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Injuries to Amateur Participants in Traditional Bullfighting Festivals☆

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ABSTRACT

Introduction: To identify the different types of injuries occurred during activities for the general public involving bulls. We analyze the conditions in which these injuries occurred, radiological examinations performed, treatment and complications.
Method: We present a 10-year retrospective study examining 107 patients who came to the Emergency Department of our hospital with pathologies associated with bulls or bull calves over a period of 10 years. We evaluated patient age and sex, exposure to toxic substances, period of the year in which the lesions occurred, type of injury (open, closed or mixed lesions), hospital stay, transfer to another hospital, treatment and complications.
Results: A total of 107 patients (98 males and 9 females), with a mean age of 41.68 years, were treated for injuries in popular bull festivals. 77.57% of the injuries occurred during the months of July, August and September. Ninety-five out of the 107 patients (88.78%) were hospitalized. The total number of injuries included: 91 open wounds, 10 bruises, 27 fractures and 5 traumatic brain injuries. Eighty-three injuries (62.40%) affected the lower limbs and perineum. The treatment received was: suture (2), Friedreich (69), hematoma drainage (1), orthopedic surgery (5), exploratory laparotomy (6) and neurosurgery (1). Two patients died.
Conclusions: Injuries occurring during traditional bull-related festivals are different in patients with open wounds from patients who suffer blunt trauma. The pathogenesis of these injuries must be understood in order to improve patient survival.

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Lesiones producidas en aficionados durante los festejos taurinos populares

Palabras clave:
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RESUMEN

Introducción: Conocer los diferentes tipos de lesiones producidas en fiestas populares con toros o vaquillas, analizar las condiciones en las que se producen estas lesiones, las exploraciones radiológicas realizadas, el tratamiento y las complicaciones.

Método: Se trata de un estudio retrospectivo en el que se revisan 107 pacientes que acudieron al servicio de urgencias de nuestro hospital con patología relacionada con los toros y vaquillas en un periodo de 10 años. Se valoraron la edad y el sexo de los pacientes, la exposición a tóxicos, el periodo del año en el que se produjeron las lesiones, el tipo de lesión (herida abierta, cerrada o lesiones mixtas), la duración del ingreso, el traslado a otro centro hospitalario, las exploraciones realizadas, el tratamiento y las complicaciones.

Resultados: Fueron atendidas 107 personas (98 varones y 9 mujeres), con una edad media 41,68 años, por lesiones producidas en festejos taurinos populares. El 77,57% de las lesiones se produjeron durante los meses de julio, agosto y septiembre. Noventa y cinco de los 107 pacientes (88,78%) fueron hospitalizados. Del total de lesiones producidas, 91 correspondieron a heridas abiertas, 10 a contusiones, 27 a fracturas y 5 a traumatismo craneoencefálico (TCE). Ochenta y tres lesiones (62,40%) se localizaron en extremidades inferiores y periné. En cuanto al tratamiento recibido, se realizó sutura de las heridas (2), Friedrich (69), punción evacuadora del hematoma (1), cirugía ortopédica (5), laparotomía exploradora (6) y neurocirugía (1). Dos pacientes fallecieron.

Conclusiones: Las lesiones producidas en espectáculos taurinos populares son diferentes en pacientes que acuden con heridas abiertas y los que sufren traumatismos cerrados. Debemos conocer la patogenia de las mismas con el fin de mejorar la supervivencia de los pacientes.

Introduction

Bull-related festivities are frequent in both Ibero-American countries and Spain. The Valencian Community, Castilla-León and Navarra, in that order, are the communities of Spain that have the greatest number of bullfighting celebrations each year.[1]

In Navarra, these festivities are well known for the release of Spanish fighting bulls in the streets (known in the English-speaking world as 'running with the bulls'), and every summer there are approximately 1500 popular celebrations (including young bull calves, bull-trimmer contests, running, etc.). In spite of the safety measures applied (civil liability insurance, presence of medical personnel, prohibition of the participation of children under 16 years of age, safety fencing, etc.), accidents are frequent.

Individuals injured in these amateur bullfighting festivities should be considered polytrauma patients, and their treatment depends on their injuries. In addition, the specific characteristics of the injuries caused by the horn of the bull or bull calf must be considered.

