PREHOSPITAL CARE

Hoof kick injuries in unmounted equestrians. Improving accident analysis and prevention by introducing an accident and emergency based relational database

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Objective: To assess injury patterns attributable to horse kicks, to raise the issue of preventive measures, and to evaluate the role of modern accident and emergency department computer software.
Methods: Data analysis using a new kind of full electronic medical record.
Results: Seventeen kicked equestrians were unmounted at the time of injury. Eight of seventeen patients sustained contusions of the extremities, the back, and the trunk. In nine patients an isolated facial injury was diagnosed. Five of nine patients needed referrals to the department of plastic surgery because of the complexity of the facial soft tissue wounds. Three underwent maxillofacial surgery.
Conclusion: Clinical: the equestrian community may underestimate the risk of severe injuries attributable to hoof kicks, especially while handling the horse. Educational lectures and the distribution of educational literature should be promoted. The introduction of additional face shields may be protective. Software related issue: the handling of an increasing amount of medical data makes a development in computerisation of emergency units necessary. Thus the increasing utilisation of new computer technology could have a significant influence on accident analysis and prevention and the quality of research in the future.

In recent decades the role of horses in society has completely changed. Once considered a work animal and the only way to pull heavy loads, the horse is now used primarily for fun and sports activities, at least in the western world. Today there are an estimated 50 000 Swiss equestrians (in a population of 6 million), and more than 13 000 are organised in equestrian and country clubs (unpublished data of the Swiss Equestrian Association).

Along with the emphasis on sport have come injuries. Series of injuries among non-professional equestrians, jockeys, polo players, and rodeo riders as well as cross country riders have been published in the past decade.[1–7] Although horseback riding accidents decreased about 41% during the past 20 years because of improved safety guidelines for riders, statistically there are still more horseback riding accidents per hour than motor bike accidents.[8]

Fractures of the extremities, spine, and pelvis as well as injuries of the head and face, responsible for up to 80% of related deaths, are common among these sportsmen, and the improvement of protective clothing has been always recommended.[9 10] In a study of polo injuries in the 1996 Argentine High Polo season, Costa-Paz found 20% of players suffered head and face injuries, and recommended a face protection for the jockeys.[4] Whitlock found 31% of riders in his professional equestrian population sustained head and face injuries.[6]

Studies in this field of sports related injury analysis are hard to find either because of limited manpower or limited electronic resources to identify these and similar rare events.

Another problem is the loss of data because of inappropriate storing of patient notes. An internal investigation by the department of orthopaedic surgery at our hospital has shown that up to 20% of radiographs and 30% of handwritten medical records cannot be located when they are needed. Therefore this article focuses on our experience with a newly designed computer program that solves this kind of problem, and describes how up to date emergency room software can be a powerful tool in analysing patient data.

This study evaluates the mechanism of injury and injury patterns attributable to hoof kicks over a 18 month period in a level 1 trauma centre and proposes guidelines to improve safety in horse related sports.

METHODS

The unit

The emergency unit at the University Hospital of Berne is the only level I accident and emergency unit in this area, caring for about 1.5 million people. It is dedicated to the initial management of severely traumatised and critically ill patients, and handles about 15 000 surgical and 10 000 medical cases annually.

It is the only unit in this region providing a 24 hour service for neurological, maxillofacial, spinal, and pelvic trauma. Furthermore, it is the only unit dealing with plastic and hand surgical cases after hours and on weekends.

The new software

This new software Qualicare (Qualidoc AG, Trimbach Olten, www.Qualidoc.ch) has been developed by the Department of Orthopaedic Surgery of the University Hospital Bern, in collaboration with the Brigham and Women's Hospital (Harvard University, Boston, MA, USA), the Maurice E Müller Foundation (Bern, Switzerland), the "Arbeitsgemeinschaft für Osteosynthese" (AO) (Davos, Switzerland), and a software developing company. Through this software, diagnoses are always accessible, or predefined keywords (for example, "equestrian") can be retrieved with a mouse click. Free text search is also possible.

For this study the records of 42 642 patients were automatically scanned for horse hoof kick related injuries using the built in search engine using several key equestrian sports related key words.

The electronic medical record permitted us an instantaneous retrieval of past discharge summaries, reports on radiographs, or other text documents of these patients.

Table 1 Age and sex in injured equestrians

	Total	Women	Men
Patients	17	11	6
Age	16–74	16–58	20–74
Mean age	36	35	38

Discharge summaries, progress reports, and consults were then searched automatically for sex, age, and injury pattern.

The speed of access to clinically relevant data (generally less than three seconds; free text searches in diagnosis fields or in discharge summaries take about five seconds) allowed us to perform the complete data analysis within 30 minutes. The diagnoses were marked in order to start an automatic Medline search or a search in a linked online textbook to obtain background information about horse related injuries. The patient notes were analysed immediately using a built in statistical program.

The software thus has a dual use: first as a clinical tool and second as an integrated tool for continuing education and research.

The patients

All equestrian injuries seen at the University Hospital Bern between January 2000 and June 2001 were analysed. There were a total of 80 equestrian injuries during this period, 17 (21%) of them caused by a direct hoof kick. There were 11 female patients (65%) and six male patients (35%) (see table 1). The average age of the female patients was 27 years, with a range of 16 to 58 years, and the average age of the male patients was 31 years, with a range of 20 to 74 years. The mechanism of injury pattern and radiological results were recorded and analysed using the Qualicare clinical information and evaluation system.

