# The association between orthodontic treatment need and maxillary incisor trauma, a retrospective clinical study

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***Objectives:*** Identifying risk factors for dental trauma in children is important. The main aim of this retrospective study was to investigate the association between maxillary incisor trauma (MIT) and variables such as gender, malocclusion complexity, and orthodontic treatment need (OTN).
***Study design:*** ICON (Index of Complexity, Outcome and Need) scores were calculated in 502 schoolchildren (253 girls and 249 boys, aged 11-14-years). Subjects were categorized into 5 ICON complexity groups (easy to very difficult) and into 2 groups according to OTN (ICON >43, ICON <44). Logistic regression was performed to test for any differences in risk of MIT among subjects in different ICON complexity groups and to estimate the predictive value of gender, OTN, and ICON scores for MIT.
***Results:*** Nine percent experienced incisor trauma (93.4% maxilla, 6.6% mandible). Enamel fracture was the most common type (6.2%) of dental trauma. Boys had greater odds of MIT compared with girls (odds ratio [OR] 2.16, 95% confidence interval [CI] 1.11-4.21). Subjects with OTN showed greater odds of MIT compared to those without (OR 2.37, 95% CI 1.21-4.64). Only subjects presenting with difficult complexity grade (64 < ICON < 77) showed significantly higher odds of experiencing MIT (OR 3.16, 95% CI 1.25-8.01) compared with the easy complexity group (ICON <29).
***Conclusion:*** The higher risk of experiencing MIT in malocclusions with difficult complexity warrants more vigilant screening of this group before and during dental or orthodontic treatment. **(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011;112:e75-e80)**

Incisor trauma is an important clinical problem in children and adolescents and can result in pain, disfigurement, and speech and psychologic problems.[1] Population-based studies and studies of representative groups of schoolchildren clearly support these observations.[2-16] Males suffer more incisor trauma than females,[17-25] though 2 studies failed to detect a gender difference in dental trauma experience.[9,26] Most injuries involve 1 tooth,[27] and maxillary central incisors are the most frequently affected in both primary and permanent dentition injuries.[4,5,6,10,13,20,21] Among maxillary incisors, maxillary central incisors are more often affected than lateral incisors.[3,4,10,13,15,20,21,28] Correcting the increased overjet is one of the main reasons for seeking orthodontic treatment, and therefore, many occlusal indexes aimed at measuring the severity of malocclusion have a component to assess the overjet.[29,30]

Uncertainty surrounds the effectiveness of preventive measures to normalize the overjet. Some investigators have suggested that overjet is of minimal significance as a risk factor for maxillary incisor trauma (MIT).[2,26,31,32] However, others have observed increased trauma risk in subjects with overjet >3.5 mm.[9,19,20] There is also some evidence that overjet >6 or 7 mm increases the risk and that the risk increases with increase in overjet values.[7,28,33] Information on the increased risk of maxillary incisor injury in subjects with inadequate lip coverage is contradictory. Although some researchers have demonstrated increased risk of MIT in subjects with inadequate lip coverage[7,9,19,20,26] others have observed no association between MIT and inadequate lip coverage.[2,21,28]

These findings suggest that an increased overjet may contribute to a higher risk of receiving MIT because of increased protrusion of maxillary incisors. There is limited information in the English-language literature on the prevalence of incisor trauma in Iranian schoolchildren, and there is a need for further research into dental trauma and risk factors to establish a baseline for future preventive and trauma management strategies. The primary objective of the present study was to carry

Dr Borzabadi-Farahani is funded by a research grant from the European Orthodontic Society
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Received for publication Mar 24, 2011; returned for revision May 28, 2011; accepted for publication May 29, 2011.
1079-2104/$ - see front matter
Published by Mosby, Inc.
doi:10.1016/j.tripleo.2011.05.024

