

# *Clinical Anatomy of the Aorta*

Handout download:

<http://www.oucom.ohiou.edu/dbms-witmer/gs-rpac.htm>

**Lawrence M. Witmer, PhD**

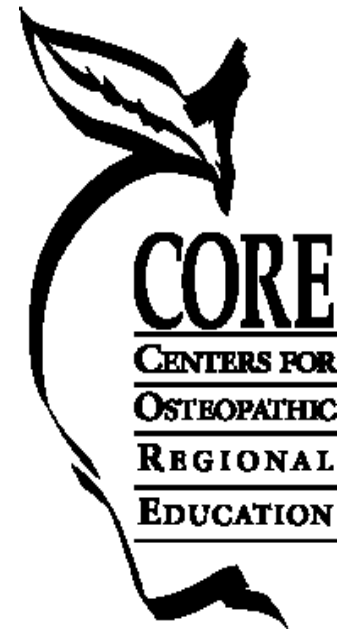
Department of Biomedical Sciences

College of Osteopathic Medicine

Ohio University

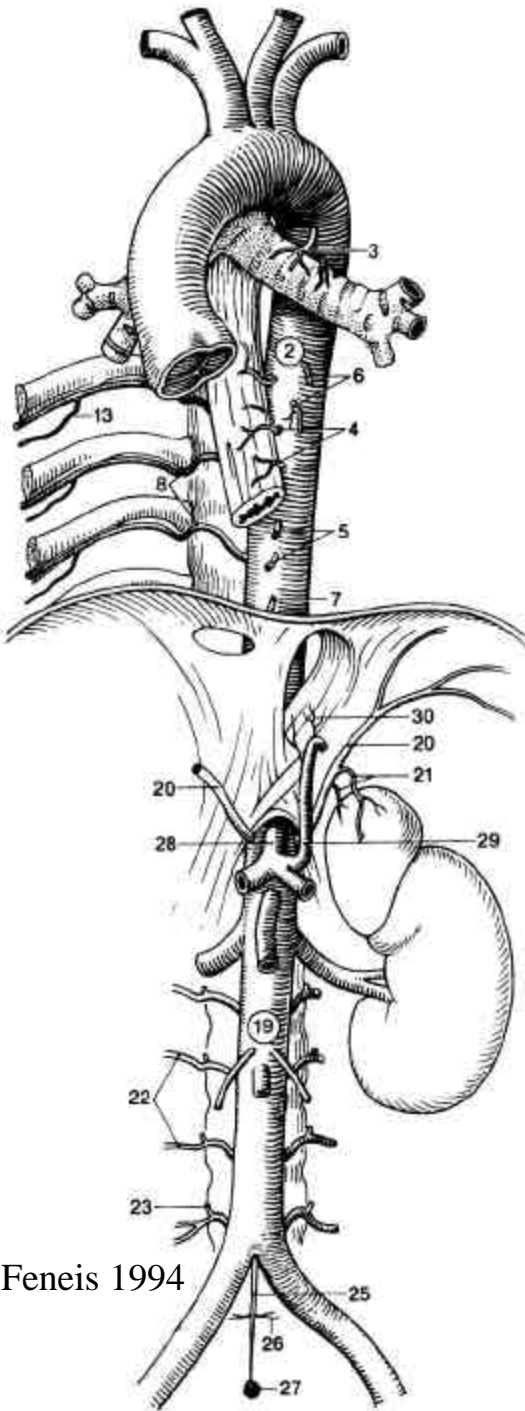
