	8.9	100.0
Girls and boys:	N	8	1032	278	127	1445
	%	0.6	71.4	19.2	8.8	100.0

Table 3. *Prevalence of children with injured upper incisors in different overjet groups*

		Incisal overjet (mm)			
		< 0	0–3	3.1–6	> 6
Girls:	N	–	52	34	19
	%	–	9.9	26.6	30.6
Boys:	N	–	95	45	30
	%	–	18.8	30.0	46.2
Girls and boys:	N	–	147	79	49
	%	–	14.2	28.4	38.6

rent with overjet ranging from 0 to 6 mm. In some of the cases, this is possibly due to the lack of occlusal contact, the location of this contact in the cervical part of the upper teeth, or the uncompleted lip closure in children with extreme overjet. Earlier findings have been similar (4, 5, 9). In Eichenbaum's study (4), the overjet had not been measured, but the classification of Angle (2) was used. However, the comparison between the classes of Angle is impaired by the large amount of individual variation in overjet. In Lewis' study (9), an overjet up to 4 mm was accepted as normal while in that of Gauba (5) the limit was 3 mm. The present study, in which several groups of classification were used, indicates that only an overjet exceeding 6 mm influences the severity of traumatic injuries to upper incisors .

The number of injured teeth was higher in children with extreme overjet (> 6 mm) than in those with normal or increased overjet (0–6 mm), possibly due to the lack of occlusal contact. This finding agrees with that of Eichenbaum (4).

In cases with extreme overjet, early orthodontic treatment might be considered in order to reduce the risk of traumatic injuries to upper incisors. The importance of early orthodontic treatment may be even greater than first appears, because of the problems in later orthodontic treatment caused by possible injuries to upper incisors (6, 12). The preventive orthodontic program for Public Dental Care presented by Järvinen (7) includes screening for extreme overjet in children at the early mixed dentition stage. The results of the present study would seem to justify this screening.

Acknowledgement. This investigation has been aided by grants from the Finnish Dental Society.

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