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Role of multidetector row computed tomography in the assessment of adrenal gland injuries

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Abstract

Objective: To determine the prevalence of adrenal injuries in a group of patients submitted to multidetector row CT evaluation after blunt trauma and to assess the impact of CT findings on clinical management decisions.

Materials and method: During a 4-year period, 2026 emergency CT examinations were performed in the setting of major blunt trauma. A total of 82 patients were retrospectively identified as having adrenal gland traumatic lesions. At multidetector row CT the following findings were considered specific of adrenal injury: 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. Associated CT findings were: stranding of the periadrenal fat, diffuse hemorrhage in the adjacent retroperitoneum and compression of the adrenal gland by adjacent traumatic lesions.

Results: We identified 82 patients (46 males and 36 females, age ranging from 15 to 86 years) with adrenal injuries. The right adrenal gland was injured in 60/82 patients, while the left adrenal gland was injured in 21 cases; in 1 patient bilateral adrenal gland traumatic lesions occurred. In 76 patients with non-isolated adrenal injuries concomitant injuries to the liver (49 cases), ipsilateral kidney (18 cases) and spleen (9 cases) were observed. Round or oval hematoma expanding the adrenal gland (61 cases), irregular hemorrhage obliterating the gland (14 cases), stranding of the periadrenal fat (9 cases) and diffuse hemorrhage in the adjacent retroperitoneum (8 cases) were the more frequent findings detected at CT. Six patients underwent surgical intervention for the presence of major injuries to the spleen (three cases), to the liver (one), to the right kidney (one), to the left kidney (one). Seventy-six patients were conservatively treated.

Conclusion: Blunt adrenal injuries typically present as part of a multiorgan trauma. Familiarity with characteristic CT findings of adrenal trauma is essential for the radiologist to avoid misdiagnosis.

Keywords: Retroperitoneal space; Injuries; Adrenal injuries; Multidetector row computed tomography

1. Introduction

Adrenal injury secondary to trauma is quite rare because of the position of the adrenal gland deep within the abdomen, well cushioned by surrounding soft tissue structures.

As reported in the literature [1], computed tomography (CT) plays a leading role in the evaluation of traumatic disease of the adrenal gland.

The main goals of this study are: (1) to determine the prevalence of adrenal injuries in a group of patients submitted to multidetector row CT evaluation after blunt trauma and (2) to assess the impact of CT findings on clinical management decisions.

2. Materials and methods

During a 4-year period, from March 2001 to March 2005, 2026 emergency CT examinations were performed in the setting of major blunt trauma. A total of 82 patients (46 males and 36 females, age ranging from 15 to 86 years) were retrospectively identified as having adrenal gland traumatic lesions.

CT examination was performed using a 16-slice scanner (Aquilion 16, Toshiba, Tokyo, Japan). This scanner is located at the −1 level, in the Section of Diagnostic Imaging of the

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Emergency Department of our trauma hospital, adjacent to both the operating and the resuscitation rooms.

CT study was performed using the following acquisition parameters: collimation 1.0 mm, image spacing 0.8, 46 mm/rot table speed, 120 kVp, 200 mA and pitch 23. Intravenous non-ionic iodinated contrast material (100–120 mL, Iopamiro 370, Bracco, Milan, Italy) was administered at a rate of 2.5–3 mL/s using a power injector through the antecubital vein in all 82 patients. A scanning delay of 60–70 s after the beginning of infusion of intravenous contrast material was routinely used. No laboratory tests were required in order to perform the emergency CT study. A single dose of 800 mL oral contrast material (Gastromiro, Bracco, Milan, Italy) was used in 13/82 patients before scanning.

Scans were transferred to a dedicated viewing workstation (Vitrea Version 3.5, Plymouth, Minnesota) where coronal, sagittal and para-sagittal multiplanar CT reformatted scans are viewed with comparable resolution to axial scans.

Scans were reviewed by radiologists with special expertise in trauma and emergency radiology. CT findings considered specific of adrenal injury included 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. Associated CT findings included stranding of the periadrenal fat, diffuse hemorrhage in the adjacent retroperitoneum and compression of the adrenal gland by adjacent traumatic lesions.

Results were compared with those provided by clinical follow-up or by surgery.

3. Results

Among 2026 trauma cases, we identified 82 patients (4%) with adrenal injuries. The causes of injury were car accident in 32 patients (39%), motorcycle accidents in 28 (34.14%), fall from height in 16 (19.52%), pedestrian injuries in 4 (4.9%) and work-place accident in the remaining 2 (2.44%).

