Shrapnel injury due to a firecracker causing gastric and gallbladder perforation

Mide ve safrakesesi perforasyonuna neden olan, kestane fişeğine bağlı şarapnel yaralanması

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A 14-year-old boy presented with a penetrating injury to the abdomen after trying to light a firecracker. A piece of metal from the tin box in which he had ignited the firecracker had penetrated his abdomen. The patient, who was in a state of shock, underwent ultrasonography (USG) and radiography of the abdomen. USG revealed free fluid in the abdomen, while abdominal radiographs demonstrated free gas and a radiopaque object. Exploration revealed gastric and gallbladder perforations for which repair and cholecystectomy were done, respectively. Visceral injury following a firecracker explosion has not been reported previously. We would like to stress the importance of parental supervision to prevent irresponsible use of firecrackers, which can cause potentially life-threatening visceral injuries.

Key Words: Cholecystectomy; firecracker; gastric perforation; gallbladder perforation.

On dört yaşında erkek çocuk kestane fişeğini ateşlemeye çalışırken geçirdiği karına delici yaralanma nedeniyle başvurdu. Hastanın konserve kutusu içinde patlattığı kestane fişeği nedeniyle metal bir parça karnını delmişti. Şok tablosundaki hastada, karnın ultrasonografisi (USG) ve radyografisi çekildi. Karın radyografisi serbest gazı ve radyoopak bir nesneyi gösterirken, USG karın içindeki serbest sıvıyı tespit etti. Eksplorasyonda, sırasıyla primer onarım ve kolesistektominin yapıldığı, mide ve safrakesesi delinmeleri saptandı. Henüz, kestane fişeği patlamasını takibeden viseral yaralanma bildirilmemiştir. Biz potansiyel olarak ciddi, hayatı tehdit edici viseral yaralanmalara neden olabilecek, kestane fişeğinin sorumsuz şekilde kullanımını önlemek için, ebeveyn gözetiminin önemini vurgulamak isteriz.

Anahtar Sözcükler: Kolesistektomi; kestane fişeği; gastrik perforasyon; safrakesesi perforasyonu.

Intra-abdominal visceral injury following a firecracker explosion has not been reported before. We report a case of firecracker injury in a boy with penetration of metal shrapnel through the abdominal wall and perforation of the gallbladder and stomach. The mechanism of injury, diagnostic techniques and management of the patient are discussed.

CASE REPORT

A 14-year-old boy presented to the trauma unit of the hospital with a history of a penetrating injury to the abdomen while trying to light a firecracker in a tin box during "Diwali" - the Festival of Lights in India. A piece of metal from the tin box penetrated his abdomen after the blast. He presented four hours post-injury with a wound over the upper abdomen, abdominal pain and incessant vomiting and hematemesis. On examination, the boy had cold clammy skin, thready pulse, tachycardia (pulse rate 130/min) and hypovolemia (blood pressure - 84/50 mmHg). A "C" shaped ragged lacerated wound was noticed in the right hypochondrium (Fig. 1a, white arrow).

The abdomen was rigid and tender with obliteration of the liver dullness. Ultrasonography revealed free fluid in the abdomen. On radiography, a radiopaque object was visualized overlying the L2 vertebral body (Fig. 2, black arrow) with free gas under the right dome of the diaphragm (Fig. 2, white arrow). Hemoglobin was 8 g/dl.

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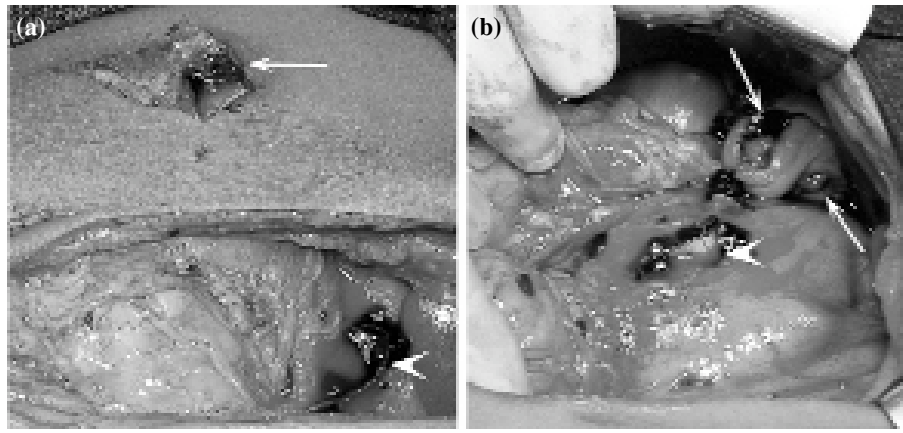

Fig. 1. **(a, b)** Intra-operative photograph showing entry wound, metal fragment lodged in the perforated stomach wall (arrowhead) and perforations in the gallbladder.

