

Blunt abdominal trauma from horse kicks

Tomasz Lübek¹, Tomasz Kulesza¹, Mariusz Jojczuk¹, Andrzej Ochal¹, Grzegorz Olszewski¹, Andrzej Prystupa², Adam Nogalski¹

¹ Department of Trauma Surgery and Emergency Medicine, Medical University, Lublin, Poland

² Department of Internal Medicine, Medical University, Lublin, Poland

Lübek T, Kulesza T, Jojczuk M, Ochal A, Olszewski G, Prystupa A, Nogalski A. Blunt abdominal trauma from horse kicks. *J Pre-Clin Clin Res.* 2013; 7(1): 59–62.

Abstract

Reports of trauma caused by a horse kick in the abdomen are rare in the literature. This article presents 4 patients with injuries sustained this way. In all cases, injuries were sustained as a result of a sudden act of aggression while tending to the horse. In all the patients, the trauma consisted in severe injuries of abdominal organs, successfully managed by means of damage control procedures. Caution should be exercised during contact with horses, even when the care taker is familiar with the animal. This is particularly important in the case of individuals who are in contact with horses as part of their professional activities, such as horse breeders or veterinarians. Abdominal injuries resulting from horse kicks are generally very severe and should be managed by means of damage control.

Key words

abdominal injuries, hemoperitoneum, laparotomy, trauma, outcome.

INTRODUCTION

As domesticated animals, horses have been used by humans in various activities for thousands of years. Within our lifetime, we have witnessed a dramatic change in the ways horses are exploited in Poland. The animal that had been used mostly as a beast of burden has become one that is used mostly in sports and recreation. The groups of people tending horses have also changed, and a growing number of users have occasional rather than daily contact with the animals. It should be mentioned, however, that these individuals rarely tend horses, and therefore the injuries sustained among this population are mostly related to falls from the horse or falls with the horse [1]. The professionals who tend horses and are at risk of trauma when doing this include breeders, veterinarians and stable staff.

Literature reports of trauma caused by a horse kick in the abdomen are rare [2, 3, 4, 5]. Therefore, in this article, 4 patients are presented with severe abdominal trauma sustained this way.

MATERIALS AND METHOD

Four patients with severe injuries resulting from a blow to the abdomen from the hind limb of a horse were treated in 2008–2009 in the Clinic for Trauma Surgery and Emergency Medicine in Lublin. The average age of the patients was 43.5 years and ranged from 24 – 54 years. Three patients were transported to the Clinic by ambulance in a state of severe oligovolemic shock due to internal haemorrhage, while the fourth patient was in a stable condition, although with significant pain discomfort and symptoms of bleeding from the urinary tract. All the patients had performed activities related with tending horses, and none of them had been

injured during a horse ride. The patients comprised two horse breeders, a farmer and a veterinarian. At presentation, three patients were in a severe clinical state and were immediately transferred to the operating theatre for laparotomy. Due to time restrictions, diagnostic examinations of the patients were limited to blood type determination, cross-matching tests, haematological determinations and FAST ultrasound of the abdomen and chest in the pre-operating room. As there were no doubts regarding the need for laparotomy, no abdomen washing puncture was performed. In all the cases, laparotomy was performed by a medial cut. Further treatment was carried out in the Clinic of Trauma Surgery and the Intensive Care Unit and, following discharge from the hospital, in the hospital's outpatient clinic. Treatment results were assessed by analyzing the medical documentation, i.e. the medical history from the Clinic of Trauma Surgery and the Intensive Care Unit (ICU), surgery logs and the outpatient clinic documentation. Of the greatest importance were the assessments of the patients' condition immediately after the trauma and during the entire hospitalization period, as well as assessments of the long-term results observed during outpatient care.

