

Occurrence and Severity of Concomitant Injuries in Other Areas Than the Face in Children With Mandibular and Midfacial Fractures

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Purpose: To clarify the occurrence, causes, severity, and predictors of concomitant injuries in pediatric patients with facial fractures.

Patients and Methods: Files of 339 pediatric patients who had sustained facial fractures at age 15 years or younger were reviewed. Outcome variables were injured organ systems other than the face, types of injuries in areas other than the face, and severity of injuries in areas other than the face. Explanatory variables were gender, age, mechanism of trauma, and type of facial fracture.

Results: Concomitant injuries in organ systems other than the face were observed in 11.0%. Limb injuries occurred in 9.1%, head and neck injuries in 5.6%, and chest injuries in 1.8%. The most common injury types were upper limb injury (8.0%), brain injury (3.2%), and lower limb injury (2.9%). Severe head and neck injuries occurred in 3.5% and severe chest injuries in 1.2%. Concomitant injuries occurred more frequently after motor vehicle accidents and falls from height compared with other etiologies ($P < .001$) and more frequently in association with combined mandibular and midfacial fractures than in association with other fracture types ($P < .001$).

Conclusions: Concomitant injuries in areas other than the face should be expected first and foremost after high-speed trauma mechanisms and in association with severe facial fractures. Concomitant injuries in general occur most frequently in the limbs, with severe concomitant injuries in particular occurring most often in the head and neck region and chest, emphasizing the importance of multiprofessional teamwork in the diagnosis of pediatric patients who have sustained facial fractures.

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J Oral Maxillofac Surg 70:92-96, 2012

Diagnosis of facial fractures and associated injuries in pediatric patients may be extremely challenging because of children's weak cooperative skills, particularly in the youngest children. However, the associated injuries sustained may demand far more rapid diagnosis and intervention than injuries to the facial bones.

Some 25% of adult patients with maxillofacial fractures have concomitant injuries, and 1 significant predictor for these is a high-speed impact.¹ Several studies from different parts of the world have shown that maxillofacial fractures in the pediatric population are frequently caused by high-speed trauma mechanisms.²⁻¹¹ Therefore, it can be assumed that associated

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0278-2391/12/7001-0\$36.00/0

doi:10.1016/j.joms.2011.06.227

injuries occur frequently in children who have sustained fractures of the facial bones.

The aim of the present study was to clarify the occurrence, causes, and severity of concomitant injuries in pediatric patients with facial fractures. An additional aim was to identify factors that predict the occurrence of concomitant injuries.

Materials and Methods

SAMPLES

Included in the present study were records of all children 15 years or younger who had been diagnosed with mandibular and/or midfacial fractures (excluding those who had isolated dentoalveolar injuries) during 2 10-year periods, January 1, 1980, through December 31, 1989, and January 1, 1993, through December 31, 2002, in a level I trauma center ($n = 339$). The study was approved by the internal review board of the Division of Musculoskeletal Surgery, Helsinki University Central Hospital.

STUDY VARIABLES

Outcome variables were injured organ systems in areas other than the face, types of injuries in areas other than the face (excluding brain concussions, wounds, and other superficial soft tissue injuries), and severity of injuries in areas other than the face. The explanatory variables were gender, age, mechanism of trauma, and type of facial fracture.

Injured organ systems in areas other than the face were classified as follows: 1) head and neck, including the cervical spine; 2) chest, including the thoracic spine and diaphragm; 3) abdomen, including the abdominal organs and lumbar spine; and 4) limbs, including the pelvic skeleton. For each organ system, all different types of injuries also were recorded in detail. The Abbreviated Injury Scale was used to assess the severity of injury in each organ system in areas other than the face.¹² For the present study, an organ-specific Abbreviated Injury Scale of at least 3 was considered a severe injury.

DATA ANALYSIS

Statistically significant differences in the occurrence of concomitant injuries among gender, age group, trauma mechanism, and fracture type were evaluated with χ^2 tests. For this purpose, patients were classified as 0 to 5, 6 to 9, 10 to 12, or 13 to 15 years old. The mechanism of trauma was classified as a fall on the ground, a fall from a height, a fall with a bicycle, motor vehicle accident (MVA), assault, hit by object, kicked by a horse, and other. In addition, each patient was designated as having 1 of the following types of facial fractures: 1) isolated mandibular frac-

Table 1. DESCRIPTIVE STATISTICS OF 339 CHILDREN

	Patients (n)	Percentage of Total (N = 339)
Gender		
Male	210	61.9
Female	129	38.1
Age (yrs)		
Range, 1.5-15.9		
Average, 11.7		
0-5	34	10.0
6-9	67	19.8
10-12	80	23.6
13-15	158	46.6
Trauma mechanism		
Bicycle	99	29.2
MVA	65	19.2
Assault	42	12.4
Fall on the ground	41	12.1
Fall from a height	32	9.4
Hit by object	24	7.1
Horse kick	18	5.3
Other	18	5.3
Type of facial fracture		
Isolated mandibular	259	76.4
Isolated midfacial	67	19.8
Combined mandibular and midfacial	13	3.8

Abbreviation: MVA, motor vehicle accident.

Thorén et al. Concomitant Injuries in Facial Fractures. *J Oral Maxillofac Surg* 2012.

ture (≥ 1 fracture in the mandible but no midfacial fracture); 2) isolated midfacial fracture (≥ 1 fracture in the midface but no mandibular fracture); and 3) combined mandibular and midfacial fractures.

Results

Descriptive statistics of the 339 children are listed in Table 1. Most were boys (61.9%). Their ages ranged from 1.5 to 15.9 years (average, 11.7 years). The occurrence of fracture increased with increasing-age group, from 10.0% in the 0- to 5-year-old group to 46.6% in the 13- to 15-year-old group. Bicycle accidents (29.2%) and MVAs (19.2%) were the leading causes of injury. An isolated mandibular fracture was by far the most common type of facial fracture (76.4%).

Forty-four children (11.0%) had concomitant injuries in organ systems other than the face. As presented in Table 2, limb injuries occurred in 31 of the 339 patients (9.1%), head and neck injuries in 19 (5.6%), and chest injuries in 6 (1.8%). The most common injury types were upper limb injury (8.0%), brain injury (ie, hemorrhage and/or contusion; 3.2%), and lower limb injury (2.9%). Cervical spine injury was infrequent (0.9%).

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