

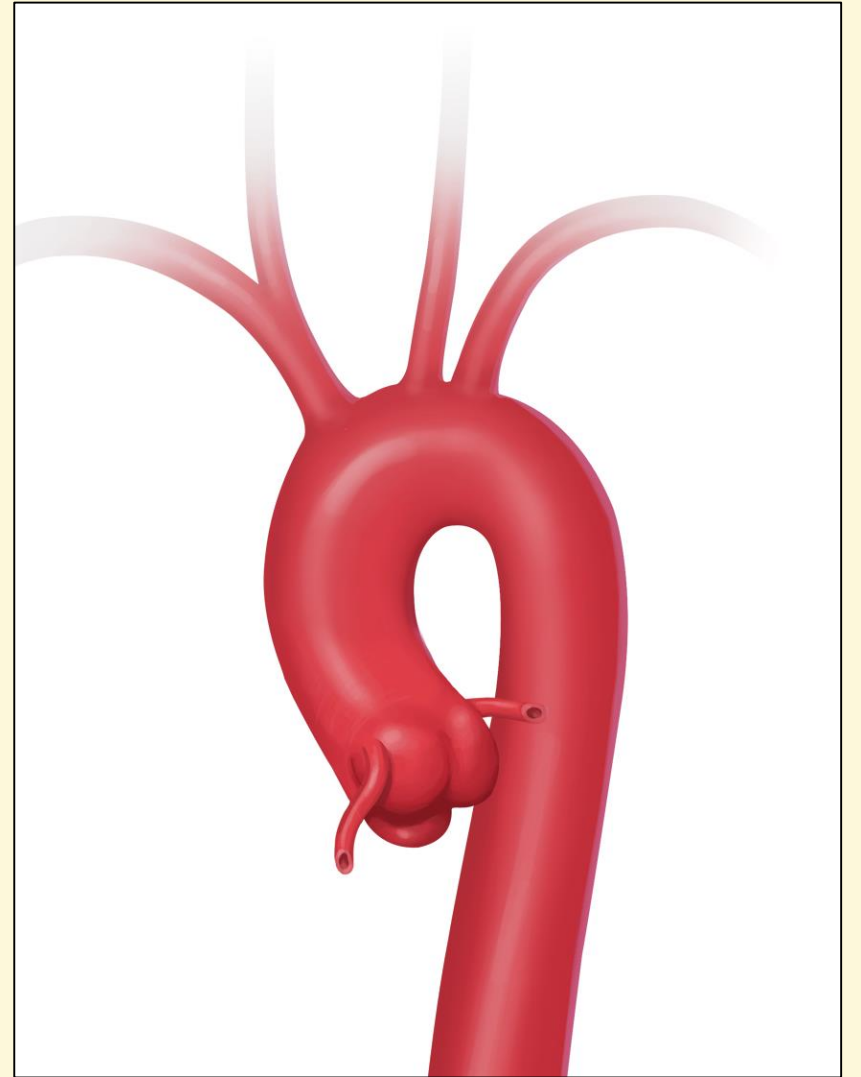
# **Aortic Wall Lamellar Structure in Phylogeny and in Humans**