Although they are very frequent, there have been few scientific publications about the injuries caused during amateur bull-related activities. What is interesting about this study is that it only includes patients who came to the hospital for injuries caused by bullfighting festivities for the general public. Professional bullfighters and patients with minor injuries treated by the medical teams present in the bullring were excluded.

Methods

This is a retrospective study reviewing patients who had been treated in the Emergency Department at the Hospital Reina Sofía de Tudela (Navarra, Spain) with bull-related pathologies during a 10-year period (2006–2015). We included patients with injuries caused by bull horns as well as patients who presented trauma injuries not caused by the bulls themselves.

The patient data collected included: file number, geographical origin, sex, age, toxic substance use, period of the year in which the injuries occurred, hospitalization admission and duration, type of injuries (single or multiple), number of trajectories in the case of open wounds, location of the injuries, treatment, complications and whether it was necessary to transfer the patient to another hospital.

In this study, injuries caused by the horn of the bull or bull calf were classified according to their depth as either closed or open trauma injuries, and the latter were classified as either superficial (*puntazos*) or deep (*cornadas*) penetrating wounds.[2]

Statistical Analysis

The data have been assessed in a descriptive statistical study.

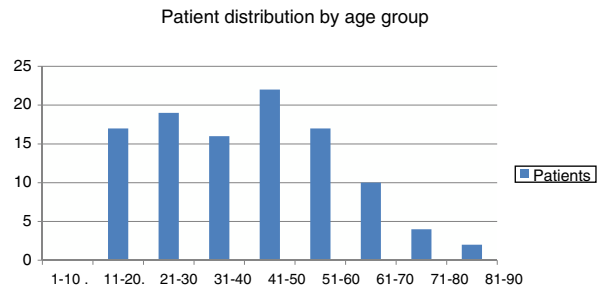

Fig. 1 – Patients with injuries caused by bull horns, distributed by age groups.

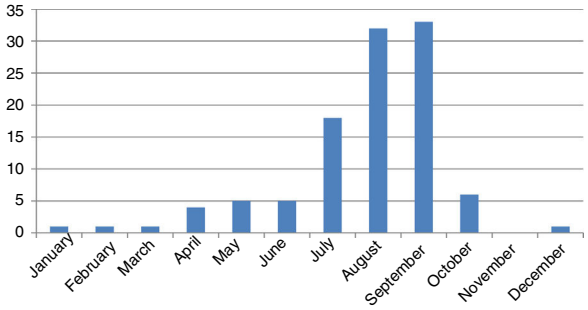

Fig. 2 – Patients with bull-related injuries according to months of the year.

Results

The Emergency Department of the Reina Sofía hospital in Tudela treated 110 people for injuries caused during bull-related celebrations for the general public in a 10-year period (January 2006–December 2015). Three patients were bullfighting professionals (two bullfighters and one professional bull trimmer) and therefore excluded from the study. Thus, the final number of patients studied was 107.

Out of the total number of patients, 60 belonged to the Spanish national healthcare area of Tudela, and 9 belonged to other healthcare areas within the Autonomous Community of Navarra. Twenty-two were from bordering communities (Aragón, La Rioja, Basque Country), 14 from non-bordering Spanish communities, and 2 belonged to other countries of the European Economic Community (France and Italy).

The distribution by sex was 98 men and 9 women, with ages between 13 and 84 years and a mean age of 41.68. Regarding the distribution by age group, the largest group of patients was between 11 and 60 years of age and decreased after that age. It should be noted that 7 of the patients were minors (3 13-year-olds, 2 15-year-olds and 2 17-year-olds) (Fig. 1).

As for the intake of toxic substances, 8 patients had ingested alcohol, one patient had consumed alcohol and drugs and one individual had taken drugs.

77.57% of the patients (83 individuals) were treated in the emergency room in the summer, when the majority of popular celebrations were held (Fig. 2).

Ninety-five patients (88.78%) were hospitalized between 1 and 17 days, with an average hospital stay of 4.875 days. In 12 cases (11.21%), hospital admission was not required.

Seven patients (6.54%) were transferred to another hospital: one requested transfer to a hospital near the family residence (Barcelona) and 6 were transferred to the Complejo Hospitalario de Navarra (CHN), to the General Surgery (1), Maxillofacial (1), ICU (1) and Neurosurgery (3) Departments due to the complexity of their injuries.

