

Incidence Of Fractured Anterior Teeth As Related To Their Protrusion

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The dental profession has quite generally accepted the point of view that when anterior teeth protrude there exists an important predisposing cause of injury to those teeth. Orthodontists often recommend the reduction of protrusion of anterior teeth as a preventive measure, in addition to esthetic and other advantages to be gained.

The literature on fractured anterior teeth is devoted almost exclusively to treatment, while incidence and protrusion as predisposing factors have received little attention. Ellis¹ reported that a survey of 4251 children revealed that 4.2% had fractured teeth, with a boy-to-girl ratio of 127:51. Martin² compared the incidence in delinquents and non-delinquents and gave 46% for delinquents and 16% for the others, for an even boy-to-girl ratio. Glucksmann³ stated: "Coronal fracture of one or more anterior teeth is so common in certain types of malocclusion, especially Class II, Division 1, that it may be regarded as one reason for early treatment of this deformity. In 100 of this type, taken in routine order from treated cases in my collection, 11 were found to have fractured teeth". Hardwicke and Newman⁴ found in a large group of children who presented for treatment that "86% of the fractures occurred in mouths with undue prominence of the affected teeth". Sweet⁵ in 1942 stated that "fractures are on the increase largely due to protrusion resulting from mouth breathing", and added that "90% of the fractured anterior teeth protrude and do not have

lip coverage". Zander and Law⁶ also felt that protruding teeth were predisposing to fracture and claimed that injuries were increasing. Malone and Massler⁷ agreed with this theme. Ellis¹ in his book cites these authors and says, "Protruding anterior teeth must be recognized as the most important predisposing factor in injury to these teeth".

The literature on the subject is not large, and it may be seen from the above that, when the figures are based on surveys, the results do not always agree and, more often than not, there have been no investigations to support the figures cited. Informal observation in the orthodontic office would seem to support these views regarding the connection between protrusion of anterior teeth and their fracture, but an objective study would be desirable, taking up the following points.

1. Is there really any discernible relationship between fractured and protruding anterior teeth?
2. Does the degree of protrusion affect the incidence or the severity of the fracture?
3. Is the incidence or the severity of fracture more severe in one sex than the other?

METHOD AND MATERIALS

A total of 343 white children, aged 8-13, were examined. All attended the same school, located in a neighborhood which was diversified with respect to socio-economic status. The children were seen in the classroom and no attempt was made to select individuals,

except for the fact that no child wearing an orthodontic appliance was included. The following were noted: age, sex, number and severity of fractured teeth, degree of protrusion (if any).

If the fracture involved only the enamel of the tooth, it was described as "mild." All other fractures were recorded as "severe". The degree of protrusion was expressed in millimeters by measuring the distance between the incisal edges of the upper incisors and the labial surfaces of the lower incisors. Measurements were made to the nearest millimeter and anything under 4 mm. was considered as non-protrusive. The classification according to Angle was not recorded, since only the protrusiveness of the maxillary incisors was considered crucial. Under this system of recording, several Class II, Division 1 malocclusions might be expected to be included as protrusive, as well as some Class I's with a similar configuration of anterior teeth. At the outset it was thought that recording coverage of the teeth by the lips would be informative, but the children were prone to assume a false lip position, making a judgment on this score unreliable. Where more than one tooth was broken, no added weight was given to this, and the case was counted only as one fracture per child.

FINDINGS

A greater incidence of fracture was observed in the thirteen-year olds than in the eight-year olds; it seems reasonable to assume that this difference results from a longer period of exposure to accident.

The remainder of the findings are best set forth (Table I) in the tabular form customarily employed for the analysis of data by the Chi Square test, the statistical device of choice in this study.

To test whether or not chance could account for the distribution above, we must determine what we would expect from chance and chance alone. We see that in all there were 282 children (98 + 184) with no fracture. Examining the totals, we find that the entire group of 343 was distributed on the basis of 133 protrusive, 210 non-protrusive. With only chance at work, we would expect that the 282 children with no fractures should be distributed in the same 133:210 ratio of the entire group; hence our "expected" figures are 109.3 and 172.7 for protrusive and non-protrusive respectively, for a total of 282. We apply the same line of reasoning for the categories of "mild fracture" and "severe fracture". The total Chi Square value of 12.696 could occur through the operation of chance alone

TABLE I

<i>Number with</i>	<i>Children with protrusion</i>			<i>Children without protrusion</i>		
	O	E	Chi ²	O	E	Chi ²
No fracture	98	109.3	1.168	184	172.7	.739
Mild fracture	24	17.8	2.160	22	28.2	1.363
Severe fracture	11	5.9	4.408	4	9.1	2.858
Totals:	133	133.0	7.736	210	210.0	4.960
Chi ² = 12.696			$p = <.01 \quad >.001$			

TABLE II

<i>Number with</i>	<i>Boys with protrusion</i>			<i>Boys without protrusion</i>			<i>Totals</i>
	O	E	Chi ²	O	E	Chi ²	
No fracture	47	52.2	0.518	84	78.8	0.343	131
Mild fracture	9	7.9	.184	11	12.1	0.118	20
Severe fracture . . .	9	4.9	3.675	3	7.1	2.467	12
Totals:	65	65.0	4.377	98	98.0	2.928	163
	Chi ² = 7.305			$p = <0.05$ >0.02			

less than once in a hundred times although it could occur by chance somewhat oftener than once in a thousand times. This more than satisfies the levels of probability ordinarily required, and it is therefore concluded that some factor other than chance accounts for the distribution above. In other words, there seems to be a causative relationship between the frequency and severity of fractures in anterior teeth and the presence or absence of protrusion of those teeth.

These same data may be regrouped so that boys are dealt with separately from girls. Table II sets forth the data with respect to boys only.

Table III sets forth similar data with respect to girls.

In each of these Chi Square tests carried out with boys separated from the girls, a somewhat lower Chi Square value is found, as is to be expected

when the number of cases is virtually halved. Nonetheless, each of these Chi Square values is high enough that it could be expected through the operation of chance alone less than five times in one hundred, although values of this size could be expected to occur a little more often than twice in one hundred.

SUMMARY AND CONCLUSIONS

Three hundred forty-three white children were examined in a public school of San Jose, California, between the ages of eight and thirteen years. In each child the degree of protrusion of anterior teeth (if any) was noted, as well as the presence or absence of fractures in anterior teeth; if fractured anterior teeth were found, the severity was noted. Fractures were designated as mild if only the enamel of the tooth was involved, all other fractures were

TABLE III

<i>Number with</i>	<i>Girls with protrusion</i>			<i>Girls without protrusion</i>			<i>Totals</i>
	O	E	Chi ²	O	E	Chi ²	
No fracture	51	57.1	.651	100	93.9	.396	151
Mild fracture	15	9.8	2.759	11	16.2	1.669	26
Severe fracture . . .	2	1.1	.736	1	1.9	.426	3
Totals:	68	68.0	4.146	112	112.0	2.491	180
	Chi ² = 6.637			$p = <0.05$ $>.02$			

recorded as severe. Statistical analysis of the data by means of the Chi Square test suggests that there is a real relationship between the incidence of fractured anterior teeth and the protrusion of those teeth, a relationship which should not be ascribed to chance alone.

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