RESULTS

During the study period, 42 642 patients were admitted to the emergency unit. Eighty (0.2%) of them were equestrians, and 17 of 80 (21%) sustained a hoof kick (table 2). In nine (53%) patients an isolated facial injury was diagnosed.

All kicked equestrians were unmounted at the time of injury. They were standing either next to the horse or behind it. Two patients reported that they were cleaning the horse's hooves.

Eight of nine patients sustained either maxilla facial fractures or deep facial lacerations. Five of nine patients needed referrals to the department of plastic surgery because of the complexity of the facial soft tissue wounds. Three underwent maxillofacial surgery.

Eight of seventeen patients sustained contusions of the extremities, the back, and the trunk. In only two patients suturing of superficial lacerations was performed. One patient needed hospitalisation for pain management after a kick to his back.

DISCUSSION

Clinical data

The possible lethal power of a horse—which is capable of delivering a kick with a force of up to one ton—was described by the ancient Arabs with the proverb "The grave yawns for the horseman".[2 9 11 12] Horseback riding accidents and injuries caused by horses carry a high risk of severe trauma. In addition, a horse's kick can transfer a force of more than 10 000 Newtons to the body, causing fractures of the skull or other bones as well as devastating damage to the intestines.[13–17]

In correlation with the literature, the head was the most frequent site of injury in our patient group.[16] Because all of our patients were protected with a helmet, we did not find any significant injury of the brain. This is a major improvement over rates of brain damage reported in a previous study, when less than 20% of equestrians in the United States were protected by helmets.[18 19]

However, although the cranium is now covered by a helmet, the face is still bare and vulnerable and was injured in 53% of all kicked patients. All patients who received kicks to the face needed complex suturing, half of them by a plastic surgeon. Sixty seven per cent of patients who sustained a facial kick needed hospitalisation; three underwent maxillofacial surgery. In the group of eight patients who were kicked in other parts of the body only one patient needed hospitalisation for pain management, and this patient was discharged the next day.

Direct trauma to the face is mainly associated with handling and not riding the horse. The risk of serious injury seems to be a function of cumulative exposure to horses, not level of expertise as is assumed by the majority of riders.[9] Understanding the behaviour patterns of horses can help to improve safety, but working with animals will never be completely safe.[20]

Table 2 Injury location and diagnosis in 17 kicked patients

Patient	Age	Sex	Injury location	Injury
1	20	male	hand	dorsal swelling, superficial soft tissue wound MCP joint finger IV + V
2	45	male	upper limb	soft tissue wound
3	24	male	knee	soft tissue laceration
			shoulder	contusion
4	33	female	lower limb	contusion
5	31	female	upper limb	contusion
6	44	female	back	undisplaced fractures of processus spinosus L2 + L3
7	18	female	trunk	contusion
8	74	male	upper limb	contusion
9	31	female	face	soft tissue wound frontal, right eyelid
			cervical spine	distorsion
10	16	female	face	perforating wound 4 cm of the upper lip, local laceration of gingival tissue
11	37	female	face	amputation of the right earlobe, soft tissue wound
12	20	male	face	luxation of teeth 11, 12 and 21, alveolar fracture
13	45	male	face	fracture of zygomatic arch, orbita floor, soft tissue wound
14	33	female	face	fracture of nasale bone, soft tissue wound
15	43	female	face	fracture of orbita basis, soft tissue wound
16	41	female	face	contusion
17	58	female	face	upper lip, soft tissue wound

The authors think that the introduction of face shields, like those used by polo players, could be a possibility for better face protection. Another possibility could be the use of custom-made mouth guards for oral protection.[21] The development of such safety devices should be discussed and further studies performed.

The distribution of educational literature as well as educational lectures for the equestrian community about safety measures should be reinforced.

Software related issue

The handling of an increasing amount of medical data makes the development in computerisation of emergency units necessary. Conventional text based systems often have not kept pace with the resulting demands, and once data are recorded and printed, they are often difficult to locate or it is very time consuming to find them. This results not only in an enormous waste of time and energy but also in an enormous loss of data.

Modern software significantly reduces the administrative workload of medical personnel by completely eliminating redundant recording of data and providing access to all clinical data without restrictions of time or place. Through this additional functionality, the quality of the work is improved and multiple prospective and retrospective studies can be performed simultaneously by a single researcher.

Thus, the increasing utilisation of new computer technology could have a significant influence on accident analysis and prevention and the quality of research in the future. We promote the idea of establishing computer trauma data surveillance resources worldwide.

Contributers

Aristomenis Exadaktylos, the principal author and investigator, initiated and coordinated the formulation of the study, discussed core ideas with other involved departments, participated in data collection, and wrote the paper. Philipp Inden, a sixth year medical student, has been responsible for the data collection and data documentation. Stephan Eggli participated in the protocol design, data analysis, and edited the part about the computer software. Heinz Zimmermann, head of the unit and a consultant in statistics, supervised the research project, participated in the statistical analysis, edited the paper, and acts as the scientific guarantor.

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