Clinical and Neurosurgical Management of Cranial Machete Injuries: The Experience of a Tertiary Referral Center in Nicaragua

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■ BACKGROUND: **The neurosurgical literature rarely describes managing open head injuries caused by machetes, although this is a common head injury in developing countries. We present our experience managing cranial machete injuries in Nicaragua over a 5-year period.**

■ METHODS: **A retrospective chart review identified patients admitted to a neurosurgery service for cranial machete injury.**

■ RESULTS: **Among 51 patients studied, the majority (n = 42, 82%) presented with mild neurologic deficits (Glasgow Coma Scale score ≥14). Nondepressed skull fracture (25/37, 68%) was the most common injury identified on skull radiography, and pneumocephalus (15/29, 52%) was the most common injury identified with computed tomography. Overall, 38 patients (75%) underwent surgical intervention for 1 or more conditions, including laceration length ≥10 cm (n = 20), open intracranial wound (n = 8), pneumocephalus (n = 7), cerebral contusion (n = 6), intracranial hemorrhage (n = 5), and depressed fracture (n = 5). All patients received aggressive antibiotic therapy. Patients without intracranial injury received a 7-day course of intravenous ceftriaxone, followed by a 10-day course of oral ciprofloxacin. Patients with violation of the dura received a 7- to 14-day course of intravenous metronidazole, ceftriaxone, and vancomycin, followed by a 10-day course of oral ciprofloxacin. Postoperative complications included a visible skull defect (n = 6), infection (n = 3), and unspecified neurologic (n = 2) and mixed (n = 1) complications. At discharge, most patients had only minimal disabilities (47/51, 92%). In-hospital mortality rate was zero.**

■ CONCLUSIONS: **An aggressive approach to managing open head injury caused by machete yields good outcomes, with the majority of patients experiencing minimal disability at hospital discharge and a low rate of infection.**

Key words
- Developing world
- Head injury
- Head trauma
- Machete
- Nicaragua

Abbreviations and Acronyms
CT: Computed tomography
GCS: Glasgow Coma Scale
GOS: Glasgow Outcome Scale

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INTRODUCTION

Traumatic brain injury is currently a leading cause of death and long-term disability in people younger than 40 years of age worldwide, and it is projected to become the major cause of death and disability by the year 2020 in this age group.[1-3] The incidence of closed head injury is greater in developing nations than in the developed world. Specifically, the 1996 Global Burden of Disease Report revealed that the Latin America—Caribbean region had the greatest rates in the world of traumatic brain injury due to violence and road traffic injuries.[4] In addition to a greater incidence of traumatic brain injury in low- and middle-income countries, mortality rates due to traumatic brain injury in these countries are twice as high as those observed in high-income countries.[5]

Machetes are a common implement in developing countries, and they are often used as instruments of interpersonal violence.[6] Although several case series of cranial machete injuries have been reported in the literature, these are limited to the experience of centers in Africa and the Caribbean.[7,8] The epidemiology, management, and outcomes of cranial machete injuries in Central America remain poorly understood.

In our experience in a national referral center in Nicaragua, assaults with machetes are a leading cause of head injury. The management of patients with head injuries caused by machete attacks and the sequelae of these attacks, both endemic and iatrogenic, presents numerous challenges. Consequently, we undertook a comprehensive survey of admissions for cranial machete injuries to a national neurosurgery referral center in Nicaragua to describe the epidemiology and management of these cranial machete injuries.

METHODS

Patient Population

A retrospective chart review was conducted at the Lenin Fonseca Hospital in Managua, Nicaragua, for patients presenting with cranial machete injuries from January 1, 2009, to December 31, 2013. From this chart review, an anonymized database without any patient-identifying information was constructed. Patients admitted to the neurosurgery service with cranial machete injuries during this period were deemed eligible for inclusion in the study. Patients who suffered superficial lacerations, regardless of length of laceration, and were without suspicion for fracture or intracranial pathology were not admitted to the neurosurgery service and consequently were excluded from this study. Patients who died before admission to the neurosurgery service also were excluded, as well as those for whom medical records were missing or incomplete. The work described was carried out in accordance with The Code of Ethics of the World Medical Association Declaration of Helsinki. As this study was a retrospective deidentified review, no patient consent was required.

