

# Mesenteric fibrosis—a histologic marker of previous blunt abdominal trauma in early childhood

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Received: 30 October 2008 / Accepted: 23 December 2008 / Published online: 10 February 2009  
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**Abstract** A girl aged 21 months and a boy aged 3 years both died of hemorrhage from intestinal and mesenteric lacerations due to inflicted blunt abdominal trauma. Histologic examination of sections from the areas of duodenal and mesenteric lacerations confirmed changes of acute injury with hemorrhage, acute inflammatory infiltrates, and surface fibrin deposition. In addition, in both cases, there was also evidence of much longer-standing trauma with mesenteric fibrosis and hemosiderin-containing macrophages (the latter in keeping with previous hemorrhage). In the absence of a history of surgery and local inflammatory disease, these findings suggest that these children had suffered previous abdominal trauma, possibly from similar types of injuries. Scarring of the mesentery and intestine in cases of lethal childhood blunt abdominal trauma may provide evidence of previous similar, significant although sublethal tissue damage. Extensive histologic sampling of abdominal organs and tissues including the mesentery can, therefore, be extremely useful in such cases.

**Keywords** Abdominal trauma · Childhood · Inflicted injury · Abuse · Mesenteric fibrosis · Intraperitoneal hemorrhage · Mesenteric laceration

## Introduction

Blunt abdominal trauma in early childhood ranks second to closed craniocerebral trauma as the most common cause of lethal inflicted injury. The diagnosis of intra-abdominal trauma at autopsy is usually not difficult, with bruising of the anterior abdominal wall indicating underlying injury, confirmed by bloody fluid spilling from the peritoneal cavity upon incision. Typical injuries include lacerations of the liver, transection of the duodenum, contusions of the pancreas, and bruising of the mesentery [1–3]. Vascular and diaphragmatic injuries may also occur with blunt trauma [4, 5]. Rupture of the liver is more likely due to a blow or a kick than to a fall on to a level surface, and similar organ injuries may occur at all ages [6, 7]. Mesenteric injuries may not always be easy to diagnose in life and intra-abdominal hemorrhage may rarely be due to underlying vascular malformations such as peliosis hepatis rather than to trauma [8, 9]. It is also often difficult to try to determine a possible time frame for the injuries and to provide an estimate of the minimum number of blows that may have caused the tissue and organ damage. Two cases are presented to demonstrate a histologic finding that may indicate that there had been at least one previous episode of blunt abdominal trauma.

## Case reports

### Case 1

A 21-month-old girl was found collapsed at her home address and died soon afterwards. At autopsy, there were multiple bruises of the legs, arms, head and face, chest, back, and abdomen. The peritoneal cavity was filled with

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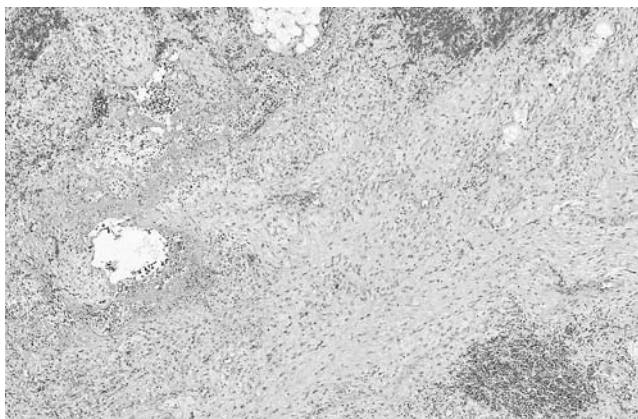
350 mL of blood-stained fluid with a 100-mm tear across the base of the mesentery, almost complete transection of the duodenum, and bruising of the transverse colon, mesocolon, and pancreas. There were no underlying organic diseases present that could have caused or contributed to death, and toxicology was negative. Death was due to blunt abdominal trauma.

Histologic examination of the duodenum near the site of perforation revealed interstitial hemorrhage with a very mild background infiltrate of neutrophils in keeping with an early vital reaction. Areas of traumatized muscularis showed a subserosal inflammatory infiltrate with adherent surface necrotic debris and fibrin. There was also evidence of a similar early vital reaction with hemorrhage within the adjacent mesentery in addition to areas of well-established fibroblastic proliferation (Fig. 1) with scattered hemosiderin-containing macrophages (Fig. 2).

