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Case Report

Motion-Artifact 'Pseudo–Type A Dissection' on Ungated CTA in a Morbidly Obese Patient with Resolution on ECG-Gated CTA: A Case Report

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ABSTRACT

We present a case of acute chest pain in a 48-year-old morbidly obese female with multiple comorbidities that raised suspicion for Acute Aortic Syndrome (AAS). The initial ungated PE-protocol CT angiogram (CTA) revealed a linear low-attenuation band in the ascending aorta consistent with a motion artifact-induced pseudo-flap. This finding led to two Transesophageal Echocardiograms (TEEs): the first, performed under conscious sedation, was positive; the second, performed under general anesthesia (GA) to minimize artifact, was negative. To definitively assess the findings, a confirmatory ECG-gated CTA was performed immediately after heart rate control, which was negative for both pulmonary embolism (PE) and aortic dissection. The final diagnosis was Acute Decompensated Heart Failure (ADHF), and the patient was discharged on Guideline-Directed Medical Therapy. This case illustrates that the ungated PE-protocol CTA is critically suboptimal for the ascending aorta and underscores the need to use a dedicated ECG-gated CTA when AAS is suspected, particularly in obese patients prone to motion artifacts, to prevent diagnostic error and unnecessary surgical intervention.

1. Introduction

Motion in the ascending aorta can create imaging artifacts that may be mistaken for a false channel or an intimal flap [1]. These artifacts are often seen in emergency department (ED) scans because the imaging is typically ungated. The primary purpose of these scans is to detect pulmonary embolism, not to screen for acute aortic syndromes, which can lead to misinterpretation. Recognizing that these artifacts may be masquerading as an acute aortic emergency is crucial, especially in the ED. This awareness can prevent unnecessary further testing and even surgical interventions. Additionally, morbid obesity is increasingly recognized as a challenge that can negatively impact the diagnostic accuracy of various imaging methods, including CT scans. These challenges can include Increased Noise (Quantum Mottle), X-ray beam weakening, Truncation/Cropping Artifacts, and Motion Artifacts [2].

Imaging for suspected AAS is critical and performed rapidly, with CTA of the chest/abdomen/pelvis as the modality of choice for hemodynamically stable patients (Class I recommendation). The ACR Appropriateness Criteria also rates CTA as "Usually Appropriate" for definitive diagnosis. A key technical caution, however, is that ungated PE-protocol CTA can produce ascending aortic motion artifacts, potentially obscuring or simulating the intimal flap of a critical Type A dissection due to the heart's cyclical movement. Therefore, dedicated aortic or ECG-gated CTA protocols are generally preferred, especially for evaluating the ascending aorta [3, 4].

2. Case Presentation

A 48-year-old female presented to a rural hospital ED complaining of the sudden onset of chest pain and respiratory distress. Her past medical history included morbid obesity, pulmonary hypertension, obstructive sleep apnea, chronic diastolic heart failure, cardiomegaly, COPD, hypertension, and a history of pulmonary embolism on anticoagulation with apixaban.

Her initial vital signs were as follows: Temp 97.4F, HR 97, RR 24, BP was mildly elevated on arrival but without hypertensive emergency (145/84 mmHg), and SpO2 97% on room air. Her BMI was 73.76 kg/m2. Laboratory parameters did not highlight any acute abnormalities. Troponin level was normal. Physical examination revealed a morbidly obese woman in acute respiratory distress. Auscultation revealed distant heart sounds with no audible murmurs; bibasilar crackles on lung exam; and abdominal examination was difficult due to body habits. Pulses were 2+ in all 4 extremities with slightly lower extremity edema. No focal neurological deficits were noted.

