



A ten year analysis of the traumatic maxillofacial and brain injury patient in Amsterdam: Complications and treatment[☆]



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ARTICLE INFO

Article history:

Paper received 9 January 2014

Accepted 4 June 2014

Available online 12 June 2014

Keywords:

Maxillofacial

Trauma

Brain

Injury

Complications

Treatment

ABSTRACT

Maxillofacial trauma is often associated with injuries to the cranium, especially in high-energy trauma. The management of such cases can be challenging and requires close cooperation between oral and maxillofacial surgery and neurosurgical teams. There are few reports in the current literature describing the complications that develop in patients with maxillofacial trauma and traumatic brain injury (TBI). Complications can be categorized as early or late and/or minor and major. The exact definition of complications and their categorization remains a matter of current debate. We present a 10 year retrospective study of complications and their subsequent management in patients receiving maxillofacial and neurosurgical treatment for maxillofacial trauma associated with TBI. The study population consisted of 47 people, excluded from a maxillofacial trauma population of 579 patients. The severity of the trauma was scored as mild, moderate or severe, using the Glasgow Coma Scale at presentation of the Emergency Department. In total 36 patients (76.6%) developed complications. Patients involved in road traffic collision were most likely to develop complications (92.3%). This was followed by falls (66.7%) as mechanism of the injury. Patients aged 60–69 years experienced the highest complication rate (5), followed by patients aged 20–29 years (4.1) and 30–39 years (3.5). The majority of complications were infection and inflammation (36.4%), followed by neurological deficit (24.0%), physiological dysregulation (11.6%) and facial bone deformity (8.3%). Patients who developed no complications, most often presented with mild TBI (72.7%).

The most common treatment modality employed to manage complications was pharmacological, followed by antibiotic treatment, conservative treatment and decompression therapy. The mean hospital stay after the trauma for the patients with complications was 28 days. Thirteen patients (36.1%) were transferred to a rehabilitation centre, a nursing home, or a home for the elderly. Nine patients (25%) completely recovered from their complications and 4 patients (11.1%) died after the trauma. This report provides useful data concerning the rate and type of complications that occur, and the multidisciplinary treatment that is required in traumatic maxillofacial and brain injury patients.

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1. Introduction

Maxillofacial trauma with associated traumatic brain injury (TBI) carries significant potential for mortality and neurological morbidity (Bogusiak and Arkuszewski, 2010; Giuliani et al., 1997; Stiver, 2009). Traumatic brain injury (TBI) is defined as loss of consciousness and/or post-traumatic amnesia in a patient with a

non-penetrating head injury (Davidoff et al., 1988). Maxillofacial fractures are often associated with injuries to the cranium, especially in high-energy trauma. Approximately one third of the patients presenting with facial fractures have some form of intracranial injury (Brandt et al., 1991; Haug et al., 1990). Within this cohort, frontal sinus fractures, panfacial fractures and orbitoethmoid fractures are most prevalent, as these fracture sites involve a wall of the anterior cranial fossa and a proportion of the force applied will be transmitted directly to the frontal lobes (Brandt et al., 1991; Haug et al., 1994). In their population Salentijn et al. (2014) found that 8.1% of all the surgically treated

[☆] No grants were used.

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maxillofacial and TBI patients, also required neurosurgical intervention during the same hospital stay.

A number of studies report road traffic collisions as the main mechanism of injury in these patients (Brandt et al., 1991; Haug et al., 1990; Pappachan and Alexander, 2006; Salentijn et al., 2012, 2014).

Management of maxillofacial injury associated with TBI can be challenging and frequently necessitates a multidisciplinary team approach of oral and maxillofacial surgeons and neurosurgeons (Salentijn et al., 2014; van den Bergh et al., 2012). Keen awareness and efficient cooperation between specialities facilitates rapid diagnosis and appropriate, timely treatment (Katzen et al., 2003).

A variety of complications may occur, in the immediate and late postoperative period (Cannon et al., 2012). Early postoperative complications include airway compromise, infection, inadequate fracture reduction, and morbidity or mortality from concurrent injuries. Late postoperative complications include cosmetic deformity, malunion or non-union of fractures, enophthalmus, temporomandibular joint ankylosis, meningitis and mucocele formation. Alternatively, complications could be categorized as major or minor (Shibuya et al., 2007). Minor complications are defined as seroma, haematoma, wound dehiscence, and infection managed with medical treatment. Major complications are defined as loss of vision, major neurological injury, death or severe infection requiring prolonged hospitalization (Shibuya et al., 2007).