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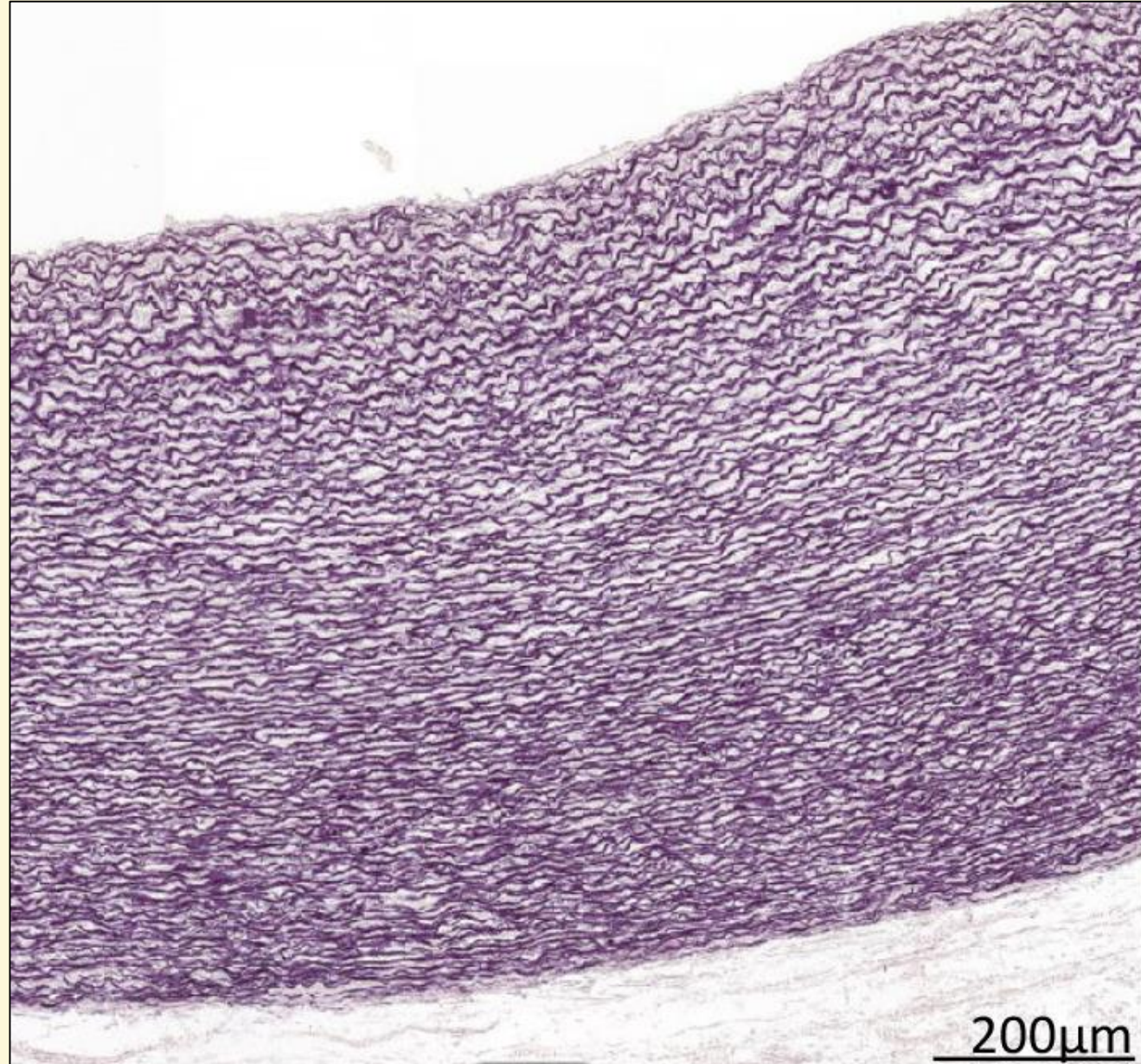
# Objectives

- To describe the histological lamellar organization of the developing ascending aorta in humans
- From the literature, to report aortic wall lamellae numbers in animals and humans, and any changes in lamellar layers in proceeding distally along the aorta