Multidetector row CT study showed the presence of non-isolated traumatic lesions of the adrenal gland in 76/82 (92.7%); in the remaining six cases the adrenal traumatic lesions were isolated. The right adrenal gland was injured in 60 (73.2%) of the 82 patients, while the left adrenal gland was injured in 21 (25.6%) cases; in 1 patient bilateral adrenal gland traumatic lesions occurred.

At CT study the following adrenal gland traumatic lesions were detected: round or oval hematoma expanding the adrenal gland (61/82 patients, 74.4%) (Figs. 1–4 and 6), irregular hemorrhage obliterating the gland (14/82, 17.1%) (Fig. 5), stranding of the periadrenal fat (9/82, 11%) (Fig. 2), diffuse hemorrhage in the adjacent retroperitoneum (8/82, 9.75%) (Fig. 2), uniform adrenal gland swelling (4/82, 4.88%) (Fig. 5), compression of the adrenal gland by adjacent traumatic lesions (3/82, 3.66%), active extravasation of contrast material from the adrenal vessels in one patient and adrenal gland rupture (Fig. 5) in one patient. A total of 101 traumatic lesions of the adrenal gland were detected at CT examination.

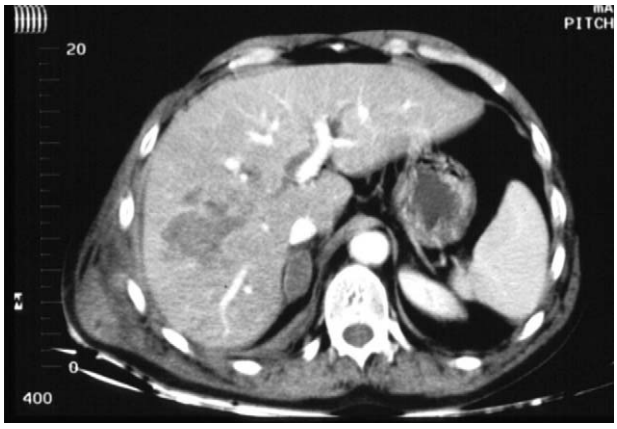

Fig. 1. MDCT shows the presence of a post-traumatic oval hematoma of the right adrenal gland. Multiple hepatic lacerations are also evident.

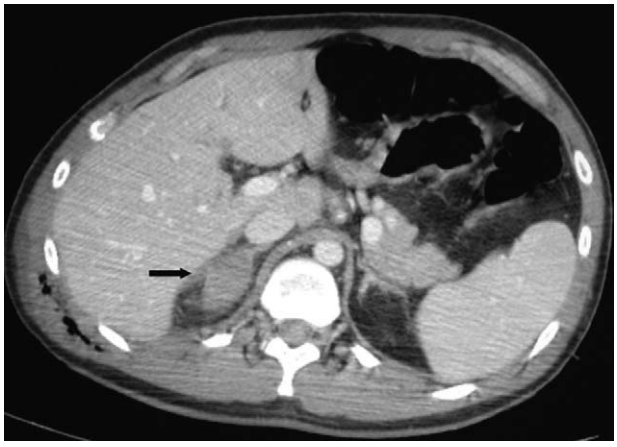

Fig. 2. MDCT demonstrates the presence of a post-traumatic hematoma of the right adrenal gland with stranding of the periadrenal fat and hemorrhage in the adjacent retroperitoneum (arrow). Right lateral subcutaneous emphysema is present.

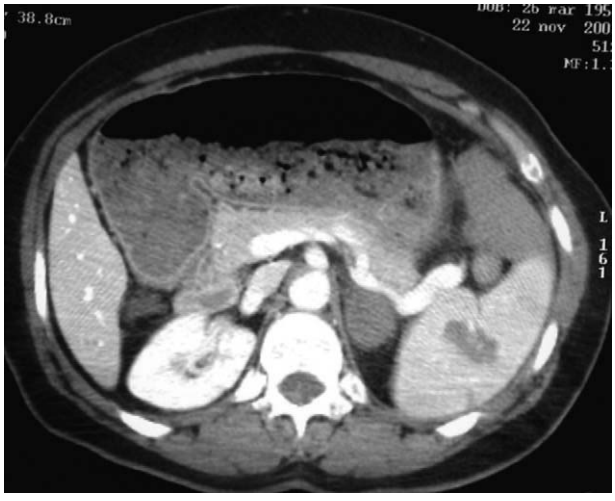

Fig. 3. MDCT shows the presence of a post-traumatic hematoma of the left adrenal gland with associated splenic lacerations.