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Research Article

Pelvic Fractures Secondary to Horse Related Accidents-An Often Under-Appreciated Mechanism of Injury

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Abstract

Objectives: Horse riding as a recreational or professional activity can be more hazardous than motor cycle riding or motor vehicle driving. Pelvic and acetabular fractures following equestrian related accidents form only a small subset of commonly sustained injuries, and as a result there is a dearth of literature on this topic. This paper reviews a large group of injuries sustained in relation to equine activities, describes the common mechanisms and aims to highlight the severity of injuries in this patient group.

Methods and Results: Data from the registry of 3 databases (2 tertiary care hospitals in U.K and Australia, and the German National database) were collated. A total of 62 patients with an average age of 40.5 were obtained with the majority being female (14 males, 48 female). The mechanisms of injury were seen to fall in 4 main groups.

Group 1 included patients who had saddle injuries, Group 2 who were kicked by horse, Group 3 who were ejected by the horse and Group 4 who were ejected and either rolled on or trodden on by the horse. The severity of the injuries corresponded with the increasing energy or impact of the injuries.

Conclusion: Equine related injuries are often severe, and can include injuries similar to those more commonly seen following motorcycle accidents. An awareness of the mechanism of injury should draw attention to the possible diagnoses, and result in appropriate imaging and subsequent management. Trauma and emergency room staff should be aware of the range of injuries associated with this type of accident.

Introduction

Horseback riding is a popular sport and an occupational requirement in some countries including USA, Australia and Canada. Horse related accidents however can cause significant trauma and persistent disability. A fully grown horse can weigh over 500 kg, gallop at speeds up to 60 kmph and can kick with a force 1.8 times its bodyweight [1]. A horse's kick can transfer a force more than 10000 Newtons to the body causing both soft tissue and bony injuries [2] . The element of danger is enhanced by the height of the rider above the ground and the dimensions and unpredictable nature of the horse. The morbidity and the disability associated with these injuries have been underestimated with follow up studies showing that more than 50% of patients required more than 6 months to recover and returned to work at a reduced capacity [3].

Horse riding is more dangerous than motorcycle riding with a higher hospital admission rate of 0.14/1000 hours versus 0.49/1000 hours [4]. The overall risk of injury from horse riding and related activities per hour has been demonstrated to be higher than car racing or riding a motor cycle (with an accident every 1000 hours compared to every 350 hours from horse riding) and is in the same order as Australian rugby [5]. Whitlock found 1.43 injured persons per 1000 attendances in a study of 21 A & E departments [6,7], while data of a single referral hospital noted 0.3% of 78000 attendances in A&E were due to injuries following horse riding [8]. Injuries related to equestrian accidents form only a small percentage of attendances to the Accident and Emergency department (A & E) (less than 0.3%), and awareness of their potential severity is therefore less prominent. Although most injuries occur during recreational riding, approximately 15% of injuries occur in non-riding activities such as feeding, handling, shoeing and saddling [9]. Accidents during occupational riding are relatively rare in comparison.

While the commonest areas to be injured are the head, upper extremity and thoracolumbar spine, pelvic and acetabular fractures are also seen [10]. Data from a systematic review [11] and the NEISS (National Electronic Surveillance System) database (USA) [12] show fractures to account for a third of all the injuries sustained following horse riding accidents. Of the fractures, 50.7% were upper limb, 22.9% were lower limb, 21% were rib or spine injuries and 4.7% were hip/pelvis

Table 1: Injury pattern and management based on mechanism of trauma.

Group	Mechanism	No	Gender (M:F)	Non operative management	Surgical management
1	Patient hits saddle or hit by saddle	6	5:1	nil	6 (100%)
2	Kicked by horse	4	0:4	1	3 (75%)
3	Ejection from horse	38	7:31	24	14 (36.8%)
	Pelvic fractures-31 (Anteroposterior type-6, Lateral compression type-7 Iliac wing & avulsion fractures-9, Sacral fractures-9) Acetabular fractures-8				
4	Horse rears up, sits/rolls on patient	14	2:12	5	9 (64%)
	Pelvic fractures-12 (Anteroposterior type-5, Lateral compression-5, Vertical shear-2) Acetabular fractures-2				

Associated injuries/complications (14.5%)

Cervical spine injury with quadriplegia-1

Small bowel obstruction requiring laparotomy-1

Sexual dysfunction-2

Foot drop -1

Associated fractures- Upper limb (3), Lower limb (1)

fractures [11]. Thus, the incidence of pelvic fractures among all horse related injuries would be about 1.6-1.9%.

Riders commonly wear body protectors which will guard against thoracic and abdominal injuries, but offer no resistance to injury for the pelvis or limbs [13]. Little has been written on pelvic injuries secondary to horse riding. This paper presents a series of pelvic injuries associated with horse riding and describes the different possible mechanisms.

Patients and Methods

Patients with pelvic injuries due to horse riding accidents were identified from 3 separate pelvic injury databases in Germany, UK and Australia, between 2000 and 2015. The databases are all completed prospectively at the time of injury presentation – the UK and Australia ones in specific hospitals, whilst the German data was retrieved from the German National Pelvic Database. The following data were extracted: demographics, timing of injury, mechanism of injury, fracture classification, hospital management and short term outcome including complications.

Results

62 patients were identified, including 14 males and 48 females, with a mean age of 40.5 years (range 16-78). Most of the female patients (76%) were under the age of 40. The injury patterns and management strategies were varied, and are shown in table 1. Associated complications were relatively uncommon in comparison to the general population of pelvic fractures presenting at most tertiary hospitals [14] (Table 1).

