UNPAIRED BRANCHES OF THE ABDOMINAL AORTA, HALLER’S TRIPOD AND THEIR CLINICAL SIGNIFICANCE

Asatullayev Rustamjon Baxtiyarovich
G’aybullayev Mirmuhammad Yorqin o’g’li

Abstract: *The main functions of the unpaired branches of the abdominal aorta are to supply blood to the internal organs such as the stomach, liver, duodenum, pancreas, jejunum, ileum, and colon. The abdominal aorta is divided into numerous branches, ensuring adequate blood circulation to these organs. In this process, the significance of Haller’s arch is considerable. It regulates the osmotic pressure of the human body and maintains the physiological processes occurring within it.*

Keywords: *Artery, aorta, branch, celiac, mesenteric, blood, organ, ischemia, aneurysm, anatomy.*

Introduction

The abdominal aorta is the continuation of the thoracic aorta and serves as the main arterial trunk supplying the abdominal organs. Its unpaired branches are of particular anatomical and clinical importance because they provide the primary blood supply to the gastrointestinal tract and its associated organs. Several of these vessels are named after prominent anatomists who first described their structures. Disorders involving these arteries are associated with severe clinical outcomes, including ischemia, aneurysms, and occlusive diseases.

Anatomical Overview of Unpaired Branches

Clinical relevance: Celiac artery stenosis or compression (Median Arcuate Ligament Syndrome) may cause abdominal pain, weight loss, and ischemia. Aneurysms of the splenic artery are the most common visceral arterial aneurysms.

Superior Mesenteric Artery (SMA, Arteria mesenterica superior)

First systematically studied by Tiedemann (1781–1861).

Originates from the abdominal aorta at the level of L1.

Supplies the midgut: distal duodenum, jejunum, ileum, cecum, ascending colon, and proximal 2/3 of the transverse colon.

Clinical relevance: SMA syndrome (Wilkie’s syndrome) occurs when the SMA compresses the third part of the duodenum, leading to nausea, vomiting, and weight loss. SMA thrombosis or embolism can cause life-threatening mesenteric ischemia.

Inferior Mesenteric Artery (IMA, Arteria mesenterica inferior)

Anatomical features detailed by Wilhelm His Sr. (1831–1904) and later by other anatomists.

Arises from the abdominal aorta at the level of L3.

Supplies the hindgut: distal 1/3 of the transverse colon, descending colon, sigmoid colon, and upper rectum.

Clinical relevance: Occlusion of the IMA is less common due to collateral circulation (marginal artery of Drummond, arc of Riolan). However, ischemic colitis can occur, particularly in elderly patients with atherosclerosis.

Pathological Conditions Associated with Unpaired Branches

1. Aneurysms

Visceral arterial aneurysms are most common in the splenic artery (celiac trunk branch).

Risk of rupture is high in pregnant women.

2. Stenosis and Occlusion

Caused by atherosclerosis, thrombosis, or external compression.

Leads to mesenteric ischemia, presenting with postprandial abdominal pain and weight loss (“intestinal angina”).

3. Ischemic Syndromes

Acute mesenteric ischemia: Life-threatening emergency, often due to SMA occlusion.

Chronic mesenteric ischemia: Progressive stenosis of celiac, SMA, or IMA, requiring surgical or endovascular intervention.

4. Congenital Anomalies

Variations in branching patterns (e.g., hepatosplenic trunk, celiomesenteric trunk) may complicate surgery or interventional radiology.

Conclusion

The unpaired branches of the abdominal aorta—celiac trunk, superior mesenteric artery, and inferior mesenteric artery—play a vital role in supplying the gastrointestinal tract. Their anatomical variations, historical significance, and eponymous associations reflect the contributions of anatomists such as Haller and Tiedemann. Clinically, these arteries are involved in life-threatening conditions such as aneurysms, stenosis, and mesenteric ischemia. Understanding their anatomy is essential for surgeons, radiologists, and clinicians, making this topic both scientifically rich and clinically relevant.

References:

1. Gray’s Anatomy: The Anatomical Basis of Clinical Practice – a classical source of anatomy, describing the abdominal aorta and its branches in detail.
2. Moore, Dalley, Agur – Clinically Oriented Anatomy – clinically significant anatomy.
3. Netter’s Atlas of Human Anatomy – anatomical atlas with precise illustrations of the celiac trunk and other arteries.
4. Snell’s Clinical Anatomy – connecting anatomy with clinical practice.
1. Scientific articles and studies
5. Haller A. Icones anatomicae (1756) – the original description of Haller’s arch.
6. Tandler J. (1904) – classical work on the celiac trunk and its variations.
7. Standring S. et al. – articles and research (Journal of Anatomy, Clinical Anatomy, etc.).
8. Modern vascular surgery and radiology reviews – on celiac trunk compression syndrome, SMA syndrome, and other clinical conditions.
2. Electronic resources
9. PubMed (https://pubmed.ncbi.nlm.nih.gov/) – latest scientific articles on the branches of the abdominal aorta and their diseases.
10. ScienceDirect, Springer, Elsevier – atlases and clinical anatomy references.