Athens, Ohio 45701

witmer@exchange.oucom.ohiou.edu

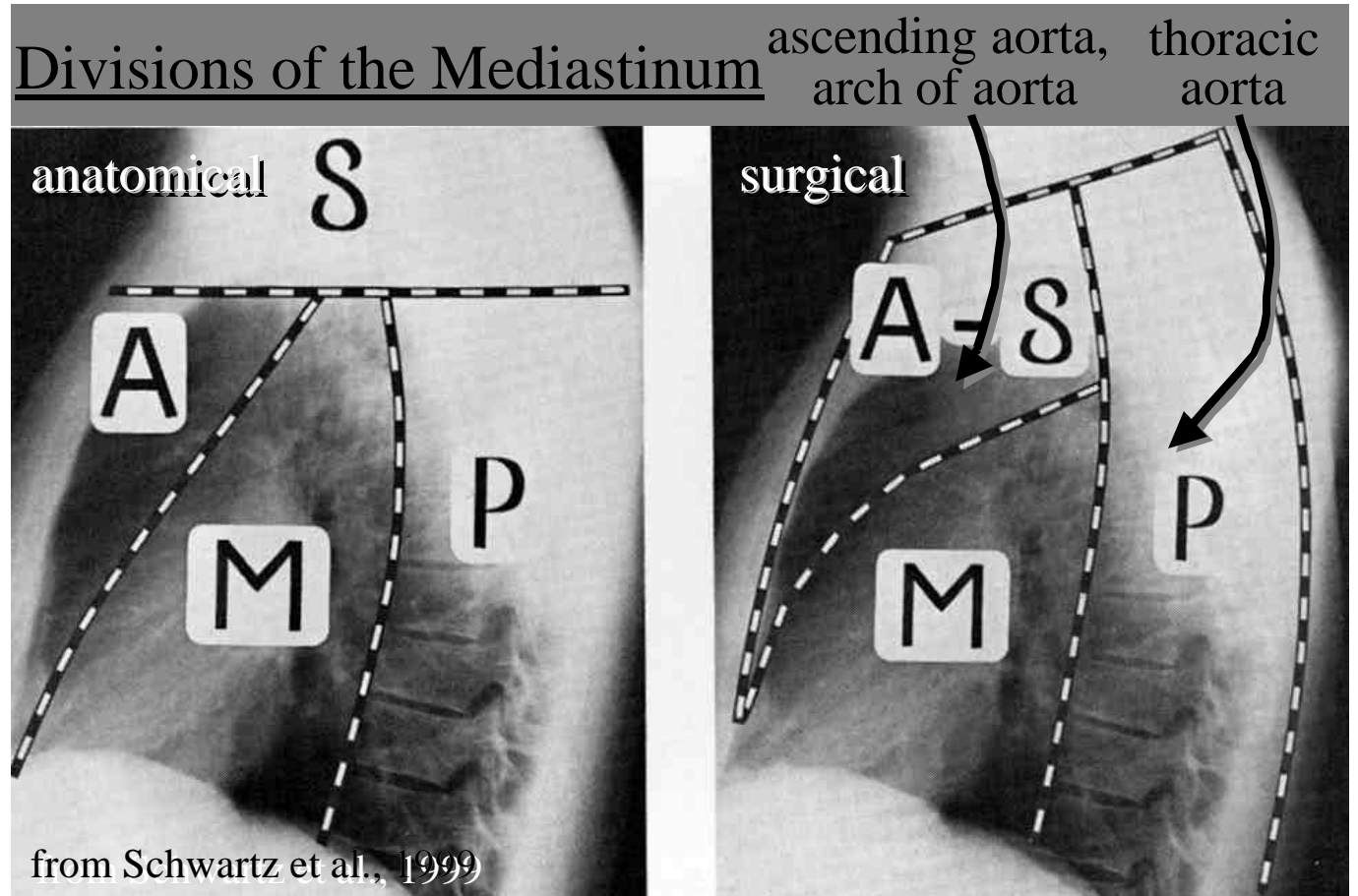


# General Anatomy of the Aorta

- Ascending aorta
- Aortic Arch
- Thoracic (descending) aorta
- Abdominal aorta

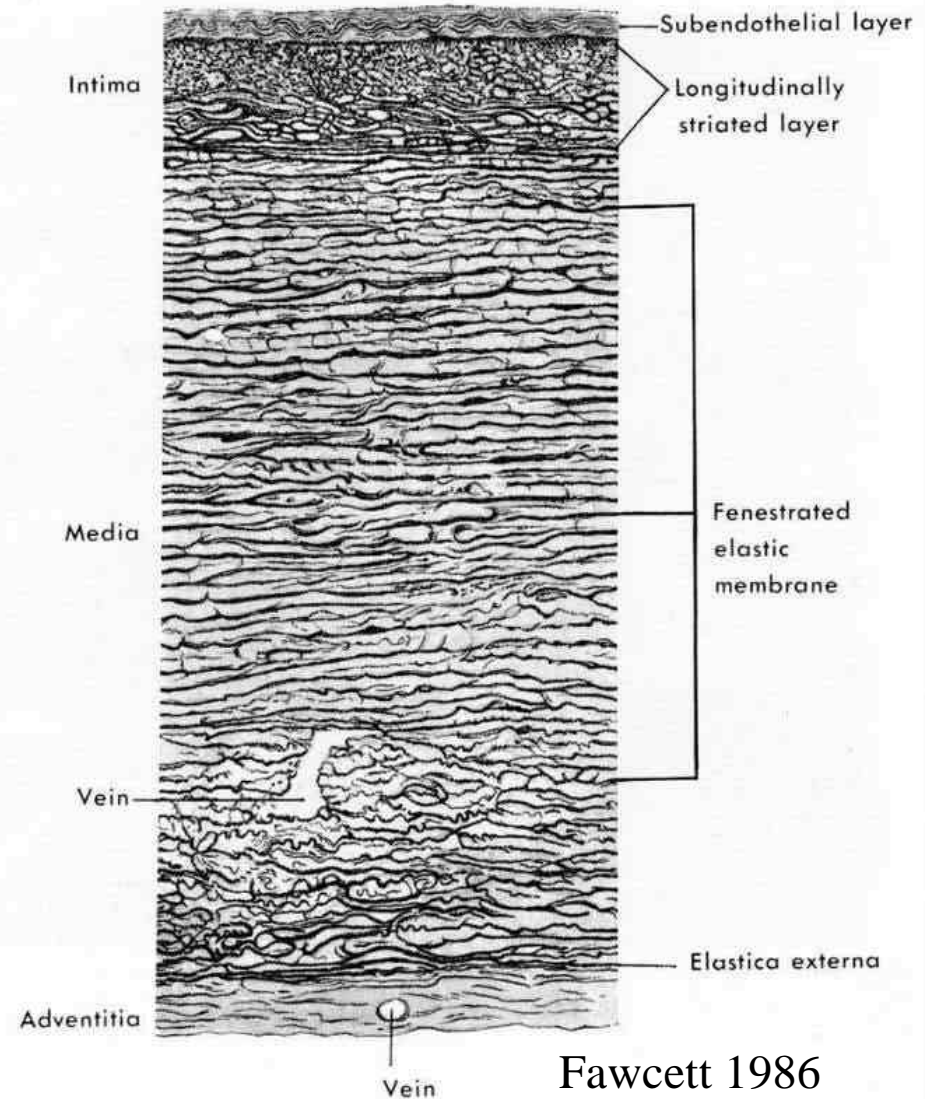
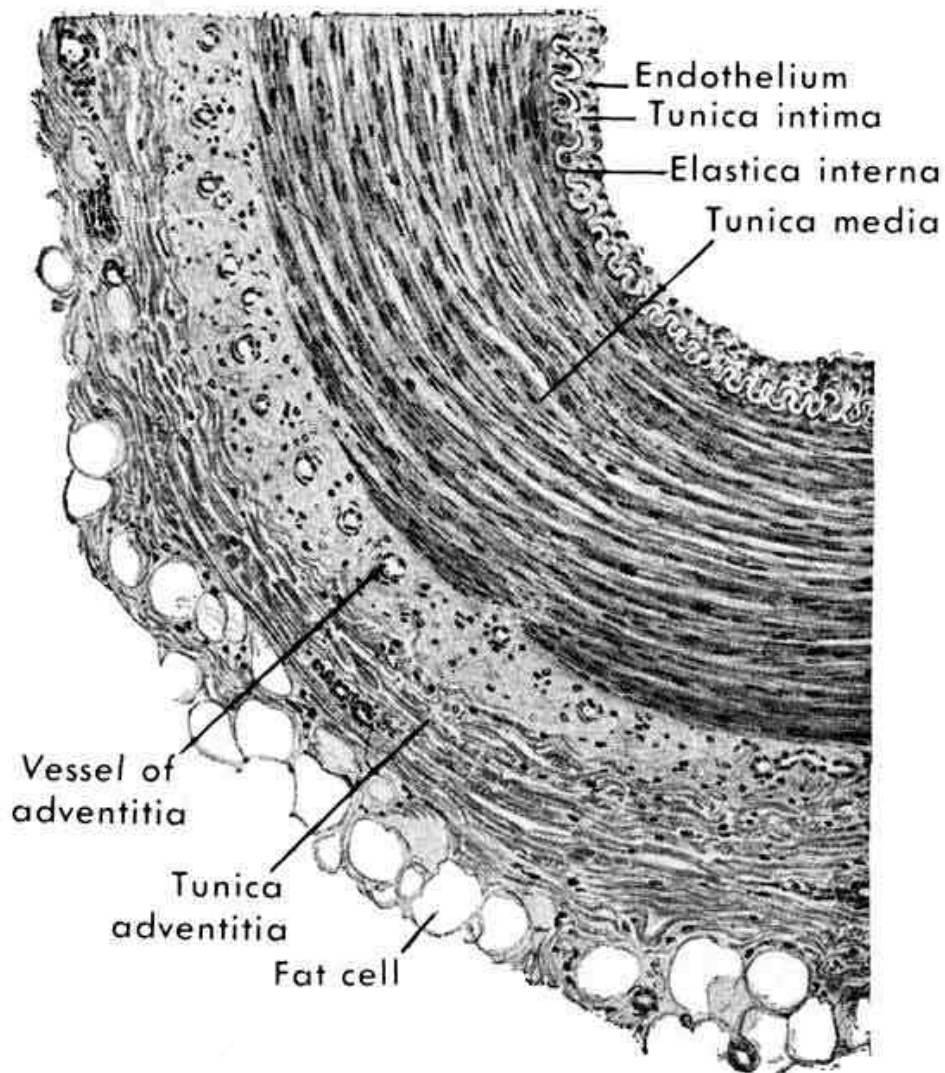


