Adrenal injuries following blunt abdominal trauma in children: report of two cases

Çocuklarda künt karın travmasından sonra oluşan adrenal yaralanmalar: İki olgu sunumu

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Adrenal injuries following blunt abdominal trauma are uncommon. Adrenal hemorrhage in children associated with multiple organ injury, which has received little attention in the past, is an increasingly recognized phenomenon in modern trauma centers with the widespread use of abdominal computed tomography. Adrenal trauma occurs in the setting of multisystem organ injury. Isolated adrenal injury is exceedingly rare. We report two children with blunt adrenal trauma (one isolated and one with associated injuries), who were admitted during the last two years to our Pediatric Surgery Department after abdominal trauma. We determined the prevalence, management and general prognosis of blunt adrenal injury in the pediatric population. Traumatic adrenal hemorrhage appears to be an incidental and unsuspected finding that resolves on follow-up imaging.

**Key Words:** Adrenal; adrenal gland; blunt abdominal trauma; children; hematoma; hemorrhage; injury.

Abdominal trauma accounts for 8-10% of all trauma admissions to pediatric hospitals, and more than 80% of traumatic abdominal injuries in children result from blunt mechanisms.[1] The significance and true incidence of traumatic adrenal hemorrhage in children is not known.[2] In the past, injury of these tiny retroperitoneal organs was difficult to detect by imaging techniques during the acute phase.[3] Since the advent of modern imaging examinations, there has been an increase in the number of recognized cases.[2] Because of their small size and retroperitoneal location, the adrenal glands are protected by surrounding structures, and are infrequently injured following impact to the torso.[4] Although the right gland lies deep in the abdomen, medial to the right hepatic lobe and lateral to the spine, at a location protected from blunt trauma, it appears to be vulnerable.[5] However, in children, the adrenals are relatively large and may be more susceptible to injury following external compressive forces.[4] Adrenal gland injuries are most often associated with high injury severity[6] and are a strong indicator of a possible associated blunt visceral lesion.[2] Thus, isolated adrenal injury is exceeding rare,[7] with only a few cases (<10) having been documented in the literature among hospitalized pediatric patients. Depending on the extent of the injury and the patient’s hemody-
that her child seemed to have suffered injury to the abdomen, experiencing several emetic episodes. He was hemodynamically stable, with a respiratory rate of 25/min and a Glasgow Coma Scale (GCS) score of 15. No visible sign of an internal or external injury was present. On the physical examination, palpation of the abdomen revealed tenderness of the right hypochondrium. An immediate abdominal CT was performed, which showed a right adrenal gland hematoma (2.7 cm x 1.8 cm x 3.5 cm) with no other signs of intraabdominal injury (Fig. 1). Vomiting was not endocrine-related but caused by retroperitoneal irritation and should not be attributed in error to a possible central nervous system injury. There was no change in the child’s vital signs or electrolyte disturbance during his hospitalization. His serum cortisole was measured with and without adrenocorticotropic hormone (ACTH) stimulation test and was normal. Ultrasound (US) examination 3 and 10 days after the accident revealed a phased decrease in the hematoma size (Fig. 2). The child was discharged on the 10th posttraumatic day. According to the one-month US follow-up, the hematoma was almost completely absorbed (Fig. 2).

**Case 2**- A six-year-old girl was referred to our emergency department about half an hour after a vehicle accident, as a rear seat passenger in a car with a visible seat belt sign. On admission, she was conscious and hemodynamically stable. Her blood pressure was 100/60 mmHg, heart rate 130 beats/min, and respiratory rate 24 breaths/min, with \( \text{SpO}_2 \): 95%. She complained of cervical spine pain and right upper quadrant abdominal pain. The physical examination revealed no acute peritoneal signs. Immediate CT examinations revealed liver laceration, right adrenal attenuation indicating local bleeding, and vertebral injury of the cervical spine. She was treated conservatively. Ten days later, follow-up CT showed good resolution, and the patient was discharged on the 15th posttraumatic day with protective stable immobilization of the cervical spine.

**DISCUSSION**

Adrenal gland hematomas, which are more common in children than adults, are associated with an-
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CT is the best diagnostic tool, while US is very useful in follow-up examinations.[2] CT findings considered specific for adrenal injury include round or oval hematoma expanding the adrenal gland, irregular hemorrhage obliterating the gland, uniform adrenal gland swelling, active extravasation of contrast material from the adrenal vessels, and adrenal gland rupture.[12] Associated CT findings include stranding of the periadrenal fat, diffuse hemorrhage in the adjacent retroperitoneum and compression of the adrenal gland by adjacent traumatic lesions.[13] The differential diagnosis of adrenal neoplasms, retroperitoneal bleeding, and hepatic or renal lesions is difficult, but must be considered.[2]

In conclusion, in the pediatric population, blunt adrenal injuries are rare and typically present as part of a multiorgan trauma, but they are probably more common than previously suspected. Although unilateral adrenal lacerations are not fatal injuries and are of limited clinical significance, they are markers of severe external force. The right adrenal gland is more likely to be injured, with liver trauma as the most commonly associated injury, followed by ipsilateral renal injury. Adrenal trauma by itself is typically self-limited and does not require intensive care monitoring or operative intervention. However, adrenal trauma should not be considered an incidental finding because of the possibility of significant hemorrhage requiring transfusion. In the case of a child with an isolated adrenal hematoma, the possibility of bleeding into a tumor or child abuse must be suspected.

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