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# Type A Aortic Dissection and Non-Contrast Computed Tomography

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## Abstract

Non-contrast enhanced chest computed tomography (CT) carries a low sensitivity for acute aortic dissection; CT Angiography remains the gold standard. We highlight the potential utility of non-contrast CT for detection of aortic dissection in a case of a young, immunocompromised man presenting with acute abdominal pain and renal injury. Given elevated creatinine, an initial non-contrast chest CT demonstrated subtle findings suggestive of aortic dissection (aneurysmal dilation of the proximal ascending aorta as well as displaced calcified intimal flap/intraluminal high linear density in the thoracic descending and distal abdominal aorta). Subsequent CT angiography confirmed the presence of an extensive type A aortic dissection. He underwent emergent exploratory laparotomy and hemiarch repair. Displaced calcified intimal flaps, intraluminal high-densities, intramural hematoma, and aneurysmal aortic dilation are common non-contrast computed tomography imaging findings that suggest aortic dissection.

**Keywords:** Aortic Dissection, Non-contrast computed tomography, Hypertensive emergency, Acquired immunodeficiency syndrome

## 1. Background

Non-contrast enhanced chest computed tomography (CT) carries a low sensitivity for acute aortic dissection; CT Angiography remains the gold standard. However, certain subtle findings on non-contrast CT may enhance the diagnostic accuracy for aortic dissection. We highlight the potential utility of subtle findings on non-contrast CT for detection of aortic dissection in a case of a young, immunocompromised man presenting with acute onset abdominal pain, bloody diarrhea, and rising serum creatinine.

## 2. Case presentation

A 43-year-old man presented to the emergency department with acute onset abdominal pain, emesis, and mild bloody diarrhea of one day duration. He had a history of hypertension, chronic kidney disease stage IIIb, and AIDS. The patient appeared uncomfortable, complained of severe abdominal pain with radiation to the back, and chest discomfort. No murmurs nor unequal pulses were appreciated. Vitals demonstrated a markedly elevated blood pressure to 220/180 mm Hg. Laboratory diagnostics demonstrated a mild non-anion gap metabolic acidosis, baseline elevation of serum

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creatinine, and a minimally elevated lipase. Lactic acid was elevated to 5.5 mmol/L. CBC demonstrated a mild leukocytosis to 13,000/uL. Subsequent labs demonstrated a worsening acidosis, serum creatinine, and lactic acid (10.1 mmol/L).

Initial chest CT scan was performed without contrast given the elevated creatinine (Fig. 1). Subsequent CT angiography (Fig. 2) confirmed the presence of an extensive type A aortic dissection extending from the sinus of Valsalva to the common iliac arteries with involvement of the ascending aorta, aortic arch, subclavian artery, right common carotid artery, right subclavian artery, celiac artery, bilateral renal arteries, superior mesenteric artery with complete thrombosis, and common iliac

arteries. Comparison of the computed tomography angiography and findings of the non-contrast study (described in retrospect) demonstrated evidence of dissection at the same level. The patient was emergently transferred and underwent exploratory laparotomy and hemiarch repair. While repeat CT demonstrated improved patency of his visceral vessels, he developed cardiogenic shock and was transitioned to comfort care.

### 3. Discussion and conclusion

Non-contrast enhanced CT, while convenient, carries a low sensitivity for acute aortic dissection.<sup>1,2</sup> CT Angiography remains the gold standard for

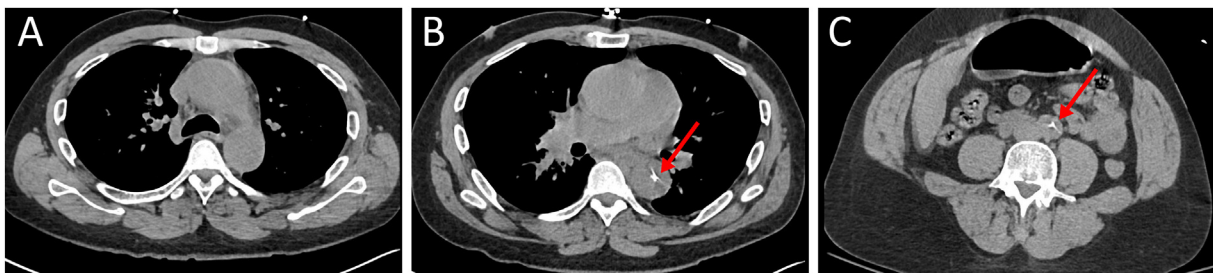


Fig. 1. Non-contrast Computed Tomography demonstrating subtle findings suggestive of Aortic Dissection. Evidence of aneurysmal dilation of the proximal ascending aorta (A), ongoing aneurysmal dilation with a noted displaced calcified intimal flap/intraluminal high linear density in of the thoracic descending aorta (B) and distal abdominal aorta (C).

