

# The Degree of Overjet and Anterior Traumatic Dental Injury in the Mixed Dentition: A Single-Center Experience

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**Objective.** The objective of this retrospective chart review study was twofold. The first was to determine whether there is a correlation between the degree of overjet and the type of anterior traumatic dental injury (ATDI) in the mixed dentition. The second was to assess whether the decision to not treat young patients with prominent upper front teeth for trauma prevention resulted in a greater number of ATDI's in patients of record from a single-center. **Study Design.** The authors conducted a retrospective chart review of patients presenting to the Boston Children's Hospital (BCH) Emergency Department with an ATDI in the mixed dentition between October 2011 and March 2016.

**Results.** Patients with an overjet less than or equal to 4 millimeters experienced all types of ATDI with greater frequency than those patients with an overjet greater than 4 mm.

**Conclusions.** Our experience at BCH described in this study has led us to believe that a patient's risk of suffering an ATDI has more to do with the type of activities they participate in rather than the degree of their overjet.

**Keywords.** Traumatic dental injuries; hospital dentistry; pediatric dentistry.

## INTRODUCTION

Conventional wisdom in pediatric dentistry and orthodontics is that children in the mixed dentition with excessive overjet greater than 3mm should be treated with orthodontics to reduce the risk of incisor trauma (American Association of Orthodontists, Document, [http://res.cloudinary.com/dorhu9mrb/image/upload/v1446484666/PTWF\\_Growing\\_Children-14-lh\\_xlg8nb.pdf](http://res.cloudinary.com/dorhu9mrb/image/upload/v1446484666/PTWF_Growing_Children-14-lh_xlg8nb.pdf)).<sup>1</sup> It has been reported that children between the ages of seven and eleven years are most vulnerable to sports-related oral injury.<sup>2-5</sup> A global meta-analysis of studies on anterior traumatic dental injury (ATDI) suggests that large overjet is co-responsible for 235 008 000 global ATDI cases (95% Confidence Interval, 104,760,000-372,168,000) during the study period.<sup>6</sup> The yearly

costs of all sports related injuries in children, including orofacial injuries have been estimated to be as high as 1.8 billion dollars.<sup>7</sup> Parents and at a later stage patients will be straddled with large costs related to restorative, endodontic, prosthodontic, implant, or surgical treatment(s) as a result of an ATDI. There are also indirect costs resulting from the ATDI such as children taking time away from school and parents losing time from work, which can burden lower income families.<sup>8,9</sup> The physical, psychosocial, and economic implications of dental trauma on children and their families should not be underestimated.<sup>10,11</sup>

A 2013 Cochrane Collaboration review suggested that providing an early orthodontic intervention for younger children with prominent upper front teeth is more effective in reducing the incidence of an ATDI than providing one comprehensive course of orthodontic treatment in early adolescence.<sup>12</sup> The review also reported that there are no other advantages for providing treatment early when compared to treatment in adolescence. One of the reviews' authors decided to critically reappraise their conclusions some months after publication by examining the original data in terms of odds, risk, and numbers needed to treat (K. O'Brien, Internet Blog, <http://kevinobrienorthoblog.com/class-ii-trauma-to-the-front-teeth/>). The updated analysis found; the chance of incisal trauma is reduced by 10% compared to a group of patients treated in adolescence, the odds of trauma will be 41% less likely than in the adolescent group, the risk of trauma will be reduced by 33% compared to the risk in the adolescent group, and to prevent one episode of trauma

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(Numbers Needed to Treat), you will need to treat 10 patients (95% Confidence Interval, 6-175). The Author concluded, "I think that I am influenced mostly by the reduction in trauma of 10% and the numbers needed to treat of being high. I would not treat early for the sole aim of reducing trauma."

The orthodontic philosophy at Boston Children's Hospital (BCH) Department of Dentistry is to only treat prominent upper front teeth in young children if there is a psychosocial need by the patient and/or parent. Orthodontic treatment strictly for the purpose of trauma prevention is not recommended. The Director of Orthodontics (author MA) has contended that the risks of performing early orthodontic treatment outweigh the purported benefits. These risks are patient compliance, improper oral hygiene that can lead to decalcification and caries, root resorption, and the high probability that a second phase of treatment in adolescence will be required anyway. BCH is the principal pediatric care center in the Boston metropolitan area and its Emergency Department receives a high number of patients with an ATDI. The Department of Dentistry is on full-time call for examining and treating these patients.

The purpose of this retrospective chart review study was twofold. The first was to determine whether there is a correlation between the degree of overjet and the type of ATDI in the mixed dentition in a sample of patients who presented to the BCH Emergency Department over a 4.5-year period. The second was to assess whether the decision to not treat young patients with prominent upper front teeth for trauma prevention resulted in a greater number of ATDI's in patients of record from a single-center.

