

Patterns of Mandibular Fractures Related to Interaction with Horses

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Abstract

Background: The risks of facial injuries with horse-related activities are much higher than in other sports. There are just a few studies about horse-related maxillofacial injuries, and there are even less data in particular about mandibular fractures. However, the aim of this study was to determine the patterns for mandibular fractures caused by horse contact or horseback riding. **Materials and Methods:** Data from patient records were collected over 15 years from January 2000 to March 2015. All patients who suffer a mandibular fracture caused by horse contact or horseback riding were included in this study. The analysis contained demographical data, trauma mechanism, type of mandible fracture, and type of protective clothing. **Results:** Overall, 23 patients within 37 fractures were included in the study. Of those, 87% were females and 13% males. More than the half (52.2%) were aged between 16 and 30 years. The most common trauma mechanism was a horse kick (78.3%). The most common site of fractures was the parasymphysis (32.4%) and the condylar region (32.4%), followed by the angle (21.7%). In addition, 52.2% of the patients had a single and 47.8% a combined fracture of the mandible. Nearly all patients (95.7%) underwent surgery. Open reduction and internal fixation was the treatment of choice. Only 17.4% of the patients wore a helmet. **Conclusion:** Mandibular fractures are not the leading trauma in horse relating accidents; however, they are often associated with functional loss. The most frequent cause is a kick from the horse while unmounted. Hence, there is a need for protective equipment usage at all times around horses especially wearing a helmet with a face guard.

Keywords: Equestrian sports, horse-related injuries, mandible fracture, maxillofacial trauma

INTRODUCTION

Horseback riding is very popular in Germany, especially in Lower Saxony.^[1] According to the Fédération Equestre Nationale in Germany, there are about 1.1 million horses in Germany with 3.7 million riders (Fédération Equestre Nationale, 2015). Many studies prove that the risks of injuries and fatal accidents with horse-related activities are much higher than in other sports.^[2-4] There are even more horse-related accidents occurring per hour compared to motorcycling, skiing, rugby, or football.^[4-6] Horse-related injuries are the 8th leading cause of emergency department presentation for sports and recreation-related injuries in female.^[7] One in five riders suffers a serious injury with hospitalization, surgery,

or long-term disability during their lifetime which results in a high-financial burden for the health-care system.^[8-11] The most common body regions to be injured during horse-related accidents are the head, face and neck region.^[7,12,13] Horses are powerful creatures. An average horse weighs up to 1200 kg and can reach a speed of 65 km/h.^[1,13] The head of a horseback rider is approximately 3 m above the ground. However, falling from this height can cause serious injuries. Likewise, if one

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is not sitting on the horse, he can be seriously injured from a single kick: a horse kick can strike the body area with a force of one ton – and the face is the most common target.^[7,12,14,15] Moreover, facial injuries are more frequent in unmounted equestrians.^[16] Considering that horse riding is a high-risk sport, the rider usually is insufficiently protected. There are body/shoulder protectors for spine and thoracic protection and helmets for head protection. Wearing a helmet and a protection vest are mandatory in Germany depending on the discipline and the skill level. However, most of the riders wear no safety equipment.^[8] Based on improved safety guidelines for riders, horse-related accidents had decreased about 46% in the last 20 years.^[5] Nevertheless, the effectiveness wearing helmets for preventing facial injuries are controversially discussed in literature.^[5,12,15,17,18] A great part of accidents happens in unmounted equestrians.^[1,16] In these cases, most of the riders usually do not wear helmets. In literature, there are just a few studies about horse-related maxillofacial injuries especially mandibular fractures. Therefore, the aim of the study was to determine the patterns for mandibular fractures caused by handling with horses or horseback riding.

MATERIALS AND METHODS

Patient records were investigated from January 2000 to March 2015. All patients treated for a mandibular fracture caused by horse contact or while horseback riding in the Department for Cranio Maxillofacial Surgery at Medical School Hannover were included in the study. Patients with only soft-tissue injuries and/or only conservatively treatment were excluded from the study. The data were evaluated retrospectively. The data included demographic information (age, and gender), circumstances of the accident (trauma mechanism, safety clothing, stud or not stud), characteristics of the fracture, and surgical treatment. SPSS Statistics (SPSS for Windows, Version 23.0, SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Descriptive analysis was performed for all demographic data. Furthermore, we used the Fisher's exact and ANOVA tests to compare relevant rates and quantitative data. $P < 0.05$ was considered as a level of significance.

RESULTS

In the time from January 2000 to March 2015, 77 patients with facial injuries caused by horses were treated in the Department for Cranio Maxillofacial Surgery of Medical School Hannover. Of all patients, 23 (29.9%) had a mandible fracture. The age ranged between 8 and 78 years (mean = 30.6 years; standard deviation = 16.5). The age group 16–30 years accounted for 52.2%, followed by the group 31–45 with 21.7%, the group <16 years with 13% and the groups 46–60, 61–75 and up to 76 with 4.3% each. Eighty-seven percent were female and 13% male [Table 1]. Nearly 78.3% suffered the fracture from a horse kick, while 13% fallen from the horse and 8.7% got the injury because of any horse contact. Fifty-six percent of the horses were not stud, while 26.1% were stud. In four cases, there was no information determinable. In most of the

cases (65.2%), no protective clothing was worn. Just four people (17.4%) wore a helmet. In four cases, there was no information. Six patients (26.1%) suffered a midfacial trauma in the same accident. Soft-tissue injuries were recorded in 47.8% and dental injuries 17.4% of the patients. A total of 37 fractures were found. The most common site of fractures was parasymphysis and condylar region, followed by the angle [Table 1]. The majority of the patients (52.2%) showed a single fracture with a parasymphyseal fracture in more than 50%. In patients with a combined fracture (47.8%), the combination of angle and contralateral parasymphysis fracture was the most common combination (27%). Open reduction and internal fixation (ORIF) was the treatment of choice (95.7%), except for fractures of the condyle. The condyle fractures were treated 50% operatively and 50% conservative. In one patient, the therapy was combined – one site ORIF, one site conservative. Nearly every second patient (47.8%) had a serious collateral injury, mostly a brain injury (21.7%). Three of all patients had even a polytraumata (13%). At the same time, 26.1% had a fracture of the midface. Dental injuries counted for 17.4% and soft-tissue injuries for 47.8%. Accidents happened mostly in summer or autumn (30.4% each), on Mondays (21.7%) and in the afternoon and evening time. Most of the people were advanced or professional riders (43.5% and 34.8%) [Table 2].