Feneis 1994



# Histology of Arteries and of the Aorta

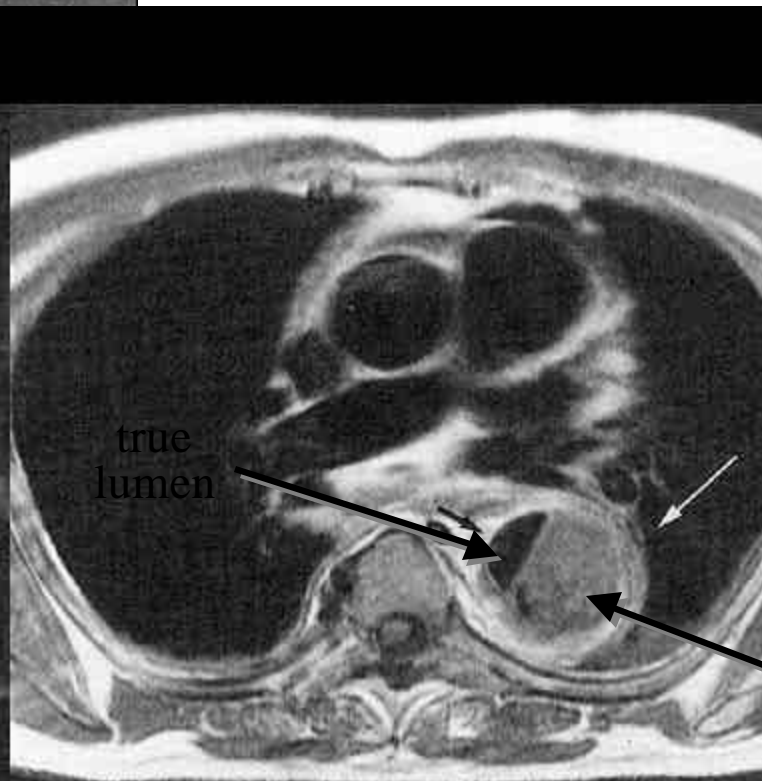
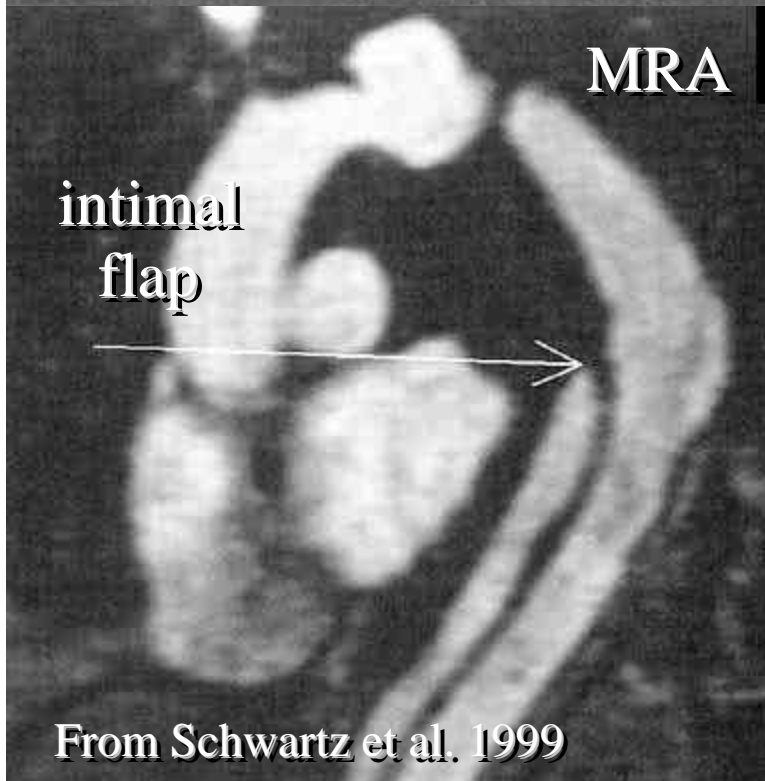
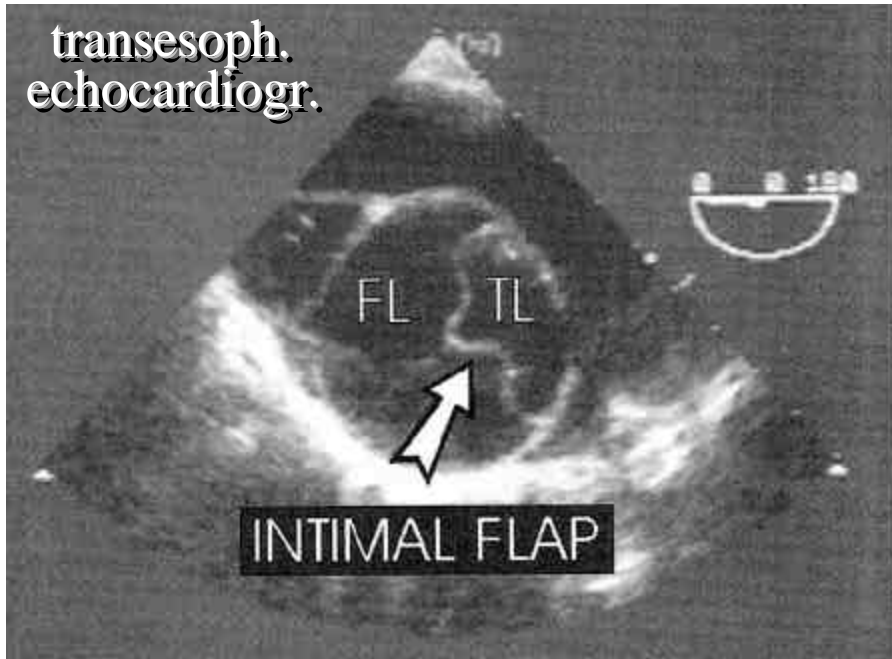
- Layers of CVS: tunica intima, tunica media, tunica adventitia
- Aorta is an elastic artery with an expanded, elastic media



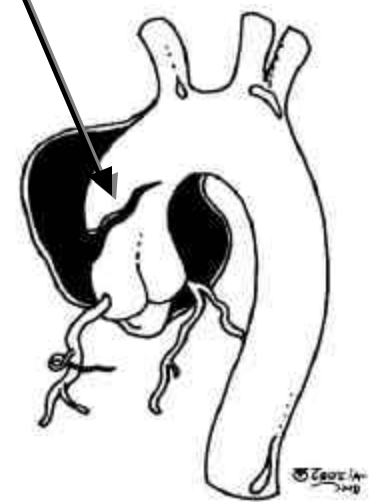
Fawcett 1986

# Aortic Dissection

- tear in intima leading to separation of the tunica media & formation of a “false lumen”
- Re-entry tear leading to a “double-barreled aorta”



intimal tear



From Blackburne 1998

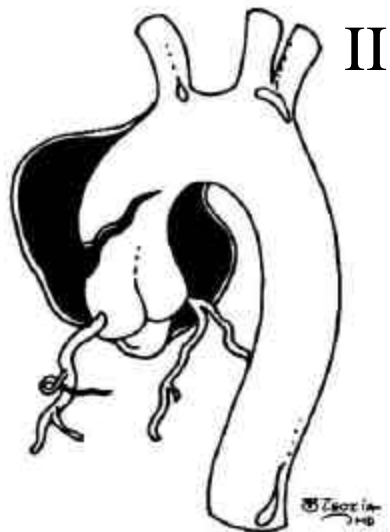
false lumen

# Classification of Aortic Dissection



## DeBakey

- Types I & II: tear in asc. aorta
- Type III: tear in thor. aorta
- Type I: asc. & desc. Aorta
- Type II: only asc. Aorta
- Type III: only desc. aorta