## MATERIALS AND METHOD

We obtained institutional review board approval from Boston Children's Hospital (IRB-00021756). A retrospective chart review of patients that presented to the BCH Emergency Department between October 2011 and March 2016 was performed. Each ATDI was documented in an electronic spreadsheet trauma log (Excel, Microsoft) by pediatric dental residents on call seven days a week outside of regular clinic hours Monday through Friday, 5:00 pm to 9:00am, and on weekends and holidays. The inclusion criteria for this study were patients in the early to mid-mixed dentition with at least one permanent maxillary incisor present and ASA I health status without any disorders of gate, balance, or coordination. The exclusion criteria included patient records with no documentation of their overjet in mm and an inadequate description of the cause of the ATDI. Eighty-one patient records were included in our analysis. We mined several demographic and clinical variables from the patients' records, de-identified them, and entered them into an electronic spreadsheet (Excel, Microsoft). The demographic variables included age, sex, and location of the patient's dental home (BCH or other). The clinical variables included the measurement of overjet in mm, the cause of the ATDI, and the type of ATDI that occurred. Simple descriptive statistics were employed to summarize the data from the study.

## RESULTS

The mean patient age in the study was 9 years (range, 6-11 years) (Figure 1). The patient population in the study was 62% male (Figure 2). Only 10% of the sample were patients of record from BCH (Figure 3).

The mean overjet of the sample was 3.44 mm and the mode was 3 mm (Figure 4). Approximately 77% of the sample had an overjet less than or equal to 4mm. When separating the cause of injury into four categories; sports, outdoor play, physical barriers and other, the majority of injuries were sustained during sports and outdoor play (Figure 5). The types of ATDI sustained were concussion, subluxation, complicated fracture, uncomplicated fracture, intrusion, extrusion, lateral luxation, root fracture and avulsion. The most prevalent ATDI was uncomplicated fracture (44%). The least prevalent ATDI was root fracture (2%) (Figure 6). Patients with an overjet less than or equal to 4 millimeters experienced all types of ATDI's with greater frequency than those patients with an overjet greater than 4 mm (Table 1).

## DISCUSSION

The mean overjet of the study sample was 3.44 mm and the mode was 3 mm. This data is contrary to other published studies including one by Nguyen et al<sup>8</sup> which concluded that a patient was twice as likely to sustain an ATDI with an overjet over 3mm and a Cochrane review<sup>12</sup> which found a correlation between increased overjet and the risk of ATDI. Approximately 77% of this study sample had an overjet less than or equal to 4mm, with this group experiencing all types of ATDI's with greater frequency than those patients with an overjet greater than 4 mm. This finding suggests that the degree of overjet is unrelated to the type of traumatic dental injury. Given that the BCH dental clinic patients of record comprised only 10% of the sample, it would seem as though the decision not to treat patients with prominent upper front teeth in the mixed dentition for trauma risk reduction did not increase the incidence of an ATDI in BCH patients.

The majority of patients in this sample suffered an ATDI during the course of sports and outdoor play. Since the trauma log template did not include data on whether the patient had or was wearing a mouthguard at the time injury, we cannot comment on the effectiveness of mouthguards for trauma prevention or the reduction in severity of an ATDI.

## CONCLUSIONS

Interceptive orthodontic treatment of prominent upper front teeth in the early to mid-mixed dentition for the purpose of trauma prevention may be unjustified. Our experience at BCH described in this study has led us to believe that a patient's risk of suffering an ATDI has more to do with the type of activities they participate in rather than the degree of their overjet. From a cost-benefit perspective, educating parents of younger children about the risks of outdoor play and the importance of wearing a mouthguard during sports is a more effective public health approach to trauma prevention than initiating interceptive orthodontic treatment of prominent upper front teeth which can be expensive, time consuming, and not without exposing the patient to other risks.

Figure 1. Age Distribution

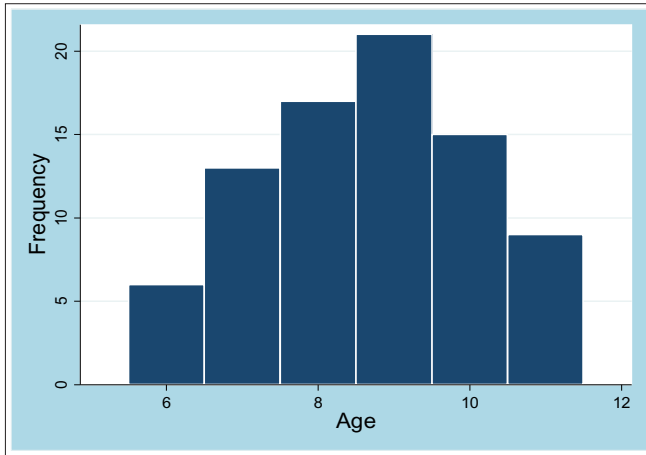


Figure 2. Sex distribution.