DISCUSSION

Horse riding is a popular sport activity, which is underestimated relating to the risks. Most of the accidents happen in mounted equestrians, except facial injuries.^[1] The most common facial injuries occur from horse kick in unmounted equestrians.^[1,15,19] In the presented study, 78.3% suffered from a mandibular fracture caused by horse kick, and about 13% fall from the horse. This outcome is consistent with the study by Antoun *et al.* 2011,^[20] where 71% of the patients occur a midfacial trauma while not mounted, mainly as a result of being kicked.^[20] In addition, Ueek *et al.* 2004 reported that 72% of all facial fractures are caused by horse kicks.^[17] The same result is reported in a study by Lee *et al.* 2008, where 73% got facial injuries while unmounted.^[21] The high incidence of facial trauma caused by horse kicks is not surprising. The face is an exposed part of the body. We know that head injuries decrease by wearing a helmet.^[5] Nevertheless, the face is still bare and vulnerable to direct trauma. A prospective study by Ueek *et al.* showed that there is no facial protection by wearing a helmet.^[17] With 17.4%, the rate of helmet wearers in our study is poor but comparable to other studies in the literature showing rates between 6% and 20%.^[16,22-24] In addition, Meredith *et al.* observed that, despite the increased likelihood of facial fractures due to kick in unmounted equestrians, helmet usage is rarely encouraged among this group (Meredith *et al.* 2010).^[25] The reasons are the belief that helmets are unnecessary or uncomfortable.^[26]

Women were frequently more involved than men (87% vs. 13%), and 52.2% of the patients were between 16 and 30 years old.

Table 1: Frequency of the mechanisms of injury based on the demographic and injury variables

Variables	Kick	Fall	Brunt	Total	P
Sex (male/female)	2/16	1/2	0/2	3/20	0.485 ^a
Age (mean±SD)	29 (13.2)	47.3 (30.0)	19.5 (7.8)	30.6 (16.5)	0.234 ^b
Other injuries	18	3	2	23	0.663 ^a
None	7	0	0	7	-
Brain	5	0	0	5	-
Cervical spine	2	0	0	2	-
Other	4	0	0	4	-
Midfacial injuries (yes/no)	6/12	0/3	0/2	23	0.324 ^a
Dental (yes/no)	7/11	1/2	0/2	8/15	0.548 ^a
Soft-tissue injuries	9	1	0	10	0.372 ^a
Safety clothing	2	2	0	4	0.085 ^a
Stud hoof ^c	5	1	0	6	0.672 ^a

^aFisher's exact test, ^bANOVA test. SD: Standard deviation

Table 2: Etiology of fractures and fracture sites

Etiology	Fracture site						Total
	Condyle	Parasymphysis	Symphysis	Angle	Body	Coronoid	
Kick	8 (44.4)	9 (50)	1 (5.6)	6 (33.3)	2 (11.1)	1 (5.6)	18
Fall	3 (100)	1 (33.3)	1 (33.3)	1 (33.3)	-	-	3
Others	1 (50)	2 (100)	-	1 (50)	-	-	2
Number of cases	12 (52.2)	12 (52.2)	2 (8.7)	8 (34.8)	2 (8.7)	1 (4.3)	23

This distribution is also shown in the literature.^[1,7,13,15,17,20,21] The high incidence of horse-related injuries in young women is because of their greater involvement with horses.^[27]

There were no data in literature about the influence of the severity of the injury if stud or nonstud hoof. In the present study, just 26.1% of the horses were stud. There was no coherence between a stud or nonstud hoof and the severity of the mandibular fracture. However, the sample size was very small, so it is vulnerable to bias.

Fractures of the mandible are the second common facial fractures following mid-facial fractures related to horse accidents.^[24] All in all the amount of mandibular fractures ranged between 16% and 34% in literature in the entirety of horse-related facial fractures.^[20,21,24] This is similar to our result of 29.9% of mandible fractures. Higher incidences of mandibular fractures (46% to 60%) sustained from other sports especially soccer.^[28,29] The most common site of fractures was the parasymphysis and the condylar region, followed by the angle [Table 2]. Comparing the results were reported by Lee and Steenberg 2008.^[21] In other sports, the most common fracture site is the angle, followed by symphysis, subcondylar region, and body, but depends on the type of sport.^[29] A large multicenter European study investigated characteristics of maxillofacial fractures in general.^[30] This study showed similar results for the distribution of the fracture location.^[30]

CONCLUSION

Related to interaction with horses mandibular fractures are the second common facial fractures. The most common site

of the fracture is the condylar and parasymphysis region. The most frequent cause is a kick from the horse while unmounted. Hence, there is a need for protective equipment usage at all times around horses. Especially, safety helmets have to be redesigned containing a face shield and mouth guard for a protection of the face and head all the time. For better compliance, riders have to be better informed about the risk factors by interaction with horses. If they are aware for the risk, a helmet-wearing mandatory will be more accepted.

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Conflicts of interest

There are no conflicts of interest.

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