## Stanford

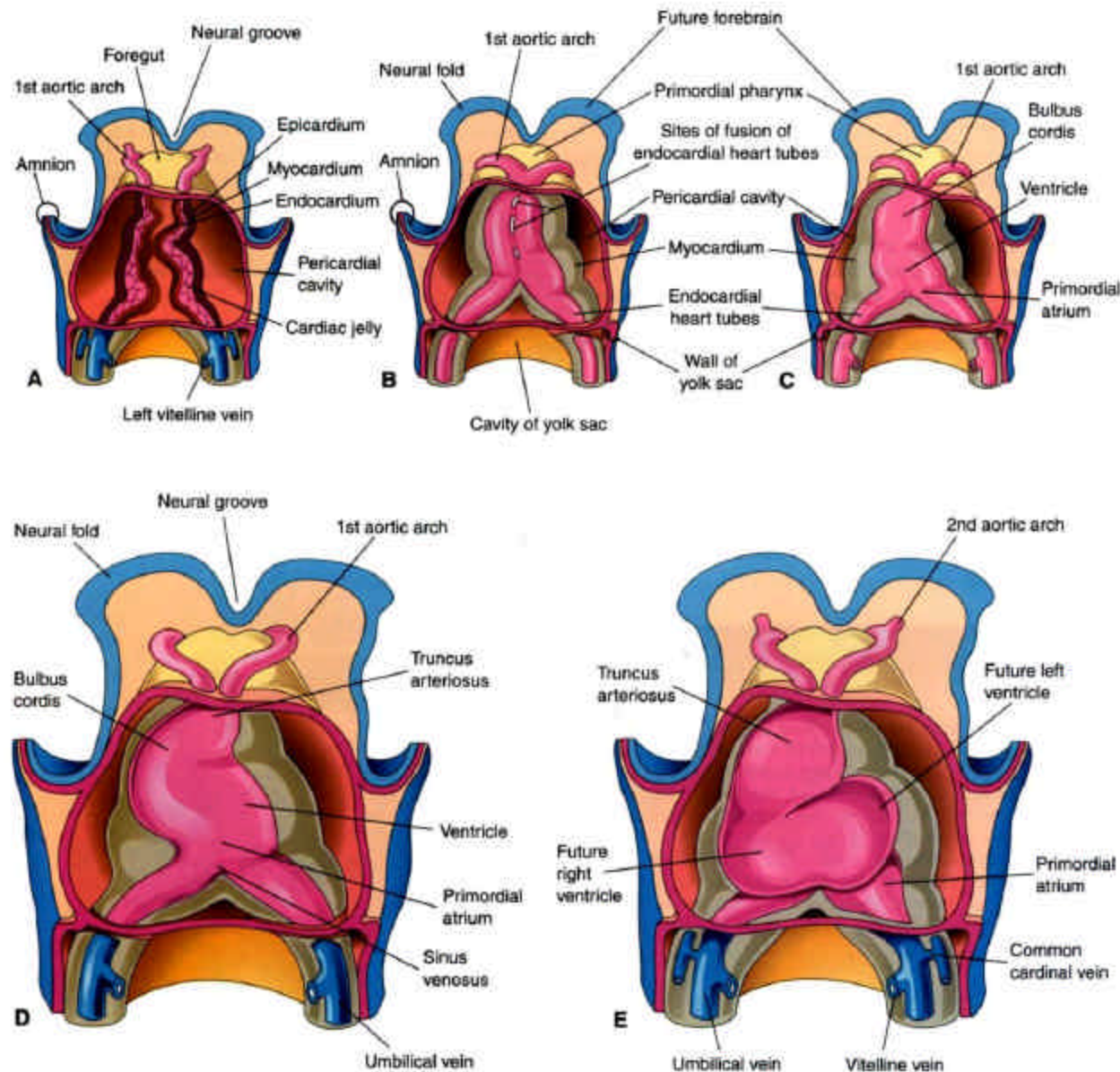


- Type A: asc. aorta ± desc. aorta
- Stanford Type A includes DeBakey Types I & II
- Type B: desc. aorta



