Isolated adrenal post-traumatic haematoma: CT and MRI findings

Clinical History:

A middle-aged man with history of hypertension and previous prostatectomy was involved in a motorbike accident. He was discharged from another hospital with fractured 10th right rib, absent haemoperitoneum, increased leukocyte count and creatine-phosphokinase.

Six days later, he suffered from fever and haematuria.

Imaging Findings:

At our hospital, repeated ultrasound (Fig. 1) confirmed the absence of haemoperitoneum, and detected a 4x2 cm ovoid mass in the anatomic site of the right adrenal gland, which appeared isoechoic compared to the liver parenchyma. This finding of uncertain traumatic origin was further investigated using CT (Fig. 2): the well-demarcated right adrenal lesion measured 44-46 Hounsfield Units precontrast attenuation, did not enhance internally, and showed minimal peripheral and septal enhancement on multiphasic contrast-enhanced CT acquisition.

Three days later, unenhanced MRI (Fig. 3) was performed to confirm the hypothesis of adrenal haematoma and exclude pre-existing underlying tumour: the adrenal lesion showed mildly heterogeneous hyperintense T2-signal, markedly high T1 signal intensity consistent with extracellular methaemoglobin, and thin peripheral low-intensity rim, without solid-type components.

The lesion, consistent with isolated traumatic adrenal haemorrhage, persisted stable at further follow-up CT (Fig. 4) two weeks later.

Discussion:

Albeit rare, traumatic adrenal injury (TAI) is increasingly recognized with the widespread use of multidetector CT in traumatized patients. Since the small-sized adrenals are deeply embedded in retroperitoneal fat, TAI requires major blunt force and occurs with variable incidence (between 0.15% and 4%) according to the severity of blunt trauma. Rarely isolated, TAIIs most usually have associated injuries of the ipsilateral ribs, kidney, liver, spleen, thoraco-lumbar spine. Proposed TAI mechanisms include: a) acute increase of intra-adrenal venous pressure from compressed inferior vena cava; b) crushing between spine and surrounding organs; and c) deceleration shearing of small adrenal arterioles. Unilateral in the vast majority, TAIIs affect the right gland in 77-90% of cases since the shorter right adrenal vein eases venous congestion damage [1-5].

Specific symptoms and signs of TAI are generally absent in the setting of polytrauma. Albeit it may be
sonographically detected [6, 7], TAI is often missed in emergency conditions [8]. The CT hallmark (accounting for 80% of cases) is a 2-4 cm hyperattenuating (mean 52-55 Hounsfield units) round or oval haematoma which expands or distorts the adrenal gland. Less common alternative appearances include adrenal obliteration by irregular haemorrhage, peri-adrenal haemorrhage, and uniform high-attenuating adrenal swelling. Contrast extravasation from adrenal vessels is uncommon. Associated findings include peri-adrenal fat stranding, diffuse retroperitoneal blood, and compression of adrenal gland by adjacent traumatic lesions [1-4, 9].

During non-operative management, haematomas decrease in size and attenuation over time, and generally resolve without sequelae. An appealing alternative to repeated CT, MRI provides panoramicity and the possibility to avoid contrast media, without ionising radiation. Borrowing from experience with cerebral haemorrhage, MRI allows detection and characterisation of adrenal haematomas with variable signal features according to haemoglobin oxygenation. Blood is T1-hyperintense in both the early (2-7 days) and late subacute (7-14 days) phases, in the latter T2-hyperintense because of extracellular methaemoglobin. Chronicity is indicated by progressive haemosiderin hypointensity developing from the periphery [5, 10].

Another concern is the possibility of an underlying adrenal mass predisposing to bleeding after minor trauma. Coupled with functional testing for hormonally active tumours, appropriate imaging follow-up is warranted in unexplained cases of adrenal haemorrhage. MRI is particularly robust in the differentiation between haematoma and pre-existent benign or malignant lesions [1, 5, 9].

Most TAIs are managed conservatively, with transarterial embolisation reserved for enlarging haematomas. Surgery for associated thoraco-abdominal lesions is required in approximately 25% of polytraumatized patients with TAI [1-3].

**Differential Diagnosis List:** Post-traumatic haematoma of the right adrenal gland., Anticoagulation / Coagulation disorder, Sepsis, Recent surgery, Adrenal adenoma or myelolipoma, Pheochromocytoma, Lymphoma, Adrenal carcinoma, Adrenal metastasis

**Final Diagnosis:** Post-traumatic haematoma of the right adrenal gland.

**References:**

Description: Longitudinal ultrasound scan of the right hemiabdomen showed a well-demarcated, moderate-sized (see calipers) ovoid lesion (arrows) in the anatomic site of the adrenal gland, approximately isoechoic compared to the liver parenchyma. Absent haemoperitoneum. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Preliminary unenhanced scan confirmed the presence of a well-demarcated ovoid right adrenal mass lesion (arrow) measuring 44-46 Hounsfield Units attenuation, without fat stranding or blood in the surrounding fat. Absent haemoperitoneum. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Axial (b) and coronal (c) arterial phase images did not show abnormal enhancement of the right adrenal mass lesion (arrows), nor active contrast extravasation. Origin: Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Axial (b) and coronal (c) arterial phase images did not show abnormal enhancement of the right adrenal lesion (arrows), nor active contrast extravasation. Mild fat stranding was noted in the caudal perinephric space (+). **Origin:** Tonolini M, Radiology Department, “Luigi Sacco" University Hospital – Milan (Italy)
Description: On axial (d) and coronal (e) portal venous phase images the right adrenal lesion (arrows) did not enhance internally, with minimal peripheral and septal enhancement. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: On axial (d) and coronal (e) portal venous phase images the right adrenal lesion (arrows) did not enhance internally, with minimal peripheral and septal enhancement. Note mild fat stranding at the caudal perinephric space (+). Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: a Origin:
Description: Coronal (a) and axial (b) T2-weighted images confirmed ovoid right adrenal lesion (arrows) with heterogeneously hyperintense signal, demarcated by thin peripheral low-intensity rim.

Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Coronal (a) and axial (b) T2-weighted images confirmed ovoid right adrenal lesion (arrows) with heterogeneously hyperintense signal, demarcated by thin peripheral low-intensity rim.

**Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Axial fat-saturated T2-weighted image confirmed ovoid right adrenal lesion (arrow) with heterogeneously hyperintense signal, without appreciable oedema of the surrounding fat. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Axial T1-weighted (d, e with fat suppression, f out-phase gradient-echo) showed the ovoid right adrenal lesion (arrows) with persistently hyperintense signal consistent with extracellular methaemoglobin, demarcated by thin peripheral low-intensity rim. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Axial T1-weighted (d, e with fat suppression, f out-phase gradient-echo) showed the ovoid right adrenal lesion (arrows) with persistently hyperintense signal consistent with extracellular methaemoglobin, demarcated by thin peripheral low-intensity rim. **Origin:** Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)
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Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Repeated portal venous phase CT acquisition showed right adrenal lesion with unchanged appearance compared to Fig. 2d. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)