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Blunt abdominal trauma in children: epidemiology, management, and management problems in a developing country

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Abstract Trauma is the leading cause of death in children in developed countries. In tropical Africa, it is only beginning to assume importance as infections and malnutrition are controlled. In developed countries, the availability of advanced imaging modalities has now reduced the necessity for laparotomy to less than 10% following blunt abdominal trauma (BAT) in children. This report reviews the epidemiology, management, and unnecessary laparotomies for pediatric BAT in a developing country in a retrospective review of 57 children aged 15 years or less at the Ahmadu Bello University Teaching Hospital, Zaria, Nigeria over 12 years. The average age was 9 years and the male-female ratio 3.8:1. Seventy-four percent (74%) of abdominal injuries in children were due to blunt trauma. The commonest causes of injury were road traffic accidents (RTA) (57%), 88% in pedestrians and 59% in children aged 5–9 years. Falls were the cause of trauma in 36%, 60% of them aged 10–15 years. Other causes of injury were sports in 5% and animals in 2%. Diagnosis was clinical, supported by diagnostic peritoneal lavage or paracentesis. Two patients had ultrasonography, and none had computed tomography. Fifty-three patients had a laparotomy. 2 died before surgery, 1 was managed nonoperatively, and in 1 surgery was declined. There were 34 splenic injuries, 20 treated by splenic preservation, splenectomy in 13, and non-operative in 1. Fourteen gastrointestinal injuries were treated in 12 patients. Of 9 hepatic injuries, 4 were minor and were left untreated, 3 were repaired, 1 was packed to arrest hemorrhage, and a lacerated accessory liver was excised. Four injuries to the urinary tract (bladder contusion 2, bladder rupture 1, ruptured hydropnephrotic kidney 1) were treated accordingly. There were 4 retroperitoneal hematomas associated with other intra-abdominal injuries and 2 pancreatic contusions. One lacerated gallbladder was treated by cholecystectomy and a ruptured left hemidiaphragm was repaired transperitoneally. In retrospect, 27 (51%) patients could have been managed by observation (splenic injury 20, liver injury 5, bladder contusion 2) using advanced imaging modalities. One patient developed an intra-abdominal abscess following splenorrhaphy. The average hospital stay was 17 days. Mortality was 8 (14.5%) from gastric perforation (3), liver injury (2), splenic injury (1), and 2 patients died before surgery. BAT in this population results predominantly from RTA in pedestrians. Laparotomy may be avoided in 51% of cases if advanced imaging modalities are readily available.

Key words Abdomen · Blunt trauma · Tropical Africa · Unnecessary laparotomy · Imaging

Introduction

Trauma is a leading cause of death in children in developed countries [1–3]. In tropical Africa, infections and malnutrition are the leading cause of death. Nordberg [4] predicted that as infections and malnutrition are controlled, trauma will become more prominent in African disease patterns.

In developed countries, the laparotomy rate following blunt abdominal trauma (BAT) in children has been greatly reduced with the use of advanced imaging modalities to confirm, localize, and quantify intra-abdominal injuries. In most of tropical Africa, the situation is vastly different. This report reviews some aspects of pediatric BAT and highlights pertinent management problems in a developing country.

Materials and methods

Between 1987 and 1998, 57 children aged 15 years or less were managed for BAT at the Ahmadu Bello University Teaching Hospital.
Hospital, Zaria, Nigeria. The hospital records, operation notes, and discharge summaries of these patients were reviewed for age and sex, mechanism and pattern of organ injury, management, and outcome. The records were incomplete for determination of mechanism of injury in 1 patient and outcome in 2. At the hospital, ultrasound (US) facilities were not usually available for use outside normal working hours. Computed tomography (CT) facilities only became available in the last 2 years of the study.

**Results**

There were 45 boys and 12 girls with an age range of 1–15 years and a mean age of 9 years. Nearly one-half of the children were aged 5–9 years (Fig. 1).

**Mechanism of injury**

Road traffic accidents (RTA) were the commonest cause of injury (32.57%); 28 (88%) of these children were pedestrians and 19 (59%) were aged 5–9 years (Table 1). Falls were the cause of trauma in 20 (36%) children, 15 of whom fell from trees, 4 from buildings and static trucks, and 1 into a well. The majority (60%) of the falls occurred in children aged 10–15 years. Three children had injuries during contact sports. A 4-year-old was trodden by a horse. The cause of injury was not documented in 1 patient. Overall, RTA were the commonest mechanism of injury in children below 10 years (70%) while falls were the commonest in patients 10 years or over (52%).

**Diagnosis**

The diagnosis of BAT was clinical (Table 2); abdominal pain, tenderness, and distension were present in most patients. Twenty-nine patients (54%) had anemia and were in shock at the time of presentation, mostly those with solid-organ and multiple injuries. One patient who had multiple injuries had hematemesis from a gastric injury and 1 with a rectal injury had hematochezia. In addition, diagnostic peritoneal lavage (DPL) or paracentesis was positive in 94% of patients; a Gram stain was not done in any case. Plain abdominal and chest radiographs were also done in most patients; a pneumoperitoneum was present in 1 with a gastric perforation and subcutaneous emphysema in another; in 1 patient with a ruptured diaphragm the radiographs showed bowel loops in the thoracic cavity. Aside from rib fractures in 6 patients with splenic injuries, X-rays were usually not helpful in isolated solid-organ injuries. Two patients had confirmation and localization of intra-abdominal organ injuries by US. CT was not done in any case.

In patients with inconclusive signs, repeated abdominal examinations and monitoring of blood pressure and pulse rate were done before a decision was made to operate. Two children died of exsanguination and 1 was taken from the hospital by the parents before surgery could be performed. Fifty-three children went on to have a laparotomy due to uncertainty regarding the nature and extent of the intra-abdominal injury (52) and failure of non-operative management (1).

**Pattern of organ injury and treatment**

There were a total of 69 intra-abdominal injuries in 54 patients, 43 of which were isolated and 11 multiple (Table 3).

**Spleen**

The spleen was injured in 34 children (60%), and in 30 was the only organ involved. The injury was grade II or

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**Fig. 1** Age distribution of 57 children with blunt abdominal trauma

![Age distribution of 57 children with blunt abdominal trauma](image_url)