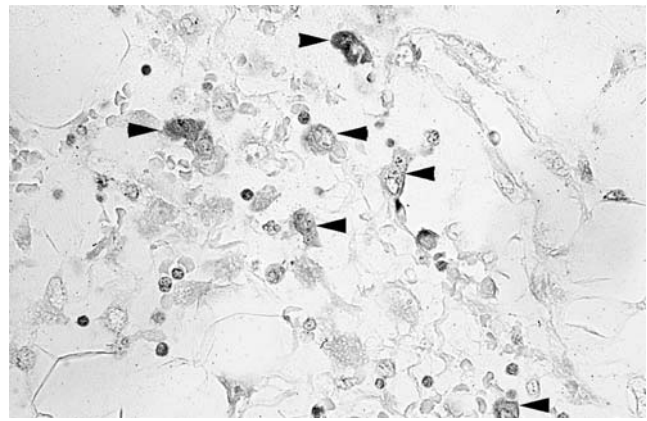
The absence of a well-developed peritonitis, with significant intraperitoneal hemorrhage, would be in keeping with death within hours of acute trauma. The presence of reactive fibrous tissue and iron staining within the mesentery was considered evidence of previous intra-abdominal trauma.

## Case 2

A 3-year-old boy collapsed at his home address following a day of vomiting and lethargy. He died soon afterwards. At autopsy, there were multiple bruises of the legs, arms, head and face, chest, back, and abdomen. The peritoneal cavity was filled with 300 mL of blood-stained fluid with a 60-mm tear of the mesentery at the duodenal–jejunal junction, transection of the duodenum, and bruising of the adjacent pancreas. There were no underlying organic diseases present that could have caused or contributed to death, and



**Fig. 1** A section of mesentery from case 1 demonstrating sheets of plump fibroblasts against a collagenized background with scattered areas of more recent hemorrhage, i.e., this figure shows areas with both acute and more long-standing tissue responses to trauma (hematoxylin and eosin (H&E),  $\times 70$ )



**Fig. 2** Scattered hemosiderin-containing macrophages within scarred areas of the mesentery in case 1 indicating previous hemorrhage (H&E,  $\times 280$ )

toxicology was negative. Death was due to blunt abdominal trauma.

Histologic examination of the duodenum at the site of transection showed prominent recent interstitial hemorrhage with a mild neutrophil infiltrate and early fibroblastic reaction in keeping with an early vital reaction. There was also a patchy early fibrinopurulent serosal reaction. The adjacent mesentery also showed similar features to case 1 with a well-established fibroblastic response within mesenteric fat (Fig. 3) with moderate numbers of hemosiderin-containing macrophages.

As in case 1, the absence of well-developed peritonitis, with significant intraperitoneal hemorrhage, would be in keeping with death within hours of acute trauma. The presence of reactive fibrous tissue and iron staining within the mesentery was again considered evidence of previous intra-abdominal injury.



**Fig. 3** A section of mesentery from case 2 demonstrating similar features to case 1 with both acute (focal interstitial hemorrhage) and more long-standing (established fibrosis) tissue responses to trauma (H&E,  $\times 130$ )

## Discussion

A difficulty often encountered by forensic pathologists in court is in dealing with complex questions concerning the chronology of inflicted injuries in infants and young children [10]. Very often it is not possible to put precise time frames on injuries, other than to state that the injuries may or may not appear to be of different ages. A not unreasonable deduction from injuries of different ages is that a child must have suffered trauma on more than one occasion—a point that may have considerable medicolegal significance.

Injuries from blunt abdominal trauma tend to occur at points of fixation of viscera to the abdominal wall, such as the ligament of Treitz, and may result in hemorrhage, sepsis from gastrointestinal perforation, and/or organ dysfunction [11, 12]. Mesenteric bruising or laceration may also occur. In the reported cases, deaths were caused by blunt abdominal trauma due to lacerations of the intestines and mesentery. A significant additional finding was, however, mesenteric scarring with exuberant fibrosis and focally prominent hemosiderin-containing macrophages. Given the absence of intraperitoneal or retroperitoneal disease and previous surgery, it is considered likely that this finding indicated that both of the children had suffered from previous blunt abdominal trauma. Mesenteric scarring in cases of lethal childhood blunt abdominal trauma may, therefore, be a significant histologic marker of previous similar injury.

**Acknowledgements** We would like to thank the South Australian State Coroner, Mr. M. Johns, for the permission to publish selected details of these cases.

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