From Blackbourne 1998

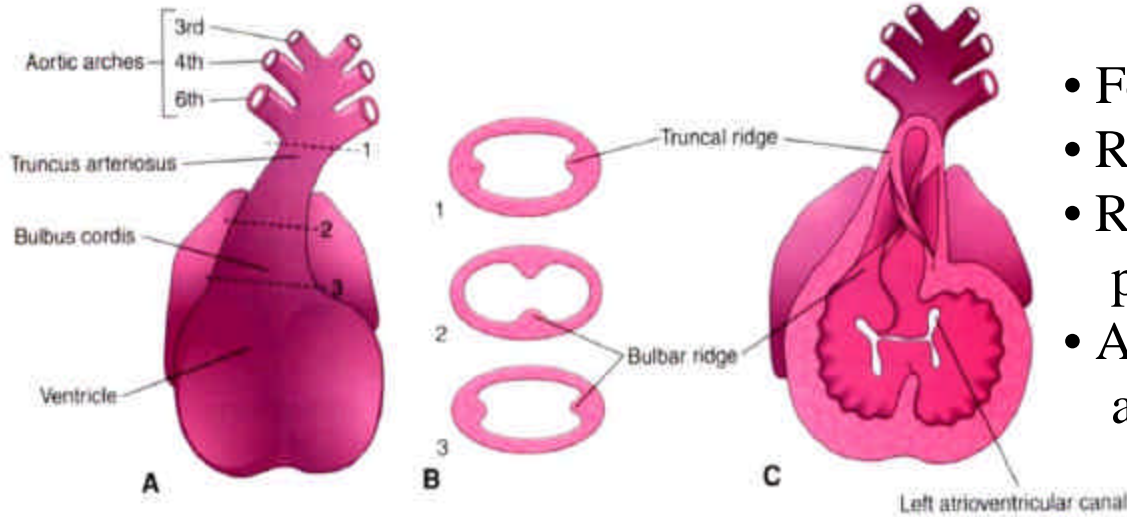
# Development of the Aorta



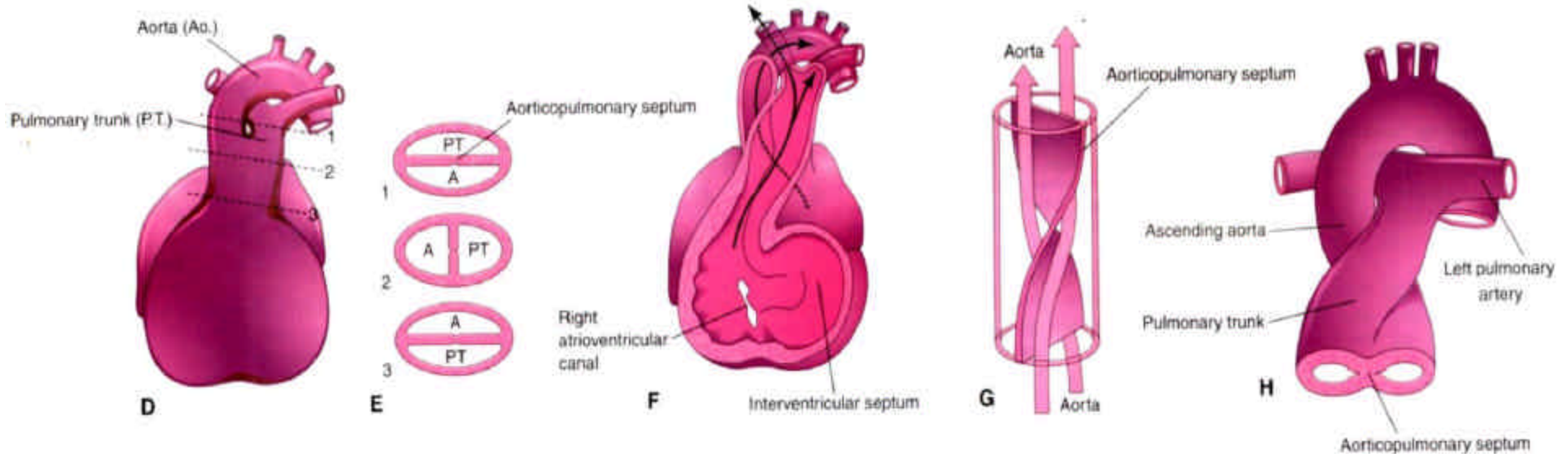
- Paired endocardial tubes fuse into a single tube
- Endocardial tube elongates & constricts
- Subdivisions
  - Sinus venosus
  - Atrium
  - Ventricle
  - Bulbus cordis
  - Truncus arteriosus
- Truncus arteriosus is partitioned into the aorta and pulmonary trunk

From Moore and Persaud, 1998

# Partitioning of the Truncus Arteriosus



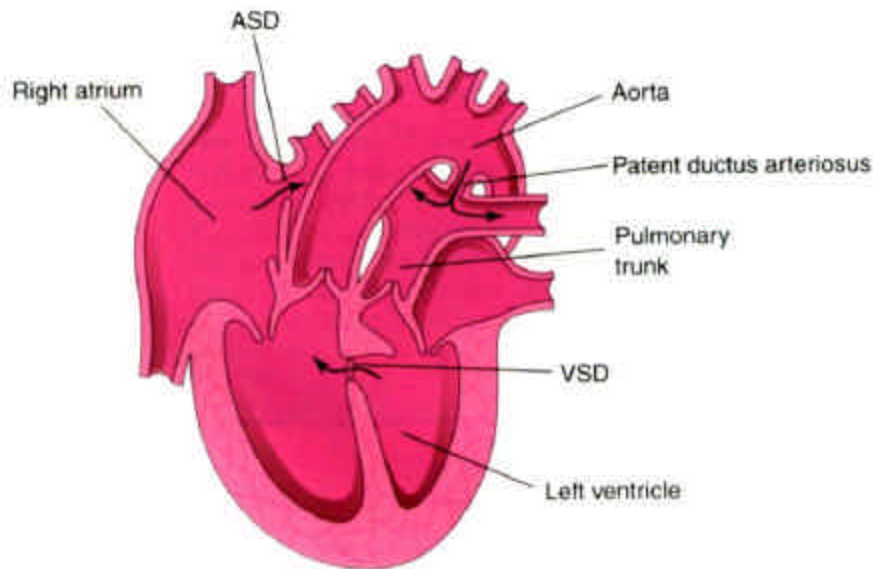
- Formation of bulbar & truncal ridges
- Ridges spiral 180° as they grow
- Ridges fuse to form aortico-pulmonary septum
- Aorticopulmonary septum divides aorta and pulmonary trunk



# Defects in Partitioning of the Truncus Arteriosus

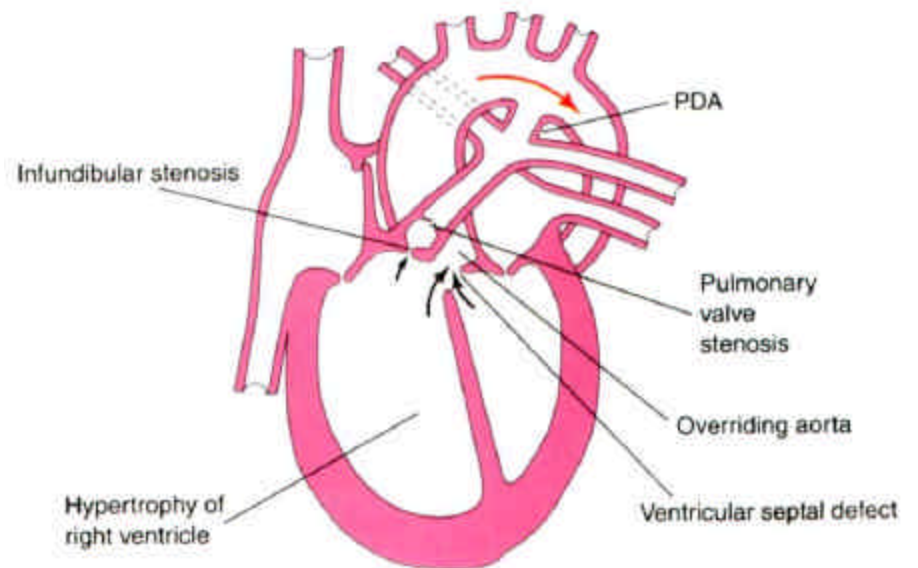
## Transposition of the Great Arteries (TGA)

- Most common cyanotic neonatal heart defect
- Failure of aorticopulmonary septum to take a spiraling course
- Fatal without PDA, ASD, & VSD



