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Associated injuries in facial fractures: review of 839 patients

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SUMMARY. **Patients with facial trauma may have associated injuries requiring immediate or specialised attention. This paper reports the incidence and nature of significant associated neurosurgical, ocular, spinal, torso and extremity injuries in facial fracture patients treated by the Department of Plastic and Reconstructive Surgery from June 1989 to June 1992. Of 839 patients treated during the period, 95 patients (11.3%) sustained significant concomitant injuries outside the facial skeleton. There were 45 (5.4%) patients with associated neurosurgical injuries, 33 (3.9%) with ocular injuries, 8 (0.9%) with spinal injuries, 16 (1.9%) with injuries of the torso, and 62 (7.4%) with injuries of the extremities. The spectrum of the injuries is presented. Most neurosurgical injuries are a result of focal impact and the intervention required is related mainly to local fracture management and the repair of dural tears. The risk of significant ocular injury is highest when the fracture involves the orbit. Injuries of the spine, torso (chest, abdomen, pelvis), and limbs were seen mainly in road trauma patients.**

Facial injury crosses the anatomical boundaries of several surgical subspecialities. Localised injury to the face may involve not only the soft tissue and the facial skeleton but also by local extension the brain, the eyes, the sinuses and the dentition. Where trauma occurs in more diffuse high velocity impacts, concomitant injuries that can be more immediately life-threatening than the facial injury have been frequently reported.[1,2] This paper details the incidence and spectrum of significant associated injuries in a prospectively studied group of adult patients with facial fractures evaluated and treated in our department.

Materials and methods

All patients with facial fractures presenting to the Department of Plastic and Reconstructive Surgery at the Royal Adelaide Hospital between June 1989 to June 1992 have had standardised data forms completed on hospital discharge. Included are full patient personal details, history of injury, physical examination findings, radiological findings, diagnosis and treatment instituted. The findings on formal ophthalmological evaluation were noted for all patients with orbitozygomatic, frontal nasoethmoid, midfacial and complex facial fractures. Review by other specialties was instituted as indicated by the findings on screening evaluation. From this large series of facial injuries, a smaller subgroup was identified in whom there were significant associated injuries both locally in the craniofacial region and at a distance. The pattern of associated injury has been analysed and their relation to individual facial fractures identified.

Results

839 patients with facial fractures were evaluated and treated by the Department of Plastic and Reconstructive Surgery at the Royal Adelaide Hospital over the 3-year period between June 1989 to June 1992, either a primary consultation or on referral from another department. The aetiological factors in this series are detailed in Table 1. There were 678 males (80.9%) and 161 females (19.1%) and the age range was 15–88 years, with the peak incidence in the third decade of life.

A total of 95 (11.3%) patients sustained concomitant injuries to other parts of the body. The incidence of the injuries according to the various sites is shown in Table 2.

Of the neurosurgical group, only moderate to severe head injuries were included, these being injuries severe

Table 1 Aetiological factors in 839 patients with facial fractures

Aetiology	*No. of patients* (%)
Road traffic accident	158 (18.8)
Assault	430 (51.2)
Sports-related	137 (16.3)
Falls	81 (9.7)
Gunshot	6 (0.7)
Work-related	13 (1.6)
Others	14 (1.7)
Total	839 (100.0)

Table 2 Associated injuries in 839 patients with facial fractures

Type of injury	*No. of patients* (%)
Neurosurgical	45 (5.4)
Ocular	33 (3.9)
Spinal	8 (0.9)
Torso (chest, abdomen, pelvis)	16 (1.9)
Extremities	62 (7.4)

Table 3 Computerised tomography findings in 45 patients with moderate to severe head injury

CT findings	*No. of patients*
Intracranial haemorrhage	
Subdural haematoma	5
Extradural haematoma	2
Contusional	9
Fractures: vault	
Single	17
Multiple	3
Fractures: base	
Single	18
Multiple	3
Diffuse cerebral oedema	4
Pneumoencephaly	6
Within normal limits	3
Miscellaneous	1

Table 4 Aetiology of facial fractures in the 45 patients with associated head injury

Aetiology	*No. of patients* (%)
Road traffic accidents	33 (73)
Assault	4 (9)
Falls	4 (9)
Work-related	3 (7)
Sport	1 (2)
Total	45 (100)

Table 5 Associated ocular injuries

Type of injury	*No. of patients*
Anterior segment	
Corneoscleral abrasions/lacerations	4
Hyphaema	10
Severe chemosis with infection	1
Increased intraocular pressure	1
Posterior segment	
Vitreous haemorrhage	3
Retinal oedema/tear/haemorrhage	10
Commotio retinae	3
Choroidal haemorrhage/rupture	1
Optic nerve damage	5
Penetrating globe injury (followed by enucleation)	3

Table 6 Aetiology of facial fractures in the 33 patients with associated ocular injury

Aetiology	*No. of patients* (%)
Road traffic accidents	13 (39)
Assault	14 (43)
Falls	1 (3)
Sports	3 (9)
Others	2 (6)
Total	33 (100)

Table 7 Sites of fracture in the patients with associated ocular injury

Site of facial fracture	*No. of patients* (%)
Orbit	6 (18)
Zygoma	11 (33)
Nasal and related fractures	2 (6)
LeFort, panfacial and other complex fractures	14 (43)
Total	33 (100)

Table 8 Aetiology and associated injuries of the spine, torso and extremities in 839 patients with facial fractures