Discussion

A recent case series on diastasis of the pubic symphysis [15] secondary to pommel injuries discussed one of the mechanisms of pelvic injuries secondary to horse riding but other mechanisms have not been described in detail before. We have therefore attempted to subdivide our cases by mechanism of injury to illustrate the variety of possible injuries from this popular activity.

Figure 1(a): Group 1 patient with saddle injury producing pubic diastasis; **Figure 1(b):** Post operative image following internal fixation.

Figure 2(a): Group 2 patient with Illiac crest fracture following a kick from the horse; **Figure 2 (b):** Post operative image following internal fixation.

We have subdivided the whole group into 4, based on the specific mechanism of injury. Group 1 patients (Figure 1) are those caused by the saddle while horse riding. Diastasis of the symphysis pubis secondary to pommel injuries has been described before [16,17] and this paper confirms that all six of the patients who were either hit by the saddle or hit the saddle sustained a diastasis of their pubic symphysis. All six underwent open reduction and internal fixation with or without sacroiliac screw fixation.

Group 2 or horse kicking injuriestypically caused an iliac wing/ crest injury, and was managed with open reduction and internal fixation (Figure 2).

Group 3 included patients who were ejected or thrown off the horse. Within this group, the majority of the patients had a sacral fracture or SI joint disruption, presumably secondary to lateral compression on landing. The injuries in the ejection group however were a combination of injuries from pubic symphysis diastasis, sacroiliac joint disruption, acetabular fractures, superior & inferior pubic rami fractures (unilateral or bilateral), column fractures and quadriplegia, reflecting the typical complex injury mechanisms associated with a high velocity fall. Previous studies have shown that pelvic and spine fractures are more likely in riders who have been thrown or bucked off the horse [12] (Figure 3).

Group 4 comprised patients who had an associated crush component due to the horse rolling or sitting on them. These patients sustained a wide spectrum of injuries affecting all regions of the pelvis, including combined pelvic and acetabular fractures (Figure 4).

Figure 3 (a): Group 3 patient who was ejected from the horse and sustained Lateral Compresion type 2 injury; **Figure 3 (b):** Post operative image following internal fixation.

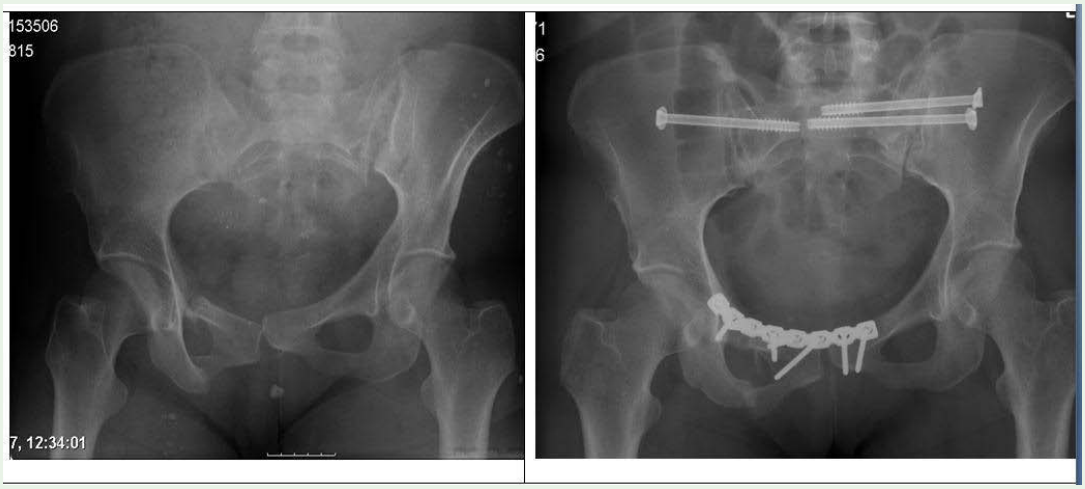

Figure 4 (a): Group 4 patient who was crushed by the horse after falling off and sustained Lateral Compression type 3 injury; **Figure 4 (b):** Post operative image following internal fixation.

The ejection and the crushed groups (3 and 4) were the most common mechanisms of injury, and sustained the most violent fracture patterns. The association between pelvic fractures and genito-urinary injuries, particularly bladder rupture and posterior urethral tears is well known, with a reported incidence of 10-15% [18]. Surprisingly in our series, our patients did not sustain any such injuries. Nevertheless, a high index of suspicion needs to be maintained and early contrast studies should be done to exclude urinary tract injuries. Sexual dysfunction (erectile dysfunction and dyspareunia) is also well-recognised sequelae of pelvic fractures [17] and was seen in 2 of our cases. We did not see a high incidence of head or spine injuries in our series which could reflect the decreasing trends worldwide due to compulsory use of helmets [11].

Conclusion

Equine related accidents and injuries carry a high risk of severe trauma. Injury patterns seen are akin to motorbike accidents, and trauma staff should be alert to this when these patients are seen in A & E. The specific mechanism of injury can give useful information regarding the potential for serious injury, and help guide investigations. We would recommend plain AP radiographs of the pelvis in all horse riding accidents other than isolated direct blows to other anatomic areas, and in cases where the mechanism is consistent with a high energy accident we would suggest a very high index of suspicion for pelvic fractures, and that these patients should receive an early pelvic CT scan to identify and delineate possible injuries. Urological imaging should also be considered in all groups except direct blows, despite the lack of urological injuries seen in this series, as identification of urethral or bladder injuries are crucial to ongoing patient management.

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