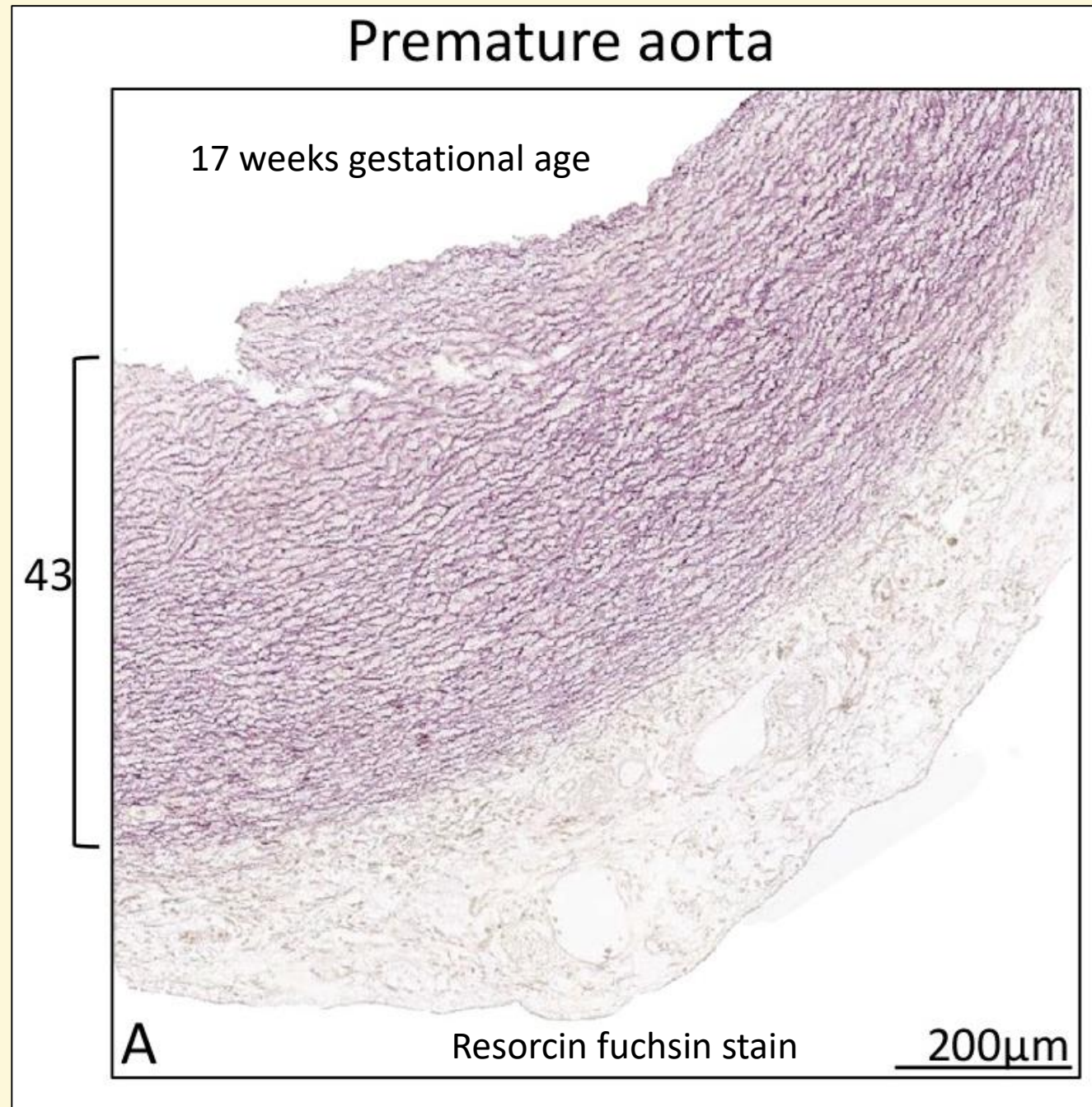
# Methods

- 60 non-dilated ascending aortic wall samples ranging from embryonic age to 70 years were collected and analyzed.
- PubMed was queried for the following search terms:
  - Aortic lamellar layers
  - Lamellar layers in the ascending aorta
  - Lamellar layers in the descending aorta
  - Extracellular matrix
  - Elastin
  - Vascular smooth muscle cells



# Results

In the premature aorta, the medial layer consists of neatly organized elastic lamellae (43) without pathological features such as elastic fiber thinning, fragmentation, or degeneration.