Aetiology/injury	*RTA*	*Assault*	*Falls*	*Sport*	*Others*
Torso:					
Chest	6	4		1	–
Abdomen	2	–	–	–	–
Pelvis	3	–		–	–
Spine:					
Cervical	2	–	–	–	–
Thoracic	1	–	–	–	–
Lumbar	4	–	–	–	–
Sacral	1	–	–	–	–
Extremities:					
Single fracture	32	6	1		1
Multiple fractures	18	1		–	–
Others:					
Brachial plexus	2	–	–	–	–
Compartment syndrome	1	–	–	–	–

enough to warrant neurosurgical consultation as well as computerised tomography of the brain. Excluded were patients managed by the general surgeons with mild closed head injury and temporary loss of consciousness who recovered without any neurological sequelae. Also excluded were patients referred for neurosurgical assessment but who did not require CT scanning and recovered without further intervention. There were 45 patients who fulfilled these criteria and their various CT findings are displayed in Table 3. The patient classified under 'miscellaneous' had a carotico-cavernous fistula and a fractured mandible as a result of a fall. Table 4 shows the aetiology in the head-injured group. The majority of these patients sustained their injuries in high velocity road traffic impacts. The facial fracture pattern was complex (*i.e.* LeFort, panfacial, or complex) in 33 patients (73%). The other 12 patients sustained fractures of the zygoma (4), mandible (6) and supraorbital ridge (2).

Neurosurgical intervention was required in 13 patients (29%) and of these, seven patients required dural repair, four patients underwent elevation of depressed skull fractures, one needed a cranioplasty for a severely comminuted frontal fracture and one required drainage of a subdural haematoma. The carotico-cavernous fistula was embolised.

The spectrum of ocular injuries is shown in Table 5, whilst the aetiology and site of facial fracture in these patients are recorded in Tables 6 and 7. Zygomatic fractures affecting the orbital floor were classified under the zygoma. Excluded from this group were patients with eyelid or adnexal injuries, nonvisually threatening injuries such as transient subconjunctival haemorrhages, and socket-related problems such as enophthalmos and telecanthus which were included in a previous report.[3]

The range of other associated injuries according to

the aetiology is displayed in Table 8. The vast majority of these occurred where the energy of impact was high.

Discussion

Patients with facial fractures can present with a combination of associated injuries of varying complexity and severity. Gwyn *et al.*[1] reviewed 567 patients with facial fractures and found that 51.6% had associated injuries and 28.9% had pre-existing systemic disease. Luce *et al.*[2] stressed the role of a capable primary surgeon in making a proper overall assessment and organising management priorities. They reported a 14% incidence of associated injuries in the group injured in a low-velocity circumstance (*e.g.* assault or fall) and 64% in the high-velocity group (*e.g.* road traffic accident). Both these series had a relatively high proportion of road traffic accidents, 35% and 65% respectively. In keeping with recent epidemiological trends, assault was the major aetiological factor (51.2%) in our series of 839 patients, with 18.8% being due to road trauma (Table 1). It is this changing pattern of aetiology, the change from high velocity to low velocity impact, that would explain the lower incidence (11.3%) of associated injuries in our series. However, the nature of these injuries continues to be significant and the well-recognised need for a multidisciplinary approach to the management of facial trauma remains evident.

Davidoff *et al.*[4] reported that 55% of 200 patients with facial fractures had closed head injury (CHI), which was defined as documented evidence of loss of consciousness and/or post-traumatic amnesia from reviews of ambulance and police reports, and interviews with patients and witnesses. More than 90% of their cases had minor CHI. Our overall incidence of moderate to severe head injury is 5.4%. Apart from a different selection criteria, this lower incidence is also attributed to a different aetiological profile in the other series. 52–71% were due to road traffic accidents in previous series.[1–3] Although it is recognised that mild CHI is not inconsequential, we chose to focus on the group with moderate to severe head injury the better to evaluate the spectrum of head injuries in our patients with their pattern of facial fractures. In this series, the majority of the injuries were skull fractures resulting from the focal traumatic impact, with a smaller proportion having parenchymal injury. Primary brain injury was thus very uncommon, supporting the theory of the air-filled impact-absorbing facial bones serving as a cushion protecting the brain.[5] In line with this, the neurosurgical intervention required in 2.9% of these patients was related mainly to the repair of dural tears and local fracture management. Although five patients demonstrated evidence of a subdural haematoma on CT scanning, only one of them was large enough to require drainage. It is, however, recognised that the presence of intracranial haemorrhage is associated with a poorer survival rate.[6]

The incidence of associated ocular injury varies from 2.7% to 67% in retrospective series.[2,3,7] In a recent prospective series, 12% of the facial fracture patients had vision-threatening ocular injuries.[8] Our incidence of vision-threatening ocular injuries is 3.9%. This could partly be explained by the sizable percentage (36%) of isolated mandibular fractures in our 839 patients where the risk of an associated ocular injury is much lower. The risk is highest when the fracture involves the orbit.[8] Aetiology is varied in this group, occurring almost equally with high energy diffuse impacts (RTA) and the more localised but lower energy impact of an assault. Although the incidence is low, associated ocular injury is significant in its nature and severity. The practice of a pre-operative ophthalmological assessment in high risk patients is useful not only because of the possibility of fracture treatment-related complications, but also because successful management of such injuries requires early recognition and prompt intervention by the appropriate ophthalmic specialist. Injuries of the torso, spine and extremities were seen mainly in road traffic accidents. The more brutal assaults resulted in rib and limb fractures which, although not infrequent, were seldom life-threatening in the acute period nor associated with significant long-term functional disturbance. Previous series have also found associated spine and torso injuries to be uncommon.[1–3]

In summary, it is apparent that the incidence of associated injuries is altered with changing patterns and aetiology of injury. However, it remains a characteristic feature of facial trauma that the anatomical boundaries of various disciplines are frequently crossed, on the face as well as in the rest of the body. It should not only be viewed as an isolated injury of the facial skeleton but as part of a spectrum of potentially disabling and sometimes life-threatening injuries which requires a coordinated team approach.

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