**Table I.** The ICON scoring method and its components[36]

| | | Score | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Component* | *0* | *1* | *2* | *3* | *4* | *5* | *Weight* |
| 1 | Esthetic assessment | Score 1-10 | | | | | | 7 |
| 2* | Upper arch crowding | <2 mm | 2.1-5 mm | 5.1-9 mm | 9.1-13 mm | 13.1-17 mm | >17 mm | 5 |
| | Upper arch spacing | <2 mm | 2.1-5 mm | 5.1-9 mm | >9 mm | | Impacted teeth | 5 |
| 3 | Crossbite | No crossbite | Crossbite present | | | | | 5 |
| 4† | Incisor open bite | Edge to edge | <1 mm | 1.1-2 mm | 2.1-4 mm | >4 mm | | 4 |
| | Incisor overbite | <1/3lower incisor coverage | 1/3 to 2/3 coverage | 2/3 up to fully covered | Fully covered | | | 4 |
| 5‡ | Buccal segment A-P | Cusp to embrasure only, class I, II, or III | Any cusp relation up to but not including cusp to cusp | Cusp to cusp | | | | 3 |

*The difference between the sum of mesiodistal tooth diameters and the available arch circumference in the upper arch is recorded in a 5-point score. Impacted teeth (score 5) must be unerupted and either ectopic or have <4 mm of space between adjacent permanent teeth. Retained deciduous teeth (without permanent successor), erupted supernumerary teeth, or lost teeth due to trauma are counted as space, unless they are to be maintained and obviate the need for prosthetic replacement or space is maintained for a prosthetic replacement (i.e., tooth lost in trauma).
†If both anterior open bite and deep bite are present, only the highest score is counted.
‡Quality of buccal segment interdigitation, not Angle classification, is measured in both sides and then added together.

out an epidemiologic study in 11- to 14-year-old Iranian schoolchildren to provide preliminary information on prevalence and severity of incisor trauma and to determine the reasons for injury. The secondary aim of this study was to investigate the association between the MIT and variables such as gender, malocclusion complexity, and orthodontic treatment need.

## MATERIAL AND METHODS

The present cross-sectional study was originally carried out to provide preliminary information on prevalence of malocclusions and occlusal traits in an urban Iranian population.[34] After approval by the Ethical Committee of Isfahan University of Medical Sciences, Faculty of Dentistry, we selected the present sample of 11- to 14-year-old Iranian schoolchildren (average age 12.4 years old) according to a stratified cluster sampling method, defining the students in 6 public schools as 6 strata. For this cross-sectional study, 249 boys and 253 girls were examined, including 6 subjects who were wearing an orthodontic appliance at the time of the survey (1 female and 5 male). The examinations were performed in a well lit room. Each maxillary and mandibular incisor was scored for presence and type of traumatic injury according to the following criteria: 0 = no evidence of trauma; 1 = trauma limited to enamel; 2 = trauma involving enamel and dentin; 3 = trauma involving enamel, dentin, and pulp; 4 = discoloration due to trauma (verified by interview); and 5 = avulsed tooth due to trauma (verified by interview). This scoring system was based on clinical nonradiographic evidence of tooth injury. One examiner (Ali Farahani) performed the clinical examination. A mouth mirror, ruler, and a digital sliding caliper were used. The examination comprised an extraoral examination of skeletal relationship[35] and an intraoral examination of the teeth and occlusion.

### The Index of Complexity, Outcome, and Need

There are several orthodontic treatment need indexes available to assess and rate the malocclusion. The Index of Complexity, Outcome and Need (ICON)[36] was used to assess the complexity of malocclusions and to rank the subjects. The ICON consists of 5 components: 1) the esthetic component, similar to esthetic component of the IOTN index[29]; 2) upper and lower crowding/spacing assessment; 3) presence of a crossbite; 4) degree of incisor open bite/overbite; and 5) fit of the teeth in the buccal segment in terms of the anterior-posterior relationship. Each component of the ICON can be measured on study casts as well as on patients (Table I). The practical application of the index is simple and takes ~1 minute for each case.[36] To rank the subjects for severity of malocclusion, an orthodontist (Ali Farahani) who had been formally trained and calibrated in the use of the ICON conducted the clinical examination. The ICON is multifunctional and determines which individuals require orthodontic treatment (ICON >43) while quantifying the degree of complexity of the malocclusion.[36]

After excluding the subjects who were wearing an orthodontic appliance (6 subjects), the 496 remaining