RESULTS

Table 1 presents a list of patients and surgical procedures performed: in one case, the procedure consisted in single-stage laparotomy and the removal of a fragmented kidney (case 4), while the three remaining cases involved multistage treatment conducted in line with damage control management recommendations (cases 1, 2, and 3). Due to the severe condition of the patients, the first stage consisted solely in haemostasis, while final management was performed at subsequent stages. In one patient, the second stage involved liver sutures and bile duct drainage. On the twenty-first day of hospitalization, the patient experienced a recurrence of intraperitoneal haemorrhage, requiring a third surgery and partial non-anatomical liver resection. In another patient, the second stage involved removal of an ischemic small intestine

Address for correspondence: Lübek Tomasz, Department of Trauma Surgery and Emergency Medicine, Medical University, Lublin, Staszica 16, 20–081 Lublin, Poland e-mail: chirurgiaurazowalublin@tlen.pl

Received: 20 October 2012; accepted: 19 April 2013

Table 1. Duration and course of surgical treatment of patients.

Patient	Day of hospitalization – Procedure
1. Farmer, 54 yrs.	I – laparotomy and damage control: stopping haemorrhage from damaged small intestinal mesentery II – resection of ischemic intestine segment
2. Horse breeder, 24 yrs.	I – laparotomy and damage control: liver packing II – liver sutures, bile duct drainage XXI – non-anatomical partial resection of right liver lobe
3. Veterinarian, 50 yrs.	I – laparotomy and damage control: stopping haemorrhage from small intestinal mesentery base III – resection of necrotic small intestine segment VI – resection of remaining small intestine and part of large intestine – necrotic lesions
4. Horse breeder, 46 yrs.	III – nephrectomy

segment due to progressive symptoms of intestinal necrosis resulting from the primary damage to mesentery vessels. The patient required another surgery, which involved removal of the entire small intestine and a part of the large intestine, followed by end-to-end anastomosis of the duodenum and the remaining segment of the ascending colon. In the case of the third patient treated by means of damage control management, the second stage included removal of the spleen and resection of a part of the small intestine.

Treatment results are presented in Table 2. The average duration of hospital stay was 32.5 days and ranged from 14 – 65 days. Three patients were transferred to the intensive care unit immediately after the first procedure. All the patients survived and were discharged from the Clinic. Patient No. 3 experienced short bowel syndrome and required continuous parenteral nutrition, which is currently being maintained.

DISCUSSION

Horse-related injuries are widely discussed in the literature. Most commonly, however, they are sustained as a result of falling from a horse during a sporting or recreational ride, and include long bone fractures, head injuries, and hand trauma caused by falling or being stepped on by a horse [4, 5]. Trunk-related injuries, particularly abdominal injuries, are described less commonly [6, 7, 8, 9, 10]. There are a few literature articles regarding injuries sustained while

tending horses in stables or paddocks, as well as regarding the behaviour of horses towards their care takers [4, 5, 11]. In the presented case, all the patients were injured while tending horses. According to the literature, trauma is most common in women in the second, fourth and fifth decade of life, who ride horses recreationally, and less common in men, unless they ride horses professionally [12, 13]. The group of patients treated in the Clinic consisted solely of men injured during horse care activities.

Most commonly, horses are aggressive towards men when irritated, i.e. when nursing foals, when strange horses are introduced in the stable, or when in rut. Special care should be taken when tending a mare with a foal at nursing time, when working with stallions, when approaching horses in unusual clothing, or when dealing with horses unfamiliar to the individual. Obviously, human behaviour when tending the horse is also important, and thus one should avoid entering the horse's blind spot, or approaching the horse without vocal warning, as well as avoiding any rapid or sudden movements or shouts. When entering the horse's box, one enters its immediate safety zone, where only its own offspring or friendly horses are tolerated. In such cases, one should be aware of aggressive animal behaviour. In most cases, horses send clear signals to the intruder, including laying their ears to the back of their heads, contracting their nostrils and lips, giving angry looks with 'flashing whites', sweeping or raising legs, or turning their backs on the intruder. These signals should be kept in mind when working with horses [14, 15, 16, 17]. In the subject group, the patients were prepared for work with horses by many years of familiarity with animals: two of the patients were horse breeders, one was a farmer and one was a veterinarian. The patients did not notice the warning signal behaviour, did not step back at the appropriate moment, and were kicked by animals standing in their own boxes.

