

Operative management of equine-related maxillofacial trauma presenting to a Melbourne level-one trauma centre over a six-year period

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Abstract

The aim of this study was to examine the pattern of equine-related maxillofacial trauma that required operative treatment in patients who presented to a level-one trauma centre in Melbourne between 2011 and 2016. A total of 28 patients (16 female and 12 male, median (range) age 31 (16–76) years) were identified from a database of all operatively managed maxillofacial trauma cases, and data were collected on demographics, mechanisms and patterns of injury, and management. The most common mechanism was kicking ($n = 16$), which was also the most likely to result in multiple injuries. Half the patients sustained an injury to the midface only, with naso-orbitoethmoidal (NOE) and orbital fractures being the most common fractures. Of the total fractures (those that did and did not require an operation), 44/54 were managed with internal fixation. Exactly half the patients were treated as inpatients and half as outpatients, and despite a longer total duration of hospital stay for inpatients, the postoperative period was the same in both. Many horse-related maxillofacial injuries were sustained by young women, and the midface was most commonly affected. More injuries overall were sustained while unmounted (particularly by kicks) than by falls. © 2019 The British Association of Oral and Maxillofacial Surgeons. Published by Elsevier Ltd. All rights reserved.

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Introduction

Sports and recreational activities that involve horses are popular in Australia, and over 250 000 Australians are actively engaged in them each year.¹ As a result, equine-related maxillofacial trauma is a considerable burden on the healthcare services. In Australia, about 0.5% of presentations to the emergency department, or 4.2% of those relating to sport, are thought to be horse-related,² and of them, maxillofacial fractures are estimated to account for 19%–54%.^{3–5}

Maxillofacial injuries can result from a range of horse-related activities, from recreational riding and training to professional racing.⁶ Epidemiological studies have shown that horse-related injuries are common in children and young (often female) adults,^{2,7} and they are particularly prevalent in areas where horse riding is a common form of recreational activity or mode of transport.⁷

Injuries can be sustained while mounted (falls), or unmounted (kicks, bites, or being stepped on),^{5,7–10} and can result from the incorrect handling of horses or their unpredictable nature.¹¹ They are comparable to those sustained by rugby players and cyclists,^{11,12} and patients often require admission to hospital for operative management. As a result, the financial cost to the health service is estimated to be higher than that for many other popular sports.^{10,11}

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Table 1
Patients by sex and age groups (years).

Sex	16-25	26-35	36-45	46-55	56-65	66-75	75+	Total
Female	4	6	4	1	0	1	0	16
Male	3	3	3	0	1	1	1	12
Total	7	9	7	1	1	2	1	28

Table 2
Mechanism of facial fracture.

Mechanism	Isolated	Multiple injuries	Total
Mounted	5	0	5
Fall	5	0	5
Unmounted	15	3	18
Kick (directly or indirectly)	13	3	16
Head-butt	2	0	2
Mounted and unmounted	3	2	5
Fall + kick	3	2	5
Total	23	5	28

A handful of papers have described the epidemiology of maxillofacial trauma resulting from horse-related activities, though few have described the fracture patterns and management. In this study therefore, we have examined both in patients who presented to a major tertiary trauma centre in Melbourne.

Patients and methods

This study was approved by the Research Ethics Committee. Data on patients who were treated by the oral and maxillofacial (OMF) team at a major trauma hospital were analysed over a six-year period (2011-2016). A total of 878 patients were treated operatively over this period, and of them, 28 (3%) had maxillofacial injuries that were sustained during equine-related activities. Patients' records were reviewed and data recorded on demographics, presentation, mechanism of injury, and associated injuries. Facial fractures and management were recorded and confirmed by operative notes and postoperative imaging. Data were entered into Microsoft Excel and analysed descriptively using in-built tools.

Results

Trend and presentation to health services

A total of 28 patients were managed operatively for maxillofacial trauma sustained during equine-related activities over the six-year period. Twelve of them presented directly to the emergency department, 14 presented initially to other hospitals, and two to general medical practitioners. Most (n = 19) presented on weekdays, and nine at weekends. There was no obvious trend in annual or seasonal variation, or in the days on which patients presented.

Table 1 shows the number of injuries by sex and age group. The overall median (range) age was 31 (16-76) years.

Table 3
Fracture subunit and specific management.