Management Algorithm

Upon admission, patients had their wounds inspected and disinfected with chlorhexidine–normal saline solution. Special care was taken when the brain was exposed to avoid contact between chlorhexidine and the brain. All patients who exhibited a focal neurologic deficit, depressed level of consciousness, depressed skull fracture, cerebrospinal fluid leak, extruding brain parenchyma, or evidence of gross infection were taken for imaging with computed tomography (CT) and then directly to the operating theater for surgical exploration and washout. Otherwise, the length of the laceration dictated the next steps in management (Figure 1).

In cases in which the laceration was <10 cm in length, a skull radiograph was performed to check for a skull fracture. Patients with skull fractures were further imaged with CT. If no fracture was seen on the skull radiograph, the patient's wound was thoroughly cleaned again with a chlorhexidine–saline solution and the galea was closed with polyglactin (Vicryl; Ethicon, Inc., Somerville, New Jersey, USA) sutures followed by nylon skin sutures.

Patients with lacerations ≥10 cm in length were investigated with a noncontrast CT of the head to evaluate for a full-thickness skull fracture or intracranial injury. The presence of a full-thickness skull fracture (involving both outer and inner tables), pneumocephalus, brain contusion, or intracranial hemorrhage prompted surgical exploration. In the absence of a full-thickness skull fracture or any intracranial pathology, the wound was disinfected and closed as outlined previously.

In the operating room, wounds were further disinfected by scrubbing with a betadine–hydrogen peroxide solution for 15 minutes. Surgical exploration of the wound was conducted by initially elevating a craniotomy flap over the fracture line so that the underlying dura mater could be inspected for tears. Any hematoma visualized on preoperative CT or identified at the time of surgery was evacuated, and hemostasis was obtained. When sinus injury was evident, efforts were taken to repair the sinus via a periosteal patch sewn over the sinus defect or by raising a dural flap and inverting this flap over the defect. In patients in whom the dura was violated, attempts were made to close the dura as a barrier to infection. If closure could not be accomplished primarily, then periosteum (or, in rare cases, the tensor fasciae latae) was harvested and a duraplasty was performed to obtain dural closure. In cases of comminuted skull fracture, care was taken to

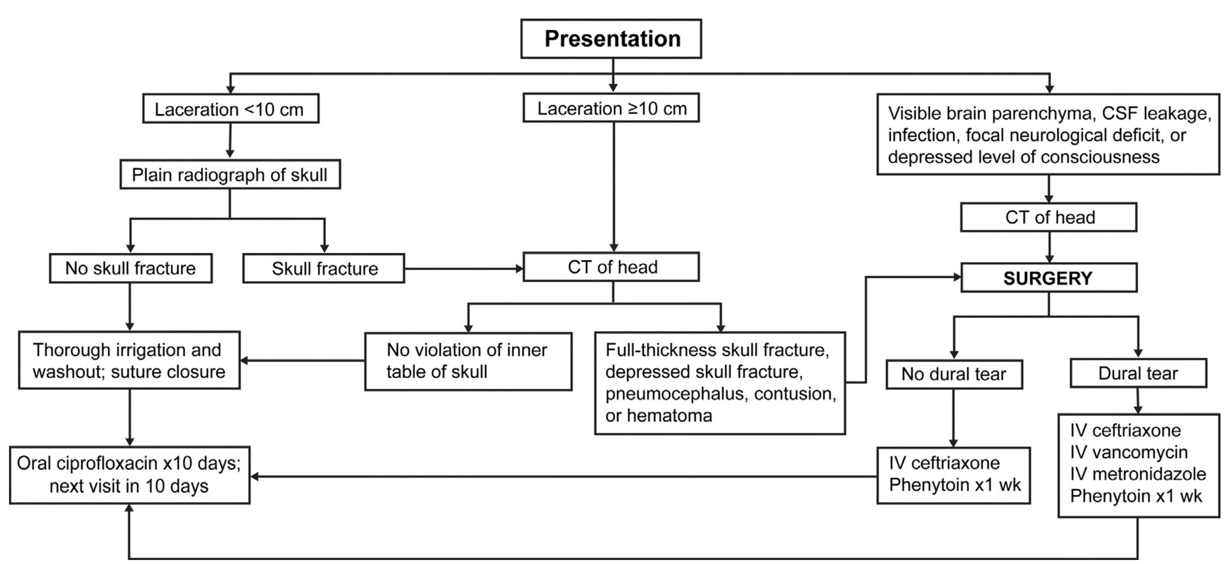

Figure 1. Management algorithm for open head wounds caused by a machete. CSF, cerebrospinal fluid; CT, computed tomography; IV, intravenous. (Used with permission from Barrow Neurological Institute.)