A 12-lead ECG was requested, which showed sinus tachycardia without any acute ST/T changes. The patient underwent a STAT CTA of the chest to evaluate for PE, per the protocol in (**Table 1**). Her Serum Creatinine was 1.7 mg/dL pre-CTA. Although there were no findings suggestive of PE, the CTA was remarkable for a linear low-attenuation band in the ascending aorta, consistent with a 'pseudo-flap' that did not extend to the aortic root, especially since the ascending aorta on ungated CTA is artifact-prone. This finding

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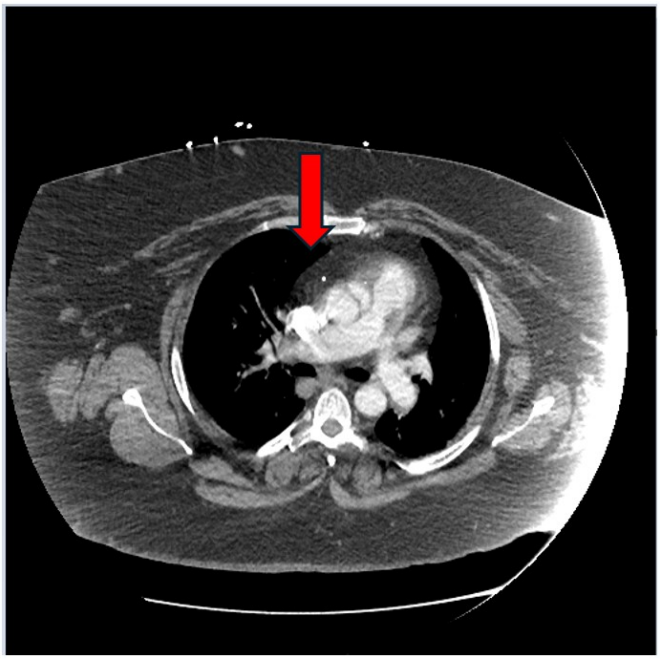

Figure 1: Contrast CT images in transverse plane consistent with false lumen flap (red arrow), a finding consistent with aortic dissection. Imaging is also remarkable for thicker than normal subcutaneous tissue and fat.

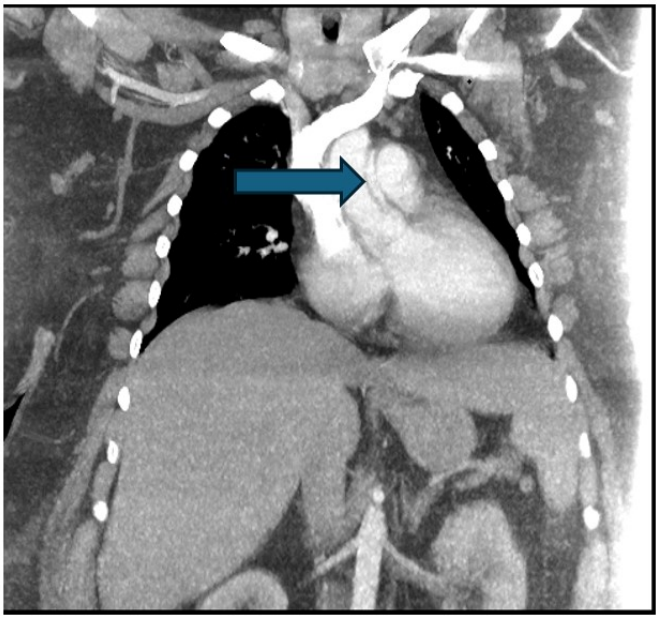

Figure 2: Contrast CT images in coronal plane suggestive of a type-A aortic dissection false lumen flap (blue arrow).

was strongly suggestive of a Type-A aortic dissection; **(Figure 1)** and **(Figure 2)**.

Subsequently, the cardiology team performed an initial TEE (TEE#1) under conscious sedation. The procedure utilized a Philips X7-2t probe operating at 5.0–7.0 MHz. Visualization utilized 2D, M-mode, and Color Flow Doppler from the Upper Esophageal to Deep Transgastric windows. During TEE#1, the HR was 95 bpm, and the BP was 142/90 mmHg. Image quality was noted to be sub-optimal in the mid-esophageal (ME) windows due to the patient's morbid obesity and increased esophageal peristalsis related to conscious sedation. The report confirmed an intimal flap suggestive of ascending aortic dissection not involving the aortic root. She was transferred to a tertiary care center for a cardiothoracic surgery evaluation and possible operative repair.