## Tetralogy of Fallot

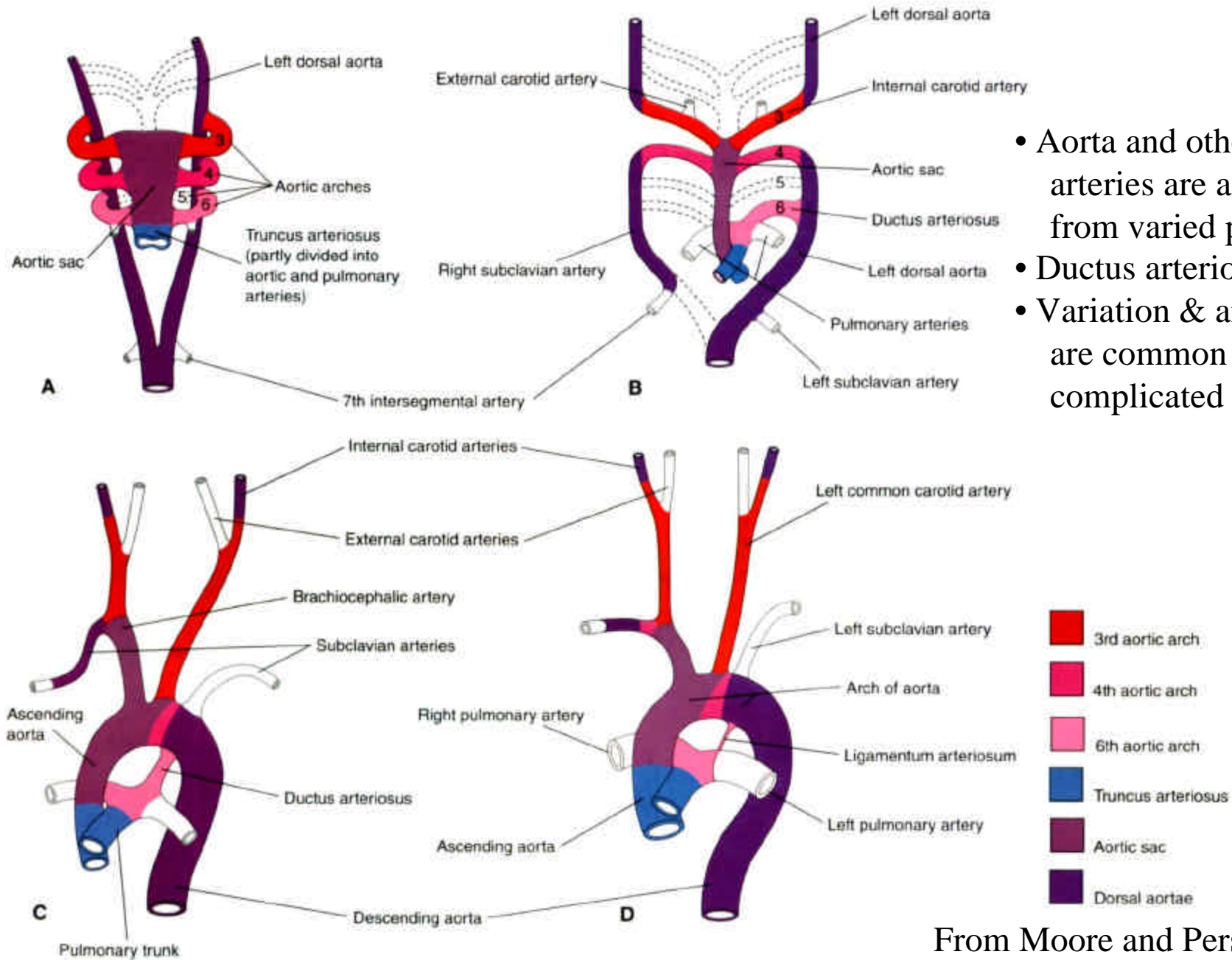
- Four co-occurring heart defects
  - Pulmonary stenosis
  - Ventricular septal defect
  - Overriding aorta (dextroposition)
  - Right ventricular hypertrophy
- Asymmetrical fusion of bulbar & truncal ridges



From Moore and Persaud, 1998



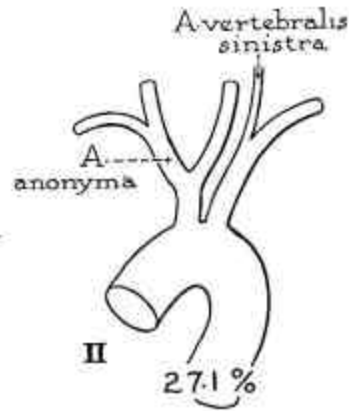
# “Cobbling Together” the Aorta



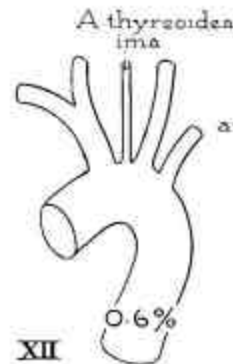
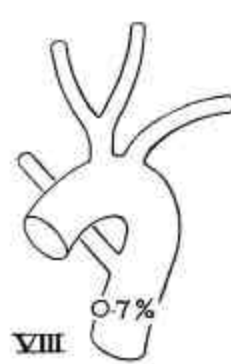
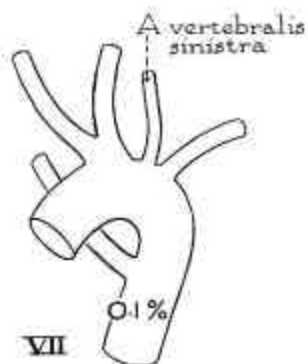
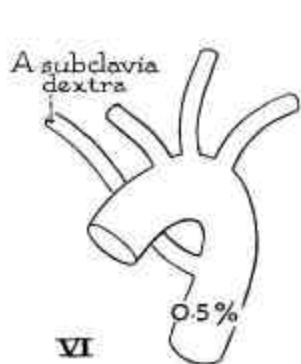
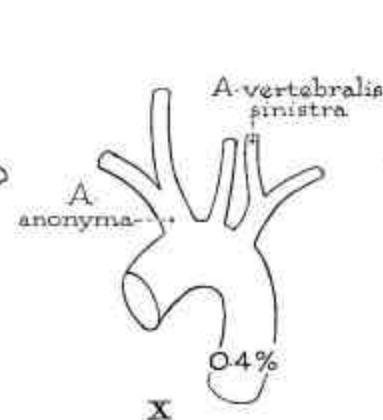
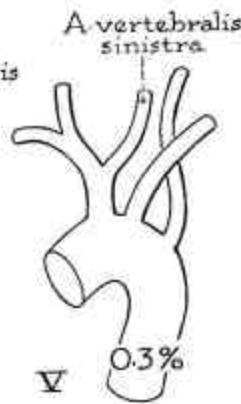
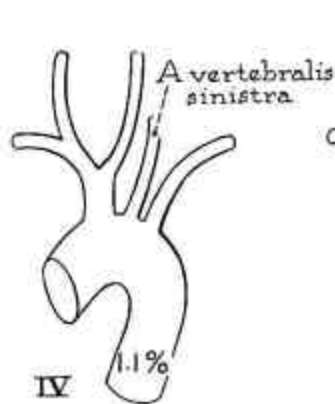
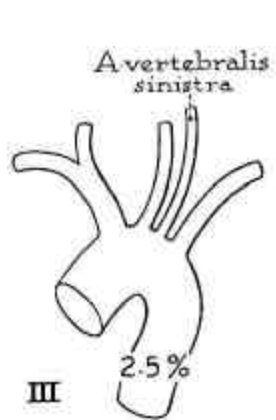
- Aorta and other major arteries are assembled from varied precursors
- Ductus arteriosus
- Variation & anomalies are common due to this complicated ontogeny

From Moore and Persaud, 1998

# Variation in Branching of the Aortic Arch



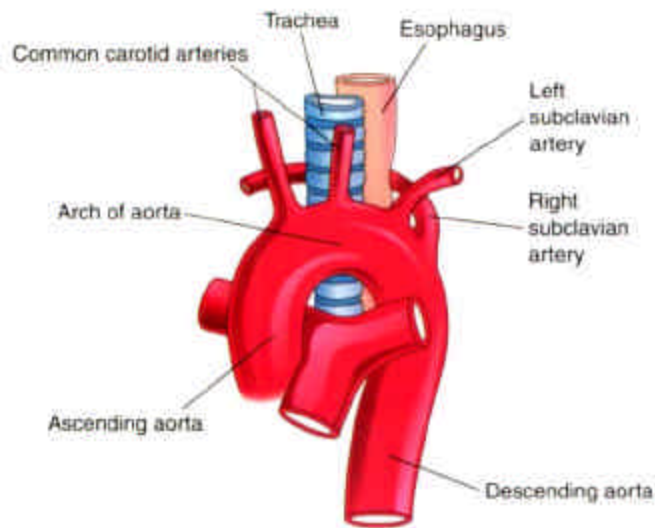
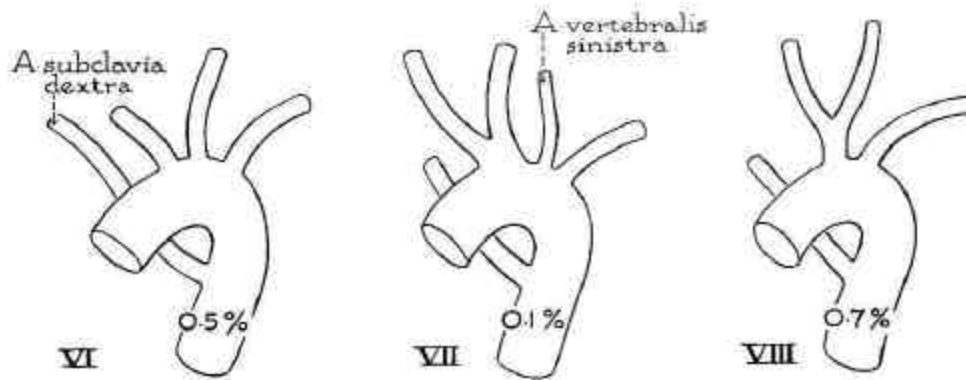
- Based on a study of 1000 cadavers by Liechty et al. 1957
- “Textbook” example (variant I) occurs less than two-thirds of the time
- Most are only problematic insofar as they may be initially confusing during surgery



