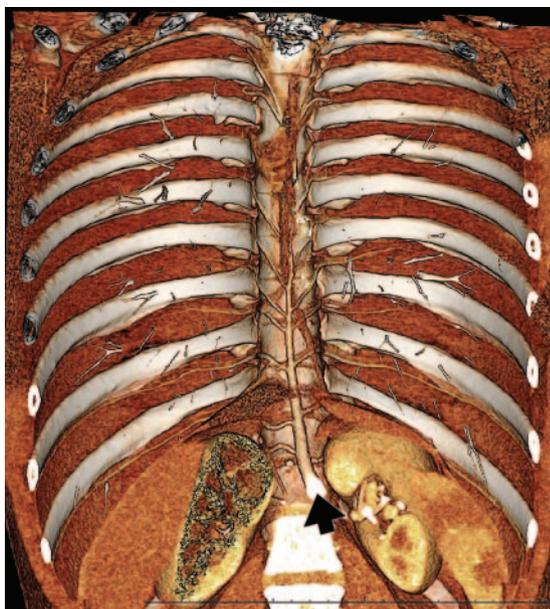


## Solitary Intercostal Arterial Trunk A Previously Unreported Anatomical Variant

John Chang, MD, PhD; Geoffrey D. Rubin, MD

During embryonic life, events may alter the normal growth and fusion of the endocardial tube, the paired dorsal aortae, and the vitelline plexus, leading to anomalies and variants of the mature axial arterial system.<sup>1</sup> Many of these are well known, especially those associated with the aorta, heart, and umbilical artery.<sup>1,2</sup> Vitelline variants have also been found that are either associated with Meckel diverticulum or caudal regression syndrome.<sup>3,4</sup> We present a case of anomalous intercostal arterial supply, which, to our knowledge, has not been reported previously. The aberrant intercostal trunk is associated with aberrant descending thoracic aorta position, a replaced common hepatic artery from the superior mesenteric artery, and an isolated splenic artery origin from the aorta.

A 27-year-old man with a medical history of irritable bowel syndrome and stage I hypertension presented for renal vasculature evaluation. A renal arterial magnetic resonance angiogram (not shown) and subsequent thoraco-



**Figure 1.** Frontal volume-rendered CT angiogram demonstrates the T4–T12 intercostal arteries arising from the anomalous intercostal trunk arising from the aorta at the T12 level (arrow).



**Figure 2.** Transverse CT section demonstrates centralized apices of the hemidiaphragms. In the upper abdomen, the aorta (A) is anteriorly displaced from the vertebrae and the anomalous trunk (curved arrow) occupies the prevertebral space. Fat occupies the space in the middle mediastinum between the aorta and vertebrae.

abdominal computed tomography (CT) angiogram [64-row multidetector-row computed tomography (MDCT), 1.0-mm section thickness after intravenous injection of 600 mgI/kg Iovue 370] demonstrated normal renal arteries and an anomalous branch artery arising from the posterior aspect of the aorta at the level of T12 with median ascension, terminating at T3. The artery gradually tapered from its 7-mm diameter origin to its terminus and supplied the third through twelfth intercostal arteries bilaterally (Figure 1). This “anomalous intercostal trunk” coursed between the thoracic spine and the descending thoracic aorta, which was elevated 23 mm anterior to the thoracic vertebral bodies and was in close association with the esophagus (Figure 2). An additional posterior trunk arose at the level of T6 and ascended superiorly to supply the first and second intercostals spaces. Associated with this anomaly was an isolated splenic artery

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The online-only Data Supplement is available at <http://circimaging.ahajournals.org/cgi/content/full/2/6/e49/DC1>.

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(*Circ Cardiovasc Imaging*. 2009;2:e49-e50.)

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*Circ Cardiovasc Imaging* is available at <http://circimaging.ahajournals.org>

DOI: 10.1161/CIRCIMAGING.109.851147



**Figure 3.** Left anterior oblique volume-rendered CT angiogram demonstrates the aorta (A) and origins of the splenic artery laterally (long arrow) and the superior mesenteric artery anteriorly (open arrow). The anomalous intercostal trunk (curved arrow) arises posterior and inferior to these branches, just proximal to the left renal artery origin (wide solid arrow). The celiac trunk is absent.

arising from the aorta at the level of T11 (Figure 3) and a replaced common hepatic artery arising from the proximal superior mesenteric artery, which arose from the anterior aspect of the aorta at the T11–12 level (Figure 4). In addition, the patient had an anomalous trunk arising from the posterior aspect of the aorta supplying the lumbar arteries at L2 and L3 levels. The remainder of the lumbar segments was supplied by the expected lumbar arteries from the aorta. All of the aforementioned anatomic relationships may be viewed in the stacked transverse CT sections in the online-only Data Supplement movie.

We speculate that this constellation of findings may represent a manifestation of anomalous development of the aorta and the vitelline arterial plexus. Possible anomalies may include (1) an interrupted aortic arch where the vitelline plexus connects with the aortic arch to develop into the aorta, whereas the native aorta atrophies but retains supply to the segmental somites, or (2) lack of expected vitelline atrophy that leads to a dominant ventral arterial supply with aortic fusion to the vitelline arteries. Regardless of the mechanism



**Figure 4.** Right lateral volume rendered CT angiogram demonstrates the anomalous intercostal trunk ascending into the thoracic cavity (curved arrows) and giving rise to the intercostal arteries. Proximal to the anomalous arterial origin, the superior mesenteric artery (open arrow) originates anterior to an aortic kink (wide arrow) at the aortic hiatus of the diaphragm. The common hepatic artery (black arrow) originates anomalously from the superior mesenteric artery.

of this anomaly, it is intriguing to consider how the reported intercostal arterial supply could facilitate spinal arterial revascularization in the setting of descending aortic replacement and also place the spinal cord at risk should the single arterial trunk become occluded.

## Disclosures

None.

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*Circ Cardiovasc Imaging*. 2009;2:e49-e50

doi: 10.1161/CIRCIMAGING.109.851147

*Circulation: Cardiovascular Imaging* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

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Print ISSN: 1941-9651. Online ISSN: 1942-0080

The online version of this article, along with updated information and services, is located on the World Wide Web at:

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## **Supplemental Material**

**Movie Legend.** Transverse images starting at the level of the upper abdominal aorta scrolling superiorly towards the thoracic inlet showing the anomalous intercostal trunk (deep purple arrow) coursing anterior to the vertebral bodies and giving rise to the intercostals arteries. A second intercostal trunk arises more superiorly (red arrow) to supply the first two intercostals arteries.