Horses attack mostly by kicking their hind legs. Young horses attack more frequently [12]. The impact energy is very high and the force is centred over a small area of the human body, amounting to about 1 ton [9]. Injuries caused by blows from hooves with horseshoes or horseshoes with calks are particularly severe. In this way, internal abdominal organs become quite easily damaged due to the high compression and deceleration of the blows. This pertains in particular to organs attached to the parietal peritoneum by means of mesenteries [18, 19].

Table 2. Characteristics of patients treated for abdominal injuries resulting from horse kicks.

Patient	1 – J. P.	2 – G. G.	3 – M. S.	4 – A. P.
Age	54	24	50	46
Occupation	Farmer	Horse breeder	Veterinarian	Horse breeder
Type of injury	Spleen damage, laceration and ischemia of small intestinal mesentery, pancreatic head contusion. Haemorrhagic shock.	Grade III liver rupture, bile duct damage, pleural effusion, haemorrhagic shock.	Crushing of celiac trunk with irreversible damage to superior mesenteric artery, numerous perforations of small intestinal mesentery with haematoma. Crushing of the pancreas at pancreatic body level. Haemorrhagic shock.	Right kidney fragmentation
Duration of hospital stay	20	65	31	14
ICU stay	5	30	8	0
Number of procedures	2	3	3	1
Treatment result	Good – Patient fully efficient, returned to work.	Relatively good – slight impairment of respiratory efficiency due to pleural adhesions following long-lasting pleural effusion.	Relatively good – Home parenteral nutrition (HPN) required due to resection of small intestine.	Good – Patient returned to work.

No additional diagnostic examinations were performed in three patients due to their haemodynamic instability, as this might have delayed acute laparotomy. Diagnosis was based only on FAST ultrasound, which is a valuable diagnostic method for detecting intraperitoneal fluid [18]. This examination enables us not only to recognize bleeding into the peritoneal cavity, but also the presence of fluid in the pleural cavity or in the pericardium. Nevertheless, the most important advantage of FAST USG is the possibility it gives of examining the patient in the emergency department in just 2–3 minutes. For most seriously injured patients that short time of examination determines the possibility of their rescue [18, 20].

In our Clinic, it is a rule when managing patients with severe abdominal injuries not to allow the patient to cross the borderline of a dangerous physiological state from which they cannot be returned. An acute surgical procedure is completed first, obviously with a plan to perform a revision repair procedure in the future. In such severe injuries, damage control management is undertaken. In the case of the described patients, preliminary management of injuries included organ packing and ligation of bleeding vessels, while the second stage involved resection of the ischemic small intestine within 48 hours (cases 1 and 3) or partial resection of the liver and spleen (case 2). Such management was in line with literature reports regarding the need for damage control laparotomy in patients with complex damage to vessels or organs which are poorly accessible for surgery, mostly in the upper part of the abdomen [6, 21, 22, 23, 24, 25, 26, 27]. This type of treatment involves only the minimum procedures required for saving the patients' lives, such as the packing of damaged parenchymal organs, clamping or stapling damaged parts of the intestines, vessel ligation, or using vascular stents in cases when the damaged vessel is the only vessel providing blood to an important organ or anatomical region [16].

Next, the patient is transferred to the intensive care unit where his volaemia and electrolyte levels are regulated, and acid-base balance determined. The intensive care unit fights with patient's hypothermia which often develops in an earlier posttraumatic phase, completes the diagnostic procedures and determines a strategy for further proceedings. All the remaining procedures to fully manage the sustained damage are completed only after the general condition of the patient has improved. Attempts for a definitive treatment of all trauma in patients with multiple injuries, massive haemorrhage and in deep shock results in lengthening the operation time and deepening hypothermia. This leads to additional tissue damage, the need for subsequent massive transfusion of erythrocyte concentrate. Very likely the 'triad of death' (acidosis, coagulopathy and hypothermia) will develop, resulting usually in the patient's death.