The injuries of 76 patients were directly related with horn impact. Sixty-four patients had single injuries (3 had blunt trauma/*varetazo*, 27 superficial *puntazos* and 34 deep penetrating *cornadas*). Twelve had multiple horn injuries (Fig. 3), with a total of 93 injuries (5 blunt *varetazos*, 40 superficial *puntazos* and 48 deep *cornadas*).

Of the total number of injuries produced during bull-related celebrations, there were 91 open wounds, 10 contusions, 27 fractures and 5 traumatic brain injuries (TBI) (Table 1). In 14 patients with open wounds, the bull or bull calf horn had created two penetrating trajectories.

In terms of the location of the injuries of both open and closed trauma (133 in total), 83 injuries (62.4%) were located in the lower extremities and perineum. Ninety-one patients sustained open injuries, which were located in the perineum and lower extremities in 74 (81.23%).

A total of 150 radiological examinations were ordered in 71 patients: 113 simple radiology studies, 17 ultrasounds (14 abdominal and 3 scrotal) and 20 CT studies (3 thoracoabdominal, 3 abdominopelvic, 3 spinal, 9 cranial and 2 lower extremity).

In terms of treatment received, 69 patients with open wounds were treated with washing, debridement of the wound edges and Friedreich. In 2 patients, the wounds were sutured. In one case, a hematoma was drained. One patient underwent neurological surgery. In 5 patients with fractures, orthopedic surgery was performed: in one case, external fixation was used to stabilize a fibula, and in the 4 remaining cases osteosynthesis was conducted.

In 6 patients, exploratory laparotomy was performed: one median laparotomy for an open wound in the epigastrium with evisceration of the colon and omentum, as well as hepatic laceration in segments V and VIII; one laparotomy due to penetrating abdominal wound (*cornada*) that had torn the

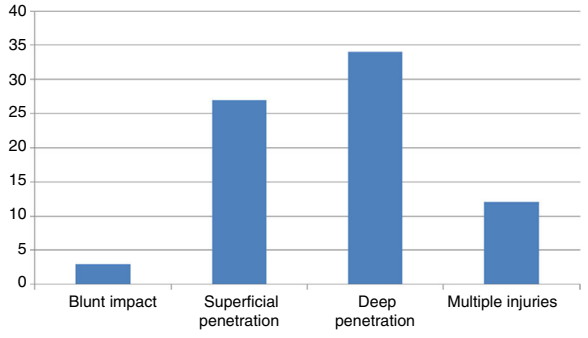

Fig. 3 – Classification of injuries caused by direct impact with bull horns.

Table 1 – Location and Types of Injuries Occurring in Bull-related Activities for the General Public.

	Open	Contusions	Fractures	TBI
Craniofacial	4		3	5
Thorax		5	6	
Abdomen	9	2		
Perineum	18			
Upper extremity	4		4	
Lower extremity	56	1	7	
Spine		1	4	
Pelvis			1	
Multiple locations		1	2	
Total	91	10	27	5

oblique, transverse and anterior rectus muscles, as well as evisceration of small bowel loops, the omentum and appendix; one laparotomy for a right flank wound, with bowel evisceration, perforation of the cecum and colon, liver contusion, trauma to the head of the pancreas, hematoma of the wall and mesentery as well as pseudoaneurysm of the left gastric artery, requiring right hemicolectomy with side-to-side ileocolic anastomosis; a laparotomy for hemoperitoneum secondary to liver laceration in the right lobe and subcapsular hematoma in the left hepatic lobe; one exploratory laparotomy for an open wound in the right flank and rupture of the anterior rectus muscle and fascia; and one laparotomy due to penetrating trauma (*cornada*) to the perineum and abdomen that caused division of the sphincter, requiring sigmoid colostomy in the left iliac fossa.

In addition, in patients with deep and superficial (*cornadas* and *puntazos*) penetrating injuries to the extremities, vascular injuries (3 cases) and trauma to the neurovascular bundle (1 case) also occurred.

As for complications during the 10-year period, one patient presented cellulitis of the leg and 2 patients died: one patient with TBI and multiple bone fractures, intraparenchymal hematoma and subarachnoid hemorrhage requiring neurosurgery (Fig. 4); and one patient died from complications of abdominal goring (*cornada*) with liver contusion, bowel evisceration, perforation of the cecum, gastric artery pseudoaneurysm, hematoma in the head of the pancreas and wall/mesentery hematoma, requiring abdominal laparotomy (Fig. 5).