Upon arrival, the surgical team decided to perform a repeat TEE (TEE#2) using a similar probe to confirm the initial reported findings. This TEE was performed under GA with mechanical ventilation to minimize movement artifact and allow for a more comprehensive esophageal and transgastric survey. Improved image quality was achieved, particularly in the ME windows, due to the absence of esophageal peristalsis under GA. The CT surgical team independently reviewed these images and, after a core review of

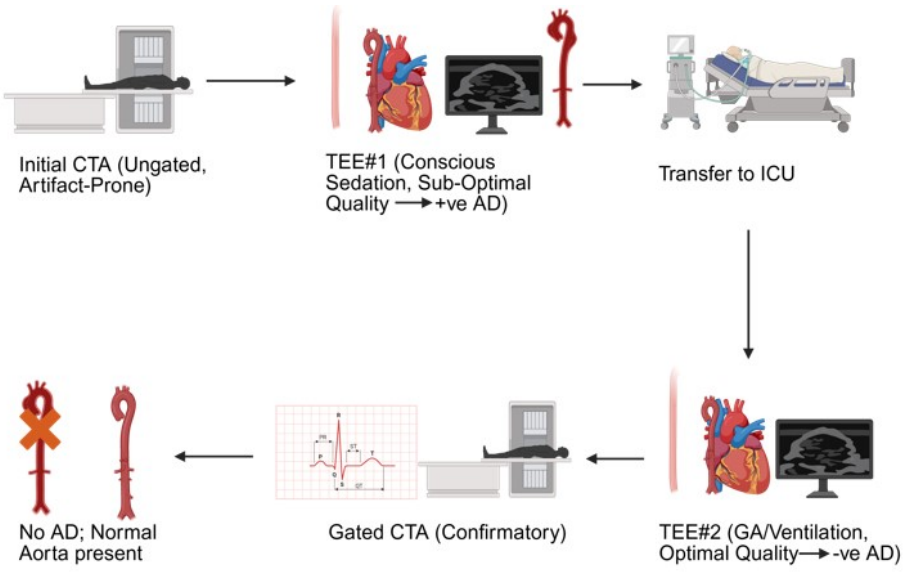

Figure 3: Timeline of diagnostic evaluation AD; Aortic Dissection.

Table 1: CTA parameters used

Parameter	Initial CTA (Ungated PE Protocol)	Confirmatory CTA (ECG-Gated Aortic)
Scanner Model	Siemens Somatom Sensation 64	Siemens Somatom Sensation 64
Gating Status	Non-Gated	Retrospectively ECG-Gated
Tube Voltage (kVp)	120	100
Effective Current (mAs)	200	350
Pitch	1.2	0.3
Rotation Time (s)	0.5	0.33
Contrast Volume / Rate	75 mL at 4.5 mL/s	100 mL at 5.0 mL/s
HR at Acquisition (bpm)	95	68 (Beta-Blockade utilized)

CTA, Computed Tomography Angiography.

both TEE#1 and TEE#2, found no convincing evidence of an intimal flap or aortic dissection in any views.

The discordance in findings was adjudicated by the attending cardiothoracic surgeon, who concluded that the findings in TEE#1 were most likely due to image artifact (reverberation) exacerbated by sub-optimal imaging planes and patient movement under conscious sedation, which were subsequently negated by the superior imaging quality and comprehensive assessment of TEE#2 performed under GA. To definitively rule out Type-A dissection, a confirmatory ECG-gated CTA of the chest was immediately recommended, and IV esmolol was started as a 500 μg/kg bolus followed by a 50 μg/kg/min continuous infusion. A STAT serum creatinine test was performed, revealing a level of 2.2 mg/dL. The ECG-gated CTA was performed to limit pulsation artifact; the protocol is in **(Table 1)**. The report was negative for PE or aortic dissection, confirming the final TEE findings and allowing for extubation and transfer out of the ICU within hours. A timeline representing the diagnostic evaluation is provided **(Figure 3)**.

The patient was extubated without complications, and a trial of 1mg IV bumetanide, along with 50mg/250mL nitroglycerin, was given. One hour later, the patient reported decreasing chest pain and feeling better. BNP level was measured at 1260 pg/mL. The diagnosis of ADHF was presumed, and the patient continued to receive bumetanide and nitroglycerin with BNP level measurement daily for 5 consecutive days: **(Table 2)**.