To our knowledge there are few reports of complications arising in patients with maxillofacial trauma and TBI in the current literature. Furthermore the exact definition of complications and their categorization remains a matter of current debate.

The aim of this retrospective study is to investigate the complications, treatment modalities, and follow-up of traumatic maxillofacial and brain injury patients, treated by oral and maxillofacial surgeons and neurosurgeons during the same hospital stay.

2. Material and methods

Hospital and outpatient records from January 2000 to January 2010 were reviewed and analysed to identify trauma patients undergoing maxillofacial surgery and neurosurgical intervention during the same hospital stay. The diagnosis of TBI was based on evaluation and consultation by the Department of Neurosurgery and Neurology in our hospital. Clinical judgement of the neurological injury was dependent on the level of consciousness and based on the GCS score at admission of the Emergency Department of our hospital. TBI was defined as mild (GCS 14–15), moderate (GCS 9–13) and severe (3–8) (Mena et al., 2011).

Indications for neurosurgical intervention were aesthetic appearance, open skull fractures with dural lesions, intracranial haemorrhage (e.g., subdural, epidural and intracerebral haematoma), and combinations thereof. Patients were included if they had been treated surgically for their maxillofacial skull and brain injuries by the oral and maxillofacial surgeons and the neurosurgeons during the same hospital stay. Patients were excluded if they had been treated by the neurosurgeons for non-skull related injuries (e.g., spine injuries/vertebral injuries).

Medical notes for the study population were reviewed to collect data including: gender, age, mechanism of injury, maxillofacial fracture type, complications and treatment modality.

2.1. Statistics

Data were processed using the Statistical Package for Social Sciences (SPSS) version 17.0. For parametric data Student *t*-test and non-parametric data chi-square tests were performed.

Table 1
General population description.

	Patients treated for OMFS trauma and TBI (2000–2010) n (%)	Number of patients developing complications n (%)
Total	47	36 (76.6%)
- Male	42 (89.4%)	31 (73.8%)
- Female	5 (10.6%)	5 (100%)
Cause		
- Traffic accident	26 (55.3%)	24 (92.3%)
- Violence	2 (4.3%)	1 (50%)
- Fall	12 (25.5%)	8 (66.7%)
- Other	7 (14.9%)	3 (42.9%)

OMFS: Oral and Maxillofacial Surgery; TBI: Traumatic Brain Injury.

3. Results

3.1. Patient demographics concerning complications

In total 579 patients with maxillofacial fractures were treated surgically over a period of 10 years. Of these patients, 47 were diagnosed with associated traumatic brain injury (TBI) that required neurosurgical intervention and were therefore included in the study population.

This means that the study population of maxillofacial and traumatic brain injury patients consisted of 47 people. In total 36 patients (76.6%) developed complications, meaning that in 11 patients (23.4%) no complications were encountered (Table 1). All 5 female patients and 31 (73.8%) of the 42 male patients developed complications. Patients involved in road traffic collision were most likely to develop complications. Most of the patients developed complications after road traffic collisions (92.3%), followed by falls (66.7%).

3.2. Complications according to age classification

The mean age of the patients with complications was 32.2 (SD: ± 12.9) years. The youngest patient was 15 years of age and the oldest patient was 69 years of age. Overall patients aged 20–29 years accounted for the largest group in which complications occurred (37.2%), followed by the group of 30–39 years of age (32.2%) (Fig. 1). Patients aged 60–69 years experienced the highest complication rate (5), followed by patients aged 20–29 years (4.1) and those aged 30–39 years (3.5). The majority of male patients were aged 20–29 years (38.1%) and the majority of female patients were 30–39 years of age (60%).

3.3. Overview of complications and classification into groups

A total of 121 complications were described (Fig. 2), which were classified into 10 different groups (Table 2). As described in Fig. 2,

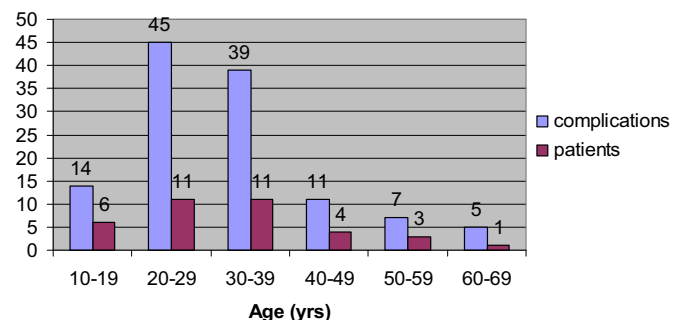


Fig. 1. Patients and complications according to age.

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