Discussion

Bullfighting and related celebrations are very popular among certain sectors of the population. They attract tourists and have an economic impact on the cities and towns where they are held. This study is a review of patients treated in hospital who were not professional bullfighters. Patients who were treated by nursing staff and those who died immediately after the bull-related trauma were excluded from the study.

In terms of geographical origin, 56% of patents were from the geographical area of Tudela, while the rest were from other regions or countries.

In this series, the vast majority of patients were males (91.58%), a datum which coincides with other published reports.[3–5]

Patient age was mainly limited to the second to fifth decades of life, with the peak age between 41 and 50. These data differ slightly from other series, in which the most frequent age range for bull-related trauma is between the ages of 20–30.[3] Seven patients in this study were minors, which demonstrates the love for bull-fighting among the population, even though the participation of minors under the age of 16 in bull-related festivities was recently prohibited.

As for the time of year of the injuries, there was a clear predominance of cases during the months of July, August and September, a time when the most important bull celebrations are held in Spanish cities and towns, which is similar to other series.[3]

As for the exposure to toxic substances, 9.25% of patients had consumed either alcohol or drugs (one patient had consumed both alcohol and drugs, one had used drugs and 8 had ingested alcohol). These data differ considerably from the results of similar studies in Latin America, where the percentage of exposure to toxic substances is 85%.[4]

Depending on the type of injuries, imaging tests are necessary, including simple radiography, ultrasound and/or CT. In this series, radiological examinations were performed in 71 patients (66.35% of the total). In 35 (32.71% of all patients), important injuries were diagnosed.

The pathogenic mechanism of the injuries caused by bulls and bull calves depends on the kinetic energy, as given by the following formula: $E_k = 1/2mv^2$ (E_k = kinetic energy; m = mass; v^2 = velocity squared). Although the speed at which the bulls

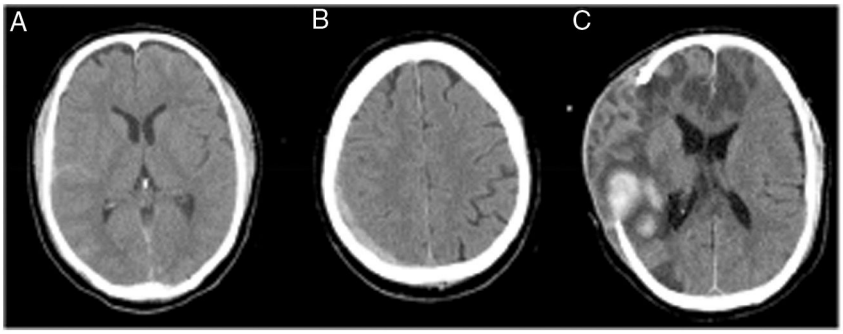

Fig. 4 – CT scans of patient with traumatic brain injury (TBI): subarachnoid hemorrhage (A) and subdural hematoma (B) requiring decompression surgery. Afterwards, intraparenchymal hemorrhage led to death (C).

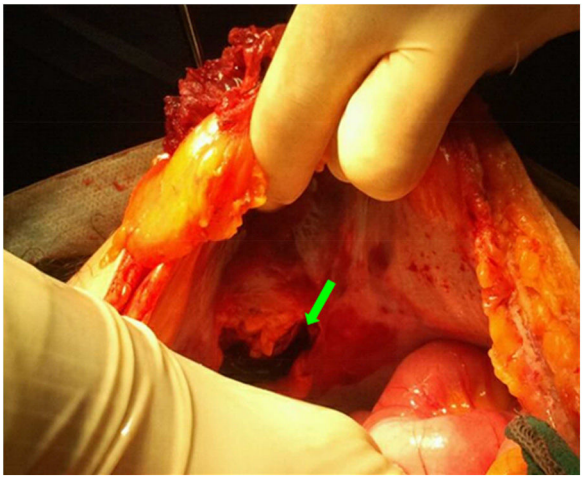

Fig. 5 – Intraoperative image of laparotomy in a patient with an open penetrating wound caused by a bull horn, with evisceration of the colon and omentum. The arrow shows the entry orifice caused by the horn.

