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ORIGINAL RESEARCH

Similarities Between Large Animal-Related and Motor Vehicle Crash-Related Injuries

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Objective.—Many Americans sustain large animal-related injuries (LARIs) from blunt trauma. We compare the injuries and management of LARI in our region of the United States with those of motor vehicle crashes (MVCs).

Methods.—A 15-year retrospective study of trauma patients with LARI matched to MVC controls by Injury Severity Score (ISS), age, and sex was conducted. Values were statistically compared, and differences were considered statistically significant at $P < .05$.

Results.—There were 156 LARI cases, of which 87% were related to horses, 8% to bulls, and the remainder to deer, mules, bison, cows, and rams. In the LARI group, the age was 42±18 years (mean±SD), ISS was 7±4, and 61% were females. The MVC group had a significantly longer length of hospital stay (5±5 vs 4±3 days) and blood alcohol concentration (35±84 vs 3±20 g/L). There were no significant differences in injury patterns between LARI and MVC; however, additional radiological studies (RS) were performed on MVC (9±6 vs 7±5). LARI patients were more often transferred from rural locations (39% vs 25%) and traveled further to our trauma center (40±32 vs 24±29 km) than did MVC patients.

Conclusions.—LARI has a similar pattern of injury to MVC, but fewer RS. LARI typically occurred further away, requiring transfer from rural areas to our institution. We recommend a similar approach for the evaluation of LARI and MVC.

Keywords: animal, injury, rural, trauma, vehicle

Introduction

An estimated $60 million were spent in the United States on large animal-related injuries (LARIs) in 2001.[1] Most of these injuries are categorized as blunt force trauma, related to being thrown or kicked by an animal. Both domestic and wild animals have been implicated in large animal attacks throughout the United States.[2–5] Many animal-related injuries inflicted on humans occur in the wilderness. Langley and Morrow reported an average of 157 deaths per year in the United States from animals. The study also found that this is an under-recognized public health hazard, as many patients do not seek medical attention in a timely fashion.[6] Horses and cattle cause the majority of occupational fatalities among animal-related events in the United States.[7] These animals were also responsible for the majority of animal-related deaths in New Mexico from 1993 through 2004.[8] The majority of these occurred in rural settings. Injuries from large animals can be under-triaged at rural hospitals due to their relative infrequency, and therefore may not receive the prompt medical attention they require.

About 30 million Americans ride horses every year, while many more work with or near horses and other large animals.[1,9] In the United States, there were 205 riding fatalities reported from 1976 through 1987, and every year more than 100,000 emergency department visits are related to injuries sustained from horse-related

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activities.[10] It has been reported that 11.2% of horse-related injuries require hospitalization, as compared with 5.5% of all injuries.[11] Horse-related trauma can have a wide range of severity and injury patterns due to the strength, weight, speed, and unpredictable nature of these animals.[10]

Another significant proportion of LARI is due to interactions with cattle. According to Langley et al, cattle were responsible for 40% of work-related fatalities in the United States. The same study reported that 12,000 professional rodeo riders compete throughout the United States and Canada each year, with an injury rate of 2.4 to 19.7 per 100 exposures.[7]

Ours is a unique study as, to our knowledge, there is no literature comparing the injury type or severity of LARI with motor vehicle crashes (MVCs), which are a more common mechanism of blunt trauma. In addition, many previous studies have focused specifically on LARI in equestrians, but have not addressed injuries inflicted on nonriders from kicking and other mechanisms, which make up more than 25% of LARI.[12] We hypothesized that LARI involving a blunt trauma mechanism has similarities to MVC, and tested this by addressing 3 objectives. First, we determined the incidence and type of LARI seen at our institution. Second, we compared these injuries to those sustained in MVCs. Third, we determined whether there were any differences in the management of LARI as compared with that of MVC at our institution.

Methods

Data from our institution's American College of Surgeons-verified level I trauma center, which serves both urban and rural populations, including a large number of Amish communities, were retrospectively analyzed. Such centers provide 24-hour trauma coverage with capabilities for treating all types of injuries and utilizing subspecialty teams. In addition, level I trauma centers are major teaching hospitals affiliated with universities with residency programs, research activities, and injury prevention and outreach programs. The data were collected from the center's trauma registry from the years 2000 through 2015 to identify LARI. The LARI patients were then matched to MVC controls using Injury Severity Score (ISS), age, and sex. The injuries, workup, treatment, and outcomes in both groups were identified and compared. The data collected from the registry and each patient's medical record included the following: the mechanism and type of injury; type and number of medical comorbidities (diabetes, heart disease, respiratory disease, and cancer); blood alcohol concentration (BAC); positive drug toxicology screen (TOXPOS); number and type of radiological studies (RSs), which included plain radiography and computed tomography (CT); surgical and orthopedic procedures; chest injuries (rib fractures and pneumothoraces); ventilator days; mortality; hospital length of stay (LOS) in days; discharge disposition; transfer from rural hospitals; and distance traveled to our trauma center (in kilometers).

The data were stratified into 2 groups (the LARI group and the matched MVC control group) for comparison. Statistical analysis was performed using the SPSS package (Armonk, NY). Values are reported as mean $\pm$ SD, or raw percentage, as appropriate. Student's t tests, χ^2 tests, or nonparametric Mann-Whitney U tests were applied where appropriate. Differences were considered statistically significant at $P < .05$.

This study was approved by the trauma center's Institutional Review Board and Human Subjects Review Committee.

Results

There were a total of 21,762 patient records, from which 5804 MVCs and 156 LARIs were identified. The most commonly encountered LARIs were horse-related (136, 87%), with 72% related to being thrown from a horse and 28% to being kicked by a horse. LARIs involving bull encounters occurred in 13 cases (8%). Of these, 10 individuals were thrown from bulls and 3 were struck by a bull. These injuries primarily occurred at a bucking bull ranch that features bull riding and is located 48 km from our hospital. The remaining 7 (5%) LARI cases were related to being attacked by a deer (2), thrown from a mule (2), gored by a bison (1), kicked by a cow (1), and struck by a ram (1).

The most common operations performed were orthopedic surgeries. There were 14 patients with solid organ injuries, including 10 LARIs and 4 MVCs. In a subanalysis of LARI cases, there were more solid organ injuries in patients kicked by large animals (70%) than in those thrown from large animals (30%). Chest injuries were composed of rib fractures (18% LARI and 15% MVC) and pneumothoraces (8% LARI and 7% MVC) (Figure 1). There was 1 death in the study population. This occurred in the LARI group in a patient who was thrown from a horse and died from multisystem organ failure secondary to hemorrhagic shock.

There were 2 missed injuries in our study, both in the LARI group. One patient was thrown from a horse and was not found to have rib fractures until the tertiary trauma survey was completed the following day. The second injury was missed by a rural hospital. The patient was initially evaluated after being kicked in the chest by