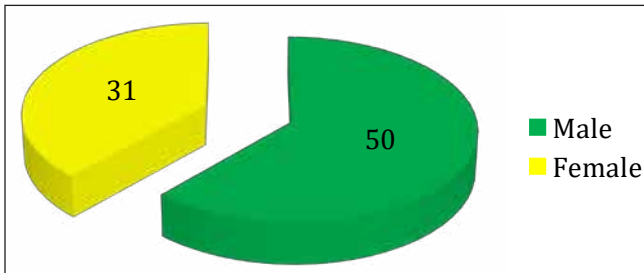


Figure 3. Boston Children's Hospital Dental patients of record in the sample versus patients from an outside dental home.

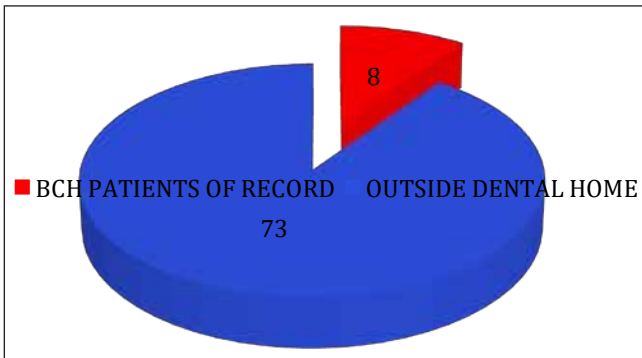


Figure 4. Distribution of overjet (Sample mean = 3.44 mm).

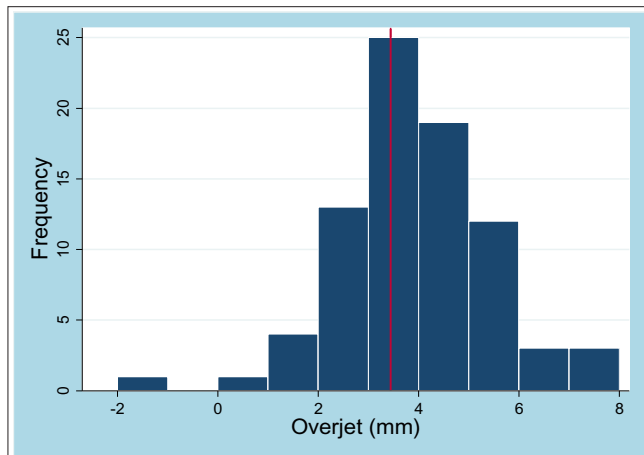


Figure 5. Events causing the ATDI.

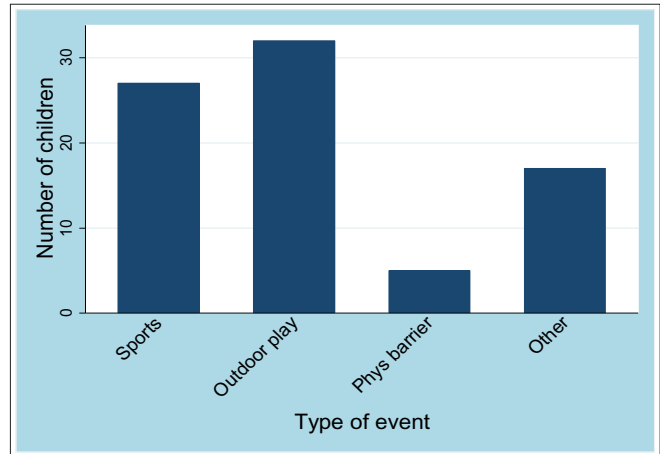


Figure 6: Type of trauma and distribution.

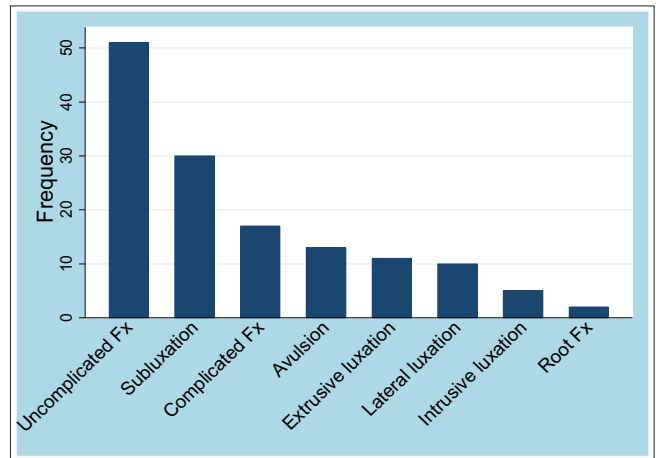


Table 1. Traumatic dental injury distribution >4mm vs. ≤ 4mm

	Overjet (Ns)		Row N
	> 4 mm	≤ 4 mm	
Subluxation	5	17	22
Uncomplicated fracture	8	28	36
Complicated fracture	2	14	16
Root fracture	0	2	2
Lateral luxation	1	7	8
Extrusive luxation	2	7	9
Intrusive luxation	1	4	5
Avulsion	3	9	12
Column N	18	63	81

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