and bull calves move is not very fast, these animals are very heavy, so the force they exert is massive. Consequently, they can cause a lot of damage.[2]

The mechanism of injury by bull horns is as follows: during the charge, the bull flexes its neck and makes a forward and upward movement, impaling the individual. If the individual maintains his/her balance, the bull will try to detach itself by lengthening the neck (*derrote*), which produces a new trajectory of injury (with a single entry wound). If the individual loses balance, the horn will act as an axis around which the body of the person turns, producing new trajectories of injury and severe tissue damage.[6]

Injuries caused by bull horns are classified according to their depth as either closed (*varetazo*) or open trauma, and the latter are classified as either superficial (*puntazo*) or deep tissue/organ trauma (*cornada*).[2] In closed trauma injuries, the horn makes contact with the body tangentially. There is no interruption of the skin, and extravasation of blood is caused by rupture of the capillaries in the connective tissue. These injuries are known as *varetazo*, and there are three degrees depending on the intensity of the injury.

In patients with open trauma, there is a break in the skin caused by the bull horn, which in Spanish bullfighting jargon is called *puntazo* or *cornada*.

Puntazos are open trauma injuries that occur when the tip of the horn makes contact obliquely or perpendicularly, causing a shallow wound that affects the skin and the subcutaneous cellular tissue. *Cornadas* are open trauma injuries that pass through the fascia or aponeurosis.

Open bull-horn wounds present constant and distinctive characteristics that differentiate them from any other type of trauma. They are bruised wounds that are small in surface diameter, with irregular and anfractuous margins. Frequently, they present with multiple trajectories causing great tissue damage as well as the introduction of foreign bodies, so these wounds are considered to be directly contaminated by massive introduction of aerobic and anaerobic germs.

The trauma caused will depend on the resistance to injury of the affected tissue. Skin is very resistant tissue, with a predominance of collagen and elastic fibers. Subcutaneous cellular tissue is less resistant and scarcely vascularized. Muscle has little mechanical resistance and its fibers break easily, but tendons have good mechanical strength. The arteriovenous and peripheral nervous systems show great elasticity. Bone is not very elastic; it absorbs the kinetic energy and fractures.

The location of the injuries that occur in amateur bullfighters who 'fight' in the streets differs from those occurring in professional bullfighters. Professional bullfighters face the bulls face to face, and their injuries are more frequently located on the front of the body. However, bullfighting in the street is associated with injuries to both the front (when the amateur 'trims the bull') and the back (buttocks, perineum, thigh) if the injury occurs while fleeing.[4] In this study, if we take into account the total number of injuries (both open and closed trauma), 61.65% were located in the lower extremities and perineum. If only open injuries are evaluated, 81.23% (74 patients) were located in the perineum and lower extremities, which coincides with the results published in the literature.[4,7–9]

The management of these patients is similar to that of polytrauma patients and includes ensuring airway patency, ventilatory control and hemodynamic control.[10,11]

Contusions require immobilization, compression bandaging, ice application, evacuation when necessary, and even surgery. Wounds must be considered contaminated by the pathogens on the horn and in the environment, so they should be explored thoroughly, examining all trajectories and associated injuries.[10,11] Steps should be taken to achieve hemostasis, prevent shock, remove foreign bodies from the wound (horn, glass, dirt, stones, etc.), wash and debride the devitalized tissue, perform a Friedreich, refreshing the edges and reconstructing the area in the most anatomical and functional way possible. In many cases, the use of Penrose drain is necessary to drain collections. It is necessary to administer antibiotic treatment and a tetanus vaccine.

Depending on the type, complexity and location of the injuries, more complex surgery may be required: exploratory laparotomy, neurosurgery, trauma surgery, etc. In any case, the highly dangerous nature of the injuries must be kept in mind. Mortality in this series reached 1.86%, which is higher than other published series in Spain[3] and somewhat lower than the rates in South American countries, which in some series reached 2%.[4] In addition, we must also be reminded that this study did not include patients who died during the bullfighting celebration and were not brought to the hospital emergency room.

In conclusion, injuries caused during popular bullfighting festivities in which amateur bullfighters participate are different from those that occur in professional bullfighting, although they are equally dangerous. Due to the complexity of the injuries, patients should be treated as polytrauma cases.

Conflict of Interests

The authors have no conflict of interests to declare.

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