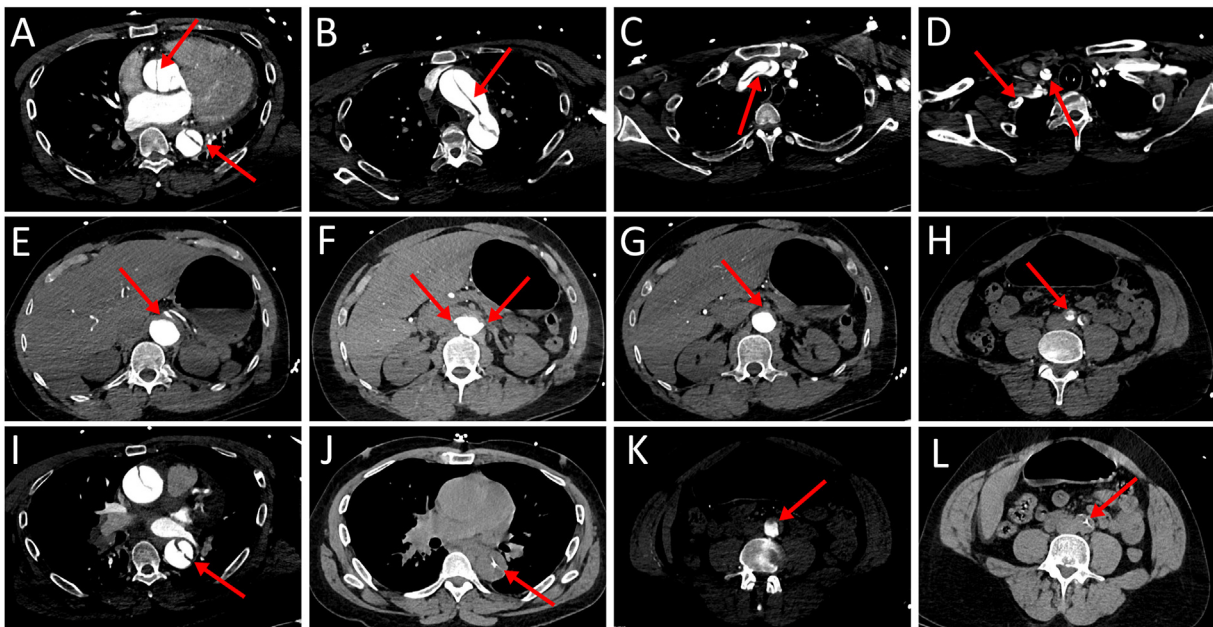


Fig. 2. Computed Tomography Angiography demonstrating extensive Type A aortic dissection extending from the sinus of Valsalva to the common iliac arteries with involvement of the ascending (A) and arch of the aorta (B), subclavian artery (C), right common carotid and right subclavian arteries (D), celiac artery (E), bilateral renal arteries (F), superior mesenteric artery with complete thrombosis (G), and common iliac arteries (H). Comparison of the Computed Tomography Angiography and non-contrast studies demonstrates evidence of dissection at the same level, highlighting pertinent non-contrast imaging findings corresponding to the respective contrasted studies at the level of the descending thoracic aorta (I, J) and distal abdominal aorta (K, L).

identification of dissection with a sensitivity approaching 100%,<sup>3</sup> yet a variety of subtle findings, radiomic modeling, and deep learning algorithms may enhance the diagnostic accuracy of non-contrast CT, for example by modelling the heterogeneity of blood appearance in different flow patterns based on subtle differences in grayscale images, which may not be visible to the naked eye.<sup>2–4</sup> Displaced calcified intimal flaps, intraluminal high-densities, intramural hematoma, and aneurysmal aortic dilation are common non-contrast computed tomography imaging findings that suggest aortic dissection, which may be especially useful in patients with kidney disease or other contraindications for intravenous contrast administration.

### Conflict of interest

The authors report no conflict of interest.

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