Of course, abbreviated laparotomy discussed here is only one of the elements in the pattern of conduct in the damage control scheme. A comprehensive discussion of that issue requires a description of abbreviated thoracotomy, craniotomy, supplying pelvic injuries, etc. It is not, however, directly related to the cases described in the presented paper, which is why these procedures are not included in the discussion. [11, 28, 29].

As suggested by many years of experience by the best hospitals treating patients with severe injuries, damage control is the only opportunity for saving those who have

suffered the worst injuries [28, 29, 30, 31, 32]. The complexity of injuries resulting from a horse kick requires much surgical experience in order to allow for shortening the diagnostic stage and fast implementation of appropriate surgical procedures. Therefore, patients who suffer this type of trauma should be referred to secondary healthcare institutions with qualified medical staff and appropriate equipment. At the same time, since prevention is always better than treatment, every person deciding to engage in horse riding or tending horses should undergo detailed training, including ways to avoid the hazards associated with working with horses.

CONCLUSIONS

One should exercise the utmost caution when in contact with horses. This is particularly important in the case of individuals who are in contact with horses as part of their professional activities, such as horse breeders, veterinarians, etc.

Abdominal injuries resulting from horse kicks are in general very severe, and the treatment of these injuries often requires the involvement of damage control procedures.

Due to significant therapeutic difficulties requiring much experience from the medical staff, as well as appropriate equipment, patients with this type of injury should be referred to secondary healthcare institutions (in future, to trauma centres).

REFERENCES

1. Chitnavis JP, Gibbons CL, Hirigoyen M, Lloyd Parry J, Simpson AH. Accidents with horses: what has changed in 20 years? *Injury*. 1996; 27(2): 103–105.
2. Nogalski A, Jankiewicz L, Cwik G, Karski J, Matuszewski Ł. Animal related injuries treated at the Department of Trauma and Emergency Medicine, Medical University of Lublin. *Ann Agric Environ Med*. 2007; 14(1): 57–61.
3. Nogalski A, Lübek T, Sompór J, et al. Agriculture and forestry work-related injuries among farmers admitted to an Emergency Department. *Ann. Agric Environ Med*. 2007; 14(2): 253–258.
4. Whitlock MR, Whitlock J, Johnston B. Equestrian injuries: a comparison of professional and amateur injuries in Berkshire. *Br J Sports Med*. 1987; 21(1): 25–26.
5. Yim VW, Yeung JH, Mak PS, et al. Five year analysis of Jockey Club horse-related injuries presenting to a trauma centre in Hong Kong. *Injury*. 2007; 38(1): 98–103.
6. Brooks AJ, Rowlands BJ. Blunt abdominal injuries. *Br Med Bull*. 1999; 55(4): 844–855.
7. Cuenca AG, Wiggins A, Chen MK, et al. Equestrian injuries in children. *J Pediatr Surg*. 2009; 44(1): 148–50.
8. Lim J, Puttaswamy V, Gizzi M, Christie L. Pattern of equestrian injuries presenting to a Sydney teaching hospital. *ANZ. J Surg*. 2003; 73(8): 567–571.
9. Sarin EL, Moore JB, Moore EE, et al. An unlucky horseshoe: blunt aortic rupture after horse kick. *J Trauma*. 2005; 59(3): 616–618.
10. Sorli JM. Equestrian injuries: a five year review of hospital admissions in British Columbia, Canada. *Inj Prev*. 2000; 6(1): 59–61.
11. Exadaktylos AK, Egli S, Inden P, et al. Hoof kick injuries in unmounted equestrians. Improving accident analysis and prevention by introducing an accident and emergency based relational database. *Emerg Med J*. 2002; 19(6): 573–575.
12. Abu-Zidan FM, Rao S. Factors affecting the severity of horse-related injuries. *Injury*. 2003; 34(12): 897–900.
13. Petridou E, Kedikoglou S, Belechri M, et al. The mosaic of equestrian-related injuries in Greece. *J Trauma*. 2004; 56(3): 643–647.
14. Collery L. Observations of equine animals under farm and feral conditions. *Equine Vet J*. 1974; 6(4): 170–173.
15. Fureix C, Jégo P, Sankey C, et al. How horses (Equus caballus) see the world: humans as significant "objects". *Anim Cogn*. 2009; 12(4): 643–654.