Fracture subunit	No.
Upper third:	
Frontal bone	6
With orbital rim involvement	1
ORIF	1
With orbital rim/roof involvement	5
Conservative	2
ORIF	3
Middle third:	
Maxilla	3
Le Fort I	3
ORIF	3
Nasal bone	6
Closed reduction under LA	1
Closed reduction under GA	5
NOE	10
ORIF	8
ORIF + medial canthopexy – fixation with wire	2
Orbital	10
1-wall defect – isolated floor	7
Conservative	1
Reconstruction – titanium	2
Reconstruction – PPE	1
Reconstruction – composite (PPE + titanium)	3
2-wall defect – (wall/floor, or wall/roof)	3
Conservative	1
Reconstruction – titanium	2
ZMC	8
Zygoma	3
Lift and 1 point of fixation	1
Lift and 2 points of fixation	1
Lift and 3 points of fixation	1
Zygoma + arch	5
Lift and 1 point of fixation	1
Lift and 2 points of fixation	2
Lift and 4 points of fixation	2
Lower third:	
Mandible	18
Angle	3
ORIF – miniplate(s) only	3
Body	4
ORIF – miniplate(s) only	4
Parasymphysis	5
ORIF – miniplate(s) only	4
ORIF – miniplate(s) + arch bars/IMF	1
Coronoid	1
Conservative	1
Condyle – head/intracapsular	2
Closed reduction – IMF screws	2
Condyle – neck/subcondyle/extracapsular	3
Conservative	2
Manual manipulation only	1
Other:	
Dentoalveolar	4
Conservative	2
Managed under LA	1
Managed under GA	1
Soft tissue (lacerations)	18
Conservative	6
Washout/repair under LA	2
Washout/repair under GA	10
Total	83

ORIF: open reduction and internal fixation; LA: local anaesthetic; GA: general anaesthetic; IMF: intermaxillary fixation; PPE: polyethylene.

A total of 23 patients had injuries isolated to the facial skeleton. Five had injuries to more than one body system in addition to the face, four of these were intracranial, and one was to the cervical spine.

Table 2 shows the mechanisms of injury. Most patients were injured while unmounted ($n = 18$), particularly by being kicked ($n = 16$). Multiple injuries were most common in unmounted riders. Only one patient was intoxicated.

Patients with facial fractures were grouped according to the third of the face and the side involved, or a combination of facial thirds and sides. Most fractures (14 patients) involved only the middle third; a smaller number (8 patients) involved only the lower third. Bilateral fractures (10 patients) were more likely to occur than left (8 patients) or right-sided fractures (6 patients) (Fig. 1).

In total there were 61 facial fractures (those that did and did not require operative treatment) of which 54 were treated operatively. Of them, 44 were managed with internal fixation, nine with closed reduction, and one with a combination of both. When dentoalveolar and soft-tissue lacerations were included, there were 83 injuries in total. The most common fracture subunits were naso-orbitoethmoidal (NOE) and orbital fractures. The management of each fracture subunit is shown in Table 3.

Of the 28 patients, 14 were admitted at the time of presentation and operated on during this stay (inpatient group). The other 14 had operations when they were readmitted after their initial presentation (outpatient group). The time to operation, duration of hospital stay, and postoperative periods for both groups are shown in Table 4.

Discussion

The aim of this study was to characterise the epidemiology, aetiology, and management of horse-related maxillofacial injuries that were treated operatively by the OMF team at a major tertiary trauma hospital over a six-year period. Patients who were managed conservatively were not included, so the study will probably have underestimated the true number of injuries overall. Although relatively common, horse-related injuries account for a small but important subcategory when all other mechanisms are considered. Over the study period 878 patients were operated on by the OMF team and horse-related trauma accounted for only 3% of the workload. Studies of a longer duration would be required to analyse larger numbers of these injuries.

Presentation

Seasonal variations with injuries peaking during the summer have previously been reported.¹³ Our data, however, did not show any obvious seasonal variation, probably because a large number of the patients were injured while unmounted, which is likely to be the case irrespective of the riding season.

In keeping with previous studies, there was also no obvious trend in the days on which the patients presented.⁷

Demographics

A relatively large number of patients were female, particularly below the age of 35 ($n = 10$). This high incidence has been widely reported and is thought to result from their greater involvement with horses.¹⁴ Over the age of 30, the ratio between men and women equalised, which seems consistent with other studies,^{11,14} and is probably because of a transition from young, female, amateur riders to older, professional, male riders.²

Isolated compared with multiple injuries

In our study, 5/28 patients had an injury to another body system in addition to the craniofacial complex. Riders in the unmounted, and the mounted and unmounted subcategories were most likely to have multiple injuries associated with facial fractures, particularly intracranial injuries. This seems to contradict other studies that have found that multiple injuries often occur in riders who fall from horses.⁸ Nevertheless, the relatively high rate of concomitant injuries associated with horse-related maxillofacial trauma means that careful consideration and investigation of all body systems is required, particularly as the facial injuries may be the most obvious.

Mechanism of injury

A number of studies have identified falls as the most common cause of equine-related trauma,^{8,9,15,16} but in the case of maxillofacial injuries it seems that most occur when riders are unmounted, particularly when they are kicked.^{7,11,17}

Although helmets have traditionally been used to protect the head, they could also be used to prevent maxillofacial trauma. Our results suggest that equipment to protect the face should be worn at all times when handling horses, particularly when unmounted and when it may not seem necessary. Published studies have shown that although a substantial proportion of horse-related maxillofacial injuries are sustained by unmounted riders (as seen in this study), helmets are rarely used or encouraged in this subgroup.¹⁸ We therefore think that safety campaigns that target the use of helmets in unmounted riders should be considered.