Table 2: BNP levels over time after presentation

Time after Presentation (Days)	BNP Level (pg/mL)
Admission	1260
24 hours (Day 1)	1112
48 hours (Day 2)	967
72 hours (Day 3)	854
96 hours (Day 4)	761
Discharge (Day 5)	682

BNP, B-type Natriuretic Peptide

The patient was discharged on day 5 post-presentation. Discharge medications included Furosemide 40mg BID, Sacubitril/Valsartan 49/51mg BID, Carvedilol 3.125mg BID, Dapagliflozin 10mg QD, and Spironolactone 12.5mg QD. They were instructed to follow up within a week at the Cardiology attending clinic.

Table 3: Comparison of Ungated vs. ECG-Gated CTA for AAS Evaluation

Feature	Ungated CTA (e.g., PE Protocol)	ECG-Gated CTA (Dedicated Aortic Protocol)
AAS Utility	Suboptimal, often reserved for ruling out PE	Standard of Care (Preferred for suspected AAS)
Image Quality (Ascending Aorta)	Poor, highly susceptible to motion artifact	Superior, minimizes cardiac motion artifact
Risk of 'Pseudo-Flaps'	High (artifact can mimic dissection flap)	Low
Procedure Time	Faster (Single acquisition, non-gated)	Slower (Requires synchronization, planning, and multiple reconstruction phases)
Radiation Dose	Typically lower (Non-gated acquisition)	Higher (Uses prospective or retrospective gating, increasing effective mAs/dose)

AAS, Acute Aortic Syndrome; PE, Pulmonary Embolism; CTA, Computed Tomography Angiography.

3. Discussion

CT scans are a routine method for evaluating AAS in patients presenting with chest pain or related symptoms. However, when used for the chest, this imaging technique is unfortunately more prone to errors and artifacts than when it's used to examine other parts of the body [5].

When AAS, particularly Type A Aortic Dissection involving the ascending aorta, is suspected, the definitive imaging modality is ECG-gated CTA of the thoracic aorta according to the guidelines. Ungated PE-protocol CTA is suboptimal for the ascending aorta because the movement of the beating heart causes significant motion artifact in the aortic root and proximal ascending aorta. This artifact can obscure a true intimal tear or, conversely, create a 'pseudo-flap' (a false-positive dissection diagnosis) due to blurring. ECG-gated imaging, by synchronizing image acquisition with the quietest phases of the cardiac cycle, minimizes this artifact and provides superior visualization of the inner and outer aortic walls, leading to improved edge depiction and greater confidence in measurements; **(Table 3)** [3].

Additionally, imaging the obese patient population presents significant technical challenges for CT, primarily due to limitations in scanner hardware and image quality degradation. The increased soft tissue diameter often exceeds the physical constraints of the gantry bore and the Scan Field of View. In contrast, the greater soft-tissue volume leads to severe photon starvation, as the X-ray beam is highly attenuated. This results in unacceptable image noise and quantum mottle. To mitigate these issues and ensure diagnostic quality, acquisition protocols must be tailored. Key strategies include using scanners with high-capacity tables and wide bores, increasing the tube current (mAs) and voltage (kVp) to boost beam penetration, and employing advanced post-processing methods, such as Iterative Reconstruction algorithms, which effectively reduce image noise and enable dose reduction without sacrificing image clarity. For anatomical regions susceptible to motion, like the thoracic aorta, dedicated ECG-gating remains essential to prevent motion artifacts that can obscure or mimic pathology [2, 6, 7].

4. Conclusion

Although a routine CT scan is highly effective for identifying aortic dissections, ungated PE-protocol CTA mimics type A dissection, particularly for those located in the ascending aorta, especially in patients with high BMI. To mitigate this risk and prevent unnecessary surgery, urgent ECG-gated CTA is the recommended confirmatory test when AAS suspicion persists, as it produces high-quality, motion-free images by synchronizing with the patient's cardiac cycle.

Conflicts of Interest

The authors declare no competing interests that could have influenced the objectivity or outcome of this research.

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Informed consent

The authors confirm that patient written consent forms have been obtained for this article, including all accompanying clinical data and images.

Large Language Model

None.

Authors Contribution

All authors contributed equally. All authors reviewed and approved the final manuscript.

Data Availability

All data generated or analyzed during this case report are included within the published article. No additional datasets were generated or analyzed. Due to the nature of a single-patient case report and to protect patient privacy, no raw or identifiable data are publicly available. Any further information is available from the corresponding author upon reasonable request and subject to ethical and privacy considerations.

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