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Blunt Trauma of the Abdomen in Children

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ABSTRACT: Abdominal trauma in children is usually due to motor vehicle accidents or falls, but child abuse is also a common cause. Injuries to the small intestine are particularly worrisome because symptoms may not appear for hours, days, or even weeks. This can cause significant difficulty for the investigator trying to determine when an injury occurred, or who may have caused it.

KEYWORDS: pathology and biology, symposium, child abuse, injuries, trauma, abdominal trauma

Physical trauma is the major cause of death in individuals under 44 years of age in the United States. In the pediatric age group, it is responsible for more death and disability than all other causes combined [1]. Children experience millions of injuries each year, although most are minor. However, at least 750 000 children are seen annually by physicians for injuries and, of these, 500 000 are hospitalized. Deaths due to injury during childhood are estimated at 15 000 to 25 000 per year, with a mortality rate of 3% in hospitalized children and an overall pediatric mortality rate of 1.5% [1,2].

Blunt force trauma continues to be the most common type of injury in childhood, and about 40% of these injuries are automobile related. Falls from a height account for about a similar number of cases [1,3].

Injury to the central nervous system (CNS), both primary and secondary (the secondary type being CNS injury made worse by shock or hypovolemia due to splenic or skeletal trauma) [1,2], is the most common cause of death. In the abdomen, the usual injuries are to the liver, spleen, and mesentery, with resultant hypovolemia. Much of the literature deals with only the emergent diagnosis and treatment of such injuries and focuses primarily upon the hemorrhage. Peritonitis is a late-appearing problem [4] and receives little mention even though delay in seeking medical treatment, particularly in cases of child abuse is very common. Also, clinical signs and symptoms of abdominal trauma are mentioned only briefly, and rarely in detail. Unfortunately, this detail is often what the forensic investigator needs most.

Presented here is a case of intraabdominal injury of an unusual type, along with some brief observations from two other cases which may aid in the investigation and timing of such injuries.

The Case

MJ was a 2½-year-old female child with a 24-h history of “not feeling well” and occasional vomiting. She had had similar episodes a couple of times during the previous

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several months, had been seen by local Health Maintenance Organization (HMO) physicians, and each time was thought to have a viral "flu." On the night prior to her death, her illness appeared to be resolved. Indeed, she commented that she was "all better" when put to bed. She vomited at 3 a.m. and was noted to be "weak but coherent." She vomited again at 5 a.m. and was found completely unresponsive when checked 30 min later. Attempts at resuscitation were unsuccessful.

At autopsy, a variety of ecchymoses, some fresh, some yellow-brown, were noted medially on the left eye, on the left maxilla, and high on the forehead. Scabbed abrasions were seen across the bridge of the nose and in the right eyebrow. The right central incisor was missing, but the socket was healed. Contusions were noted on the right biceps and the upper lateral right thigh, and healing abrasions were seen on the right elbow, the right patella, and the left lumbar area. Total body X-rays revealed a healed avulsion fracture of the left lateral humeral epicondyle.

Internal examination revealed subgaleal hemorrhages beneath the forehead contusion and also in the right parietal and occipital areas. Fresh hemorrhage was noted in the rectus abdominis muscle below and slightly to the left of the umbilicus and in a rather large area to the right of the umbilicus. The abdomen contained 300 cc of dark yellow, purulent fluid, and the peritoneal lining was thick and hemorrhagic. The loops of the small intestine were stuck together with inflammatory adhesions and there was a perforation just distal to the ligament of Treitz. The mesentery contained a firm, gray-white mass of fibrous tissue beginning at the base and extending throughout its length, at one point encircling the intestine. Mesenteric lymph nodes were incorporated into this mass. Fresh hemorrhage was also seen just above the distal end of the stomach. All other internal organs were grossly normal.

Microscopically, there was an early interstitial pneumonia and acute hemorrhagic pancreatitis (directly beneath the upper abdominal hemorrhage). The scalp injuries showed chronic inflammation on the forehead and only acute hemorrhage elsewhere. The rectus muscle sections revealed acute hemorrhage with scattered polymorphonuclear lymphocytes. The site of intestinal rupture revealed acute suppurative peritonitis without necrosis but with considerable hemorrhage. The fibrous mass was largely acellular, dense, mature scar tissue, but hemosiderin-laden cells were seen in several areas. Special stains confirmed these findings.

The cause of death was certified as peritonitis resulting from rupture of the small intestine due to recent and remote blunt trauma to the abdomen, and the manner of death was given as homicide.

In-depth investigation revealed that the family unit was intact and well-functioning. The mother was frequently away from home on business trips and the father worked as a computer software specialist. The child spent most of every day with a baby-sitter, during which time, it was discovered, virtually all of the contusions and abrasions had occurred. The baby-sitter described the child as "clumsy" to the parents whenever new injuries were noted, that is, that the child had fallen and knocked out the tooth, had fallen down the stairs and injured the arm, and so forth. Approximately 4 months prior to the death, the mother took the child to the pediatrician because of "hair falling out." When interviewed, neighbors and friends of the baby-sitter reported that she would pull her own children's hair, and 3 months before the child's death, she allegedly confided to a friend that she had pushed this child down the stairs, causing the arm fracture. No "clumsiness" was ever noted at home, and the child was always happy to see her father in the afternoon, but frequently resisted going to the baby-sitter's house in the morning. We found no history of episodes of severe abdominal pain, significant eating pattern alterations, or changes in bowel habits or behavior patterns.

Discussion

This case represents an unusual intraabdominal finding in a case of child abuse. The mesenteric scarring was apparently due to deep trauma several months prior to death, with continued growth and organization (quite possibly with repeated trauma) which eventually formed a rigid mass, fixing the small intestine in place and shoring it up from beneath so that the loops were less able to slide away from further blows. The injury causing the rupture probably occurred 2 to 3 days prior to death. The differential diagnosis primarily consisted of idiopathic retroperitoneal fibrosis [5,6]; however, this was ruled out by the location, the hemosiderin-laden cells, and other factors.

Other Cases

This is now the third case seen by one of the authors [RF] of severe, long-standing, small intestine injury in a young child where clinical signs and symptoms could not be elicited from parents, caretakers, or, as in one case, the physician who saw the child in the emergency room 3 days prior to the child's death. In that particular case, the 3-year-old was pronounced well except for an ear infection but, at autopsy, was found to have over 40 different injuries, ranging from hours to months old, including a ruptured duodenum with dense fibrosis and hemosiderin beneath acute hemorrhage and inflammation. The other child had virtually identical findings as a result of being bounced upon as a "bean bag" by an older child at day care for at least 2 to 3 weeks. She showed no symptoms until only a couple of hours before her collapse and death.

Conclusions

None of these children had the tenderness, guarding, rigidity, or even shock that would be expected with such injuries until just before their final collapse [7]. With more children in day care than ever before, the number of people with routine physical access to them has increased to such a point that narrowing down the time and place of an injury, particularly in the absence of obvious symptoms, is virtually impossible. These cases should alert forensic investigators, police, pediatricians, and other care-givers to the realization that severe, life-threatening intraabdominal injury can exist with little outward sign. Also, the investigation must be wide-ranging and will require meticulous attention to the smallest details in order to fix the place and time of the earlier, as well as the later, injuries.

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