# Vascular Rings

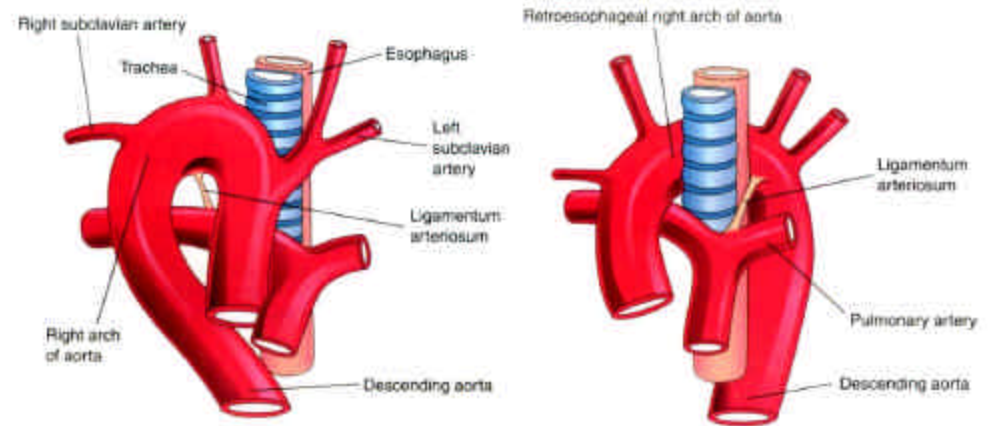
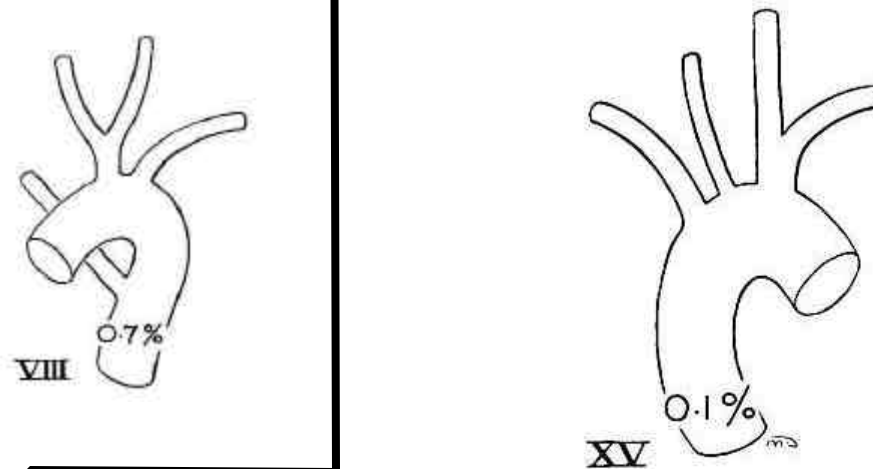
## Anomalous Right Subclavian Artery