After resuscitation, the patient underwent urgent exploratory laparotomy. The peritoneal cavity contained about 800 ml of hemorrhagic fluid with gastric contents and bile. There was a 4 cm perforation in the anterior wall of the pylorus of the stomach with a metal fragment in situ and active bleed from the margins (Fig. 1a, 1b, arrowheads). The gallbladder had two 4 cm perforations along the fundus and the visceral surface (Fig. 1b, white arrows). The rest of the extrahepatic biliary tree was normal. A 4 x 1.5 cm metal fragment was extracted from the gastric perforation (Fig. 2, inset). Lesser sac exploration did not reveal any injury in the posterior wall of stomach or in the pancreas. The patient underwent debridement and repair of the gastric perforation with cholecystectomy and drainage of the peritoneal cavity. The entry wound was debrided and primarily sutured. The patient had an uneventful postoperative course.

Fig. 2. Plain radiograph of abdomen showing free gas under the right dome of the diaphragm (white arrow) and a radiopaque fragment (black arrow). Inset: Photograph of the extracted metal fragment.

DISCUSSION

Firecrackers are responsible for burns, contusion and laceration injuries to hands, fingers, eyes, head and face.[1-4] The easy availability of an array of perilous fireworks, lighting of fireworks in close proximity to the body, their unsupervised use, and the lack of physical coordination among young children using them out of curiosity or for experimentation are some of the reasons cited for causing firecracker accidents.[5] In India, most of these injuries occur in children using firecrackers without parental supervision. Shrapnel injuries, which routinely take place during war and terrorist attacks, are never seen with commonly used firecrackers. In this instance, the boy had ignited the firecracker in a tin box to augment the reverberation produced by the cracker. Unfortunately, the box splintered on explosion, scattering fragments, one of which was responsible for the injury.

The penetrating abdominal injury due to metal fragment in this case was akin to shrapnel injuries, with both the external wound and the internal perforations having irregularly contused margins (Fig. 1). Multi-organ visceral injury is frequent with such

penetrating wounds. Though hollow viscera injury is often diagnosed preoperatively, injury to the gallbladder can rarely be diagnosed preoperatively.[6] In this patient, the free gas on radiography suggested a probable gastrointestinal perforation. However, gallbladder perforation was recognized only at laparotomy. Biliary injuries should be suspected in the presence of free bile in the peritoneal cavity or with staining of the hepatoduodenal ligament or retroperitoneum.

The poor hemodynamic state of the patient on admission was due to the delay in arrival at the hospital and hemorrhage from the walls of the gastric and gallbladder perforations during this period, which was documented intra-operatively as hemoperitoneum. Isolated injury to the gallbladder in patients with penetrating abdominal wounds is rare. The liver is the most common organ associated with gallbladder injuries followed by the duodenum, stomach, colon and pancreas.[6] The risk of bile leakage from a repaired gallbladder and the absence of any known benefit from preservation of the organ validates cholecystectomy as the management of choice for gallbladder perforations.[6] Since the gallbladder may be required to repair associated ductal injuries, cholecystectomy is mandated only after excluding such injuries.[6] Debridement and repair usually suffice for gastric perforations unless the patient has high velocity injuries causing extensive devitalization, in which case resection of the stomach may be required.

In conclusion, this case underlines the fact that even firecrackers have a potential to cause grave penetrating abdominal injuries in addition to causing burns, contusions and lacerations, if they are used irresponsibly and without parental supervision. A detailed history, examination and a high index of suspicion would facilitate the diagnosis and management of such patients with firecracker injuries. Regulatory steps need to be taken to prevent the misuse of firecrackers, which may have potentially fatal consequences.

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