Site and pattern of injury

The middle third of the face was the area most commonly injured in our patients, and most were NOE and orbital fractures (Fig. 1). This seems to be consistent with other limited studies that have described fracture patterns in horse-related trauma.^{7,17} The pattern was similar to all the facial trauma (equine and non-equine) over this period, but differed slightly when the mandible was the most common subunit fractured.

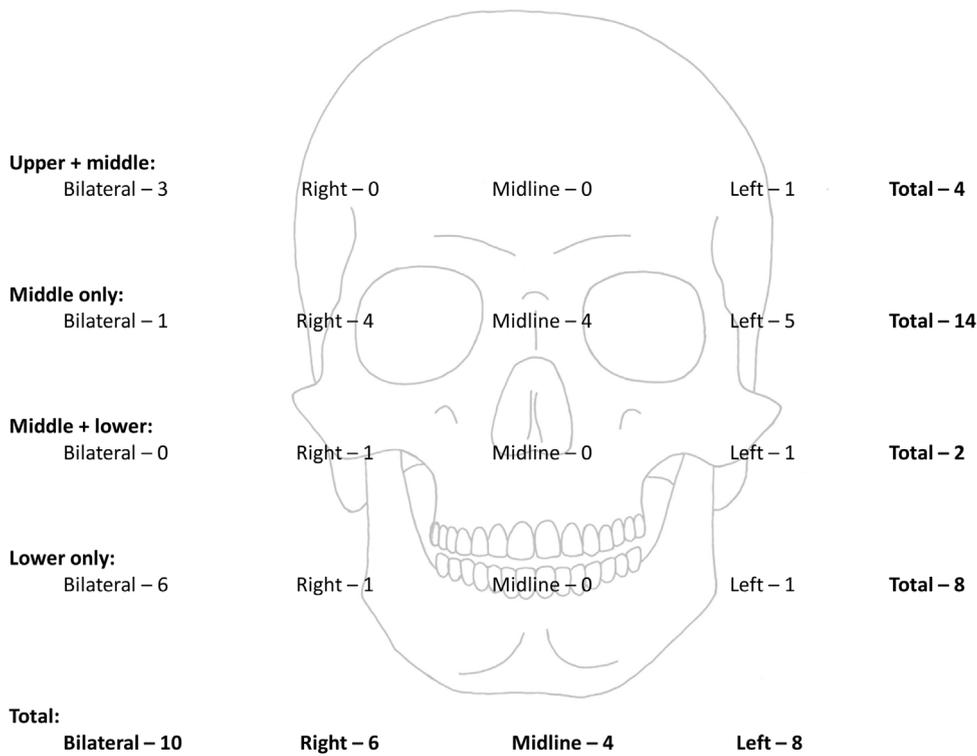


Fig. 1. Pattern of injury and side of face affected.

Table 4
Overall inpatient and outpatient stays.

	Time from presentation to operation (days)		Total duration of hospital stay (days)		Duration of postoperative hospital stay (days)	
	Mean	Median (range)	Mean	Median (range)	Mean	Median (range)
Total patients (n = 28)	7.2	6 (0-17)	3.3	2 (0-14)	1.7	1 (0-6)
Inpatients (n = 14)	3.5	2 (0-11)	4.9	3 (1-14)	1.7	1 (1-4)
Outpatients (n = 14)	10.9	11.5 (4-17)	1.8	1	1.7	1

We found that the prevalence of cases in which more than one third of the face was involved (21%) was higher than that in all patients who required operative treatment for facial trauma over the same period (13%). This may be because the injuries caused by horses (because of their speed and mass) are comparable to those of motor vehicle accidents.⁸

In addition to our suggestion to wear protective helmets at all times when handling horses, we think that helmets should be designed to protect the middle and lower facial skeleton. These could be similar to those with an anterior guard to protect the midface, or those that protect the whole face as are worn by cricketers.

Management

Maxillofacial injuries caused by horses are thought to have a higher operative rate than those sustained in other sports.¹¹ In our study 54/61 (88%) of the patients with facial fractures required operations, but when compared with all maxillofacial trauma over the period, it was slightly higher at 90%. These figures, however, need careful consideration, as

patients with isolated, conservatively-managed maxillofacial injuries were not included.

Outcomes

The mean (range) total duration of hospital stay for all patients was 3.3 (0-14) days, although this was (unsurprisingly) longer for inpatients and shorter for outpatients. This is consistent with other studies that have reported mean durations of two to seven days for patients with injuries of the head and neck.¹⁶ Of note, the duration of postoperative stay was the same for both inpatients and outpatients. This probably reflects the priority of care for patients with multiple injuries; maxillofacial surgery is commonly done after more critical injuries have been stabilised.

In conclusion, horse-related maxillofacial trauma is a small but important subgroup of facial trauma. Our study reinforces the importance of wearing helmets at all times when handling horses, and also highlights the need for additional protection of the entire facial skeleton. Larger studies are now

required to further characterise the pattern and management of these injuries.

Conflict of interest

We have no conflicts of interest.

Ethics statement/confirmation of patients' permission

This study was approved by the Research Ethics Committee. Patients' permission not required.

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