Retroesophageal course compresses trachea & esophagus



## Right aortic arch

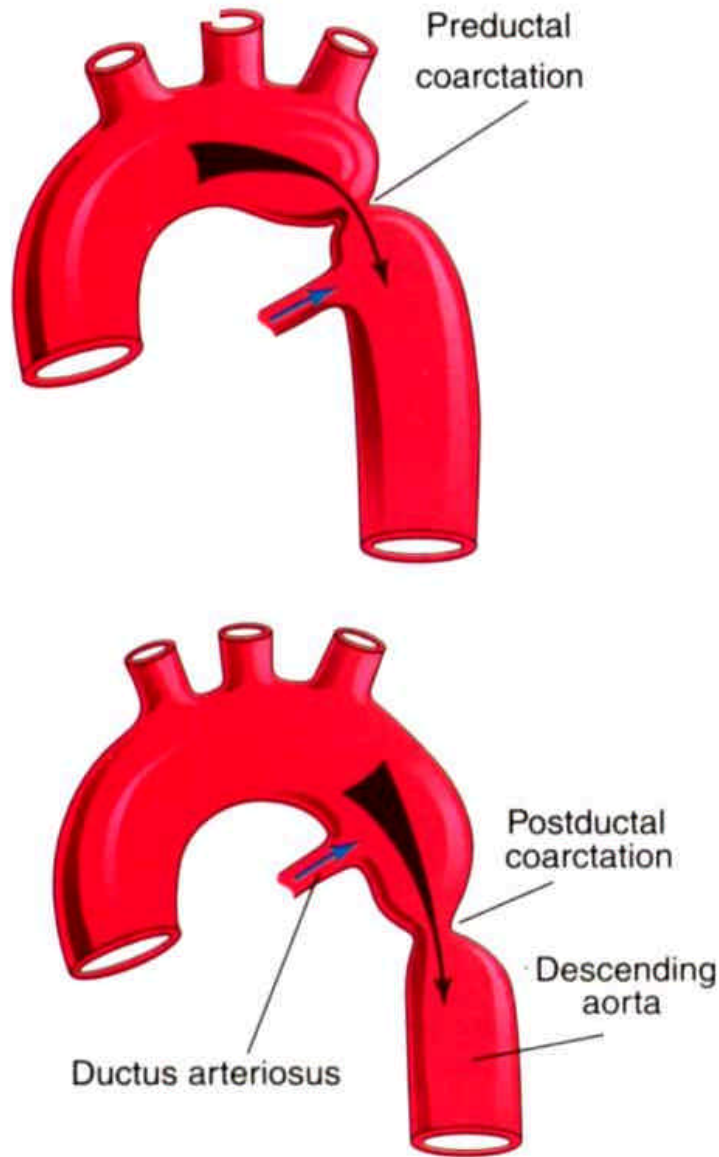
Can take a retroesophageal course



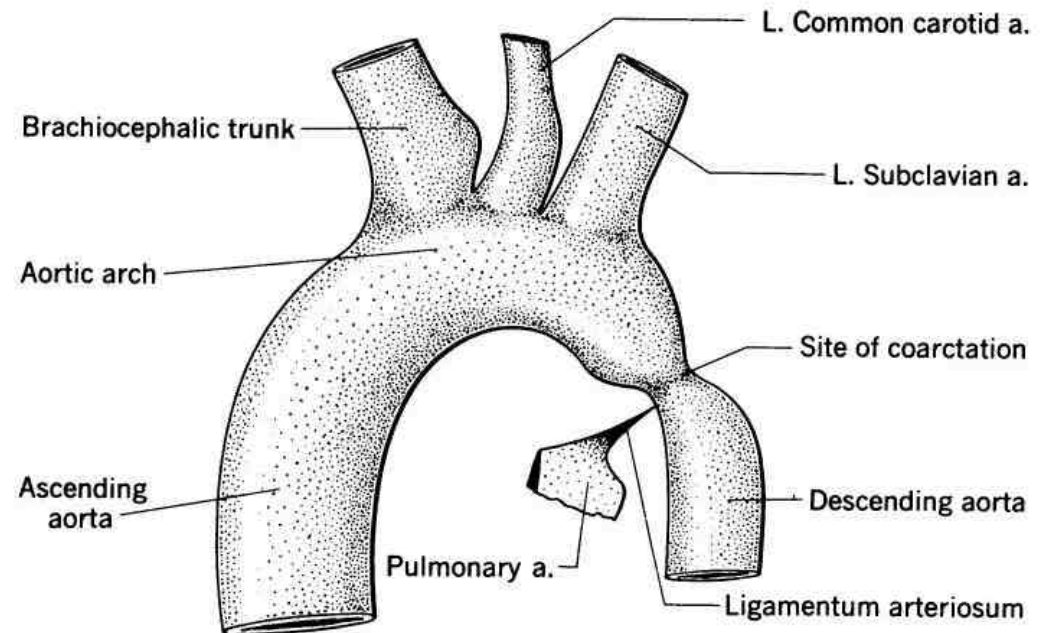
From Moore and Persaud, 1998



# Coarctation of the Aorta



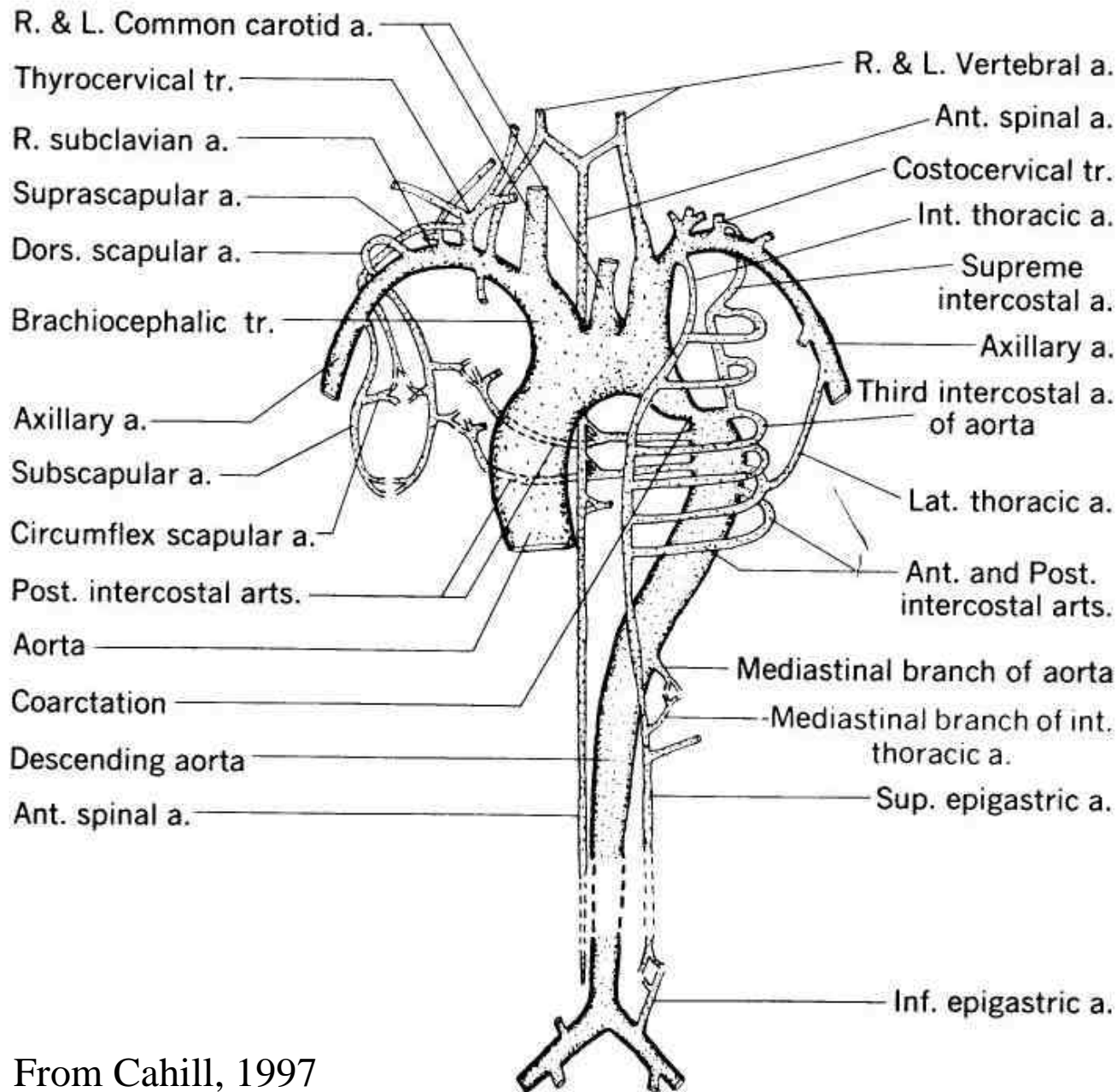
- Constriction of the aorta distal to the left subclavian artery
- Typically near ductus arteriosus (lig. arteriosum)
  - Preductal (= infantile)
  - Postductal (= “adult”)
  - Juxtaductal



From Moore and Persaud, 1998

From Cahill, 1997

# Coarctation of the Aorta



## Collateral Circulation

- Subclavian → IMA → intercostals → aorta
- Subclavian → IMA → sup. epigastr. → inf. epigastr. → iliac → aorta
- Subclavian → cervical & scap. branches → intercostals → aorta
- Subclavian → vertebral → ant. spinal → intercostals & lumbar → aorta

# References

- Blackbourne, L. H. 1998. *Surgical Recall, 2<sup>nd</sup> Ed.* Williams & Wilkins, Baltimore.
- Cahill, D. R. 1997. *Lachman's Case Studies in Anatomy.* Oxford Univ. Press, New York.
- Fawcett, D. W. 1986. *Bloom and Fawcett: A Textbook of Histology, 11<sup>th</sup> Ed.* Saunders, Philadelphia.
- Feneis, H. 1994. *Pocket Atlas of Human Anatomy.* Thieme, New York.
- Liechty, Shields, and Anson. 1957. Quart. Bull. Northwest. Univ. Med. Sch. 31:136-143.
- Moore, K. L. and T. V. N. Persaud. 1998. *The Developing Human: Clinically Oriented Embryology, 6<sup>th</sup> Ed.,* Saunders, Philadelphia.
- Schwartz et al. (eds.), *Principles of Surgery, 7<sup>th</sup> Ed.,* McGraw Hill, New York.