16. Giles N, Tupper J. Equine interspecies aggression. *Vet Rec.* 2006; 159(22): 756.
17. Weeks JW, Crowell-Davis SL, Caudle AB, Heusner GL. Aggression and social spacing in light horse (*Equus caballus*) mares and foals. *Appl Anim Behav Sci.* 2000; 68(4): 319–337
18. Malhotra AK, Ivatury RR, Latifi R. Blunt abdominal trauma: evaluation and indications for laparotomy. *Scand J Surg.* 2002; 91(1): 52–57.
19. Wang RF, Chong CF, Hsu HT, et al. Mesenteric injury caused by minor blunt abdominal trauma. *Emerg Med J.* 2006; 23(4): e27.
20. Müller T, Doll D, Kliebe F, et al. Damage control in trauma patients with hemodynamic instability. *Anesthesiol Intensivmed Notfallmed Schmerzther.* 2010; 45(10): 626–634.
21. Filicori F, Di Saverio S, Casali M, et al. Packing for damage control of nontraumatic intra-abdominal massive hemorrhages. *World J Surg.* 2010; 34(9): 2064–2068.
22. Galvan DA, Peitzman AB. Failure of nonoperative management of abdominal solid organ injuries. *Curr Opin Crit Care.* 2006; 12(6): 590–594.
23. Ivatury RR, Nallathambi M, Gunduz Y, et al. Liver packing for uncontrolled hemorrhage: a reappraisal. *J Trauma.* 1986; 26(8): 744–753.
24. Miller PR, Croce MA, Bee TK, et al. Associated injuries in blunt solid organ trauma: implications for missed injury in nonoperative management. *J Trauma.* 2002; 53(2): 238–242; 242–244.
25. Rotondo MF, Schwab CW, McGonigal MD, et al. 'Damage control': an approach for improved survival in exsanguinating penetrating abdominal injury. *J Trauma.* 1993; 35(3): 375–382; 382–383.
26. Schroepel TJ, Croce MA. Diagnosis and management of blunt abdominal solid organ injury. *Curr Opin Crit Care.* 2007; 13(4): 399–404.
27. Sharp KW, Locicero RJ. Abdominal packing for surgically uncontrollable hemorrhage. *Ann Surg.* 1992; 215(5): 467–474; 474–475.
28. Fox CJ, Gillespie DL, Cox ED, et al. The effectiveness of a damage control resuscitation strategy for vascular injury in a combat support hospital: results of a case control study. *J Trauma.* 2008; 64(2 Suppl): S99–106; S106–107.
29. Porter JM, Ivatury RR, Nassoura ZE. Extending the horizons of "damage control" in unstable trauma patients beyond the abdomen and gastrointestinal tract. *J Trauma.* 1997; 42(3): 559–561.
30. Bashir MM, Abu-Zidan FM. Damage control surgery for abdominal trauma. *Eur J Surg.* 2003; 588: 8–13.
31. Casali M, Di Saverio S, Tugnoli G, et al. Penetrating abdominal trauma: 20 years experience in a Western European Trauma Center. *Ann Ital Chir.* 2008; 79(6): 399–407.
32. Hirshberg A, Mattox KL. Planned reoperation for severe trauma. *Ann Surg* 1995; 222(1): 3–8.

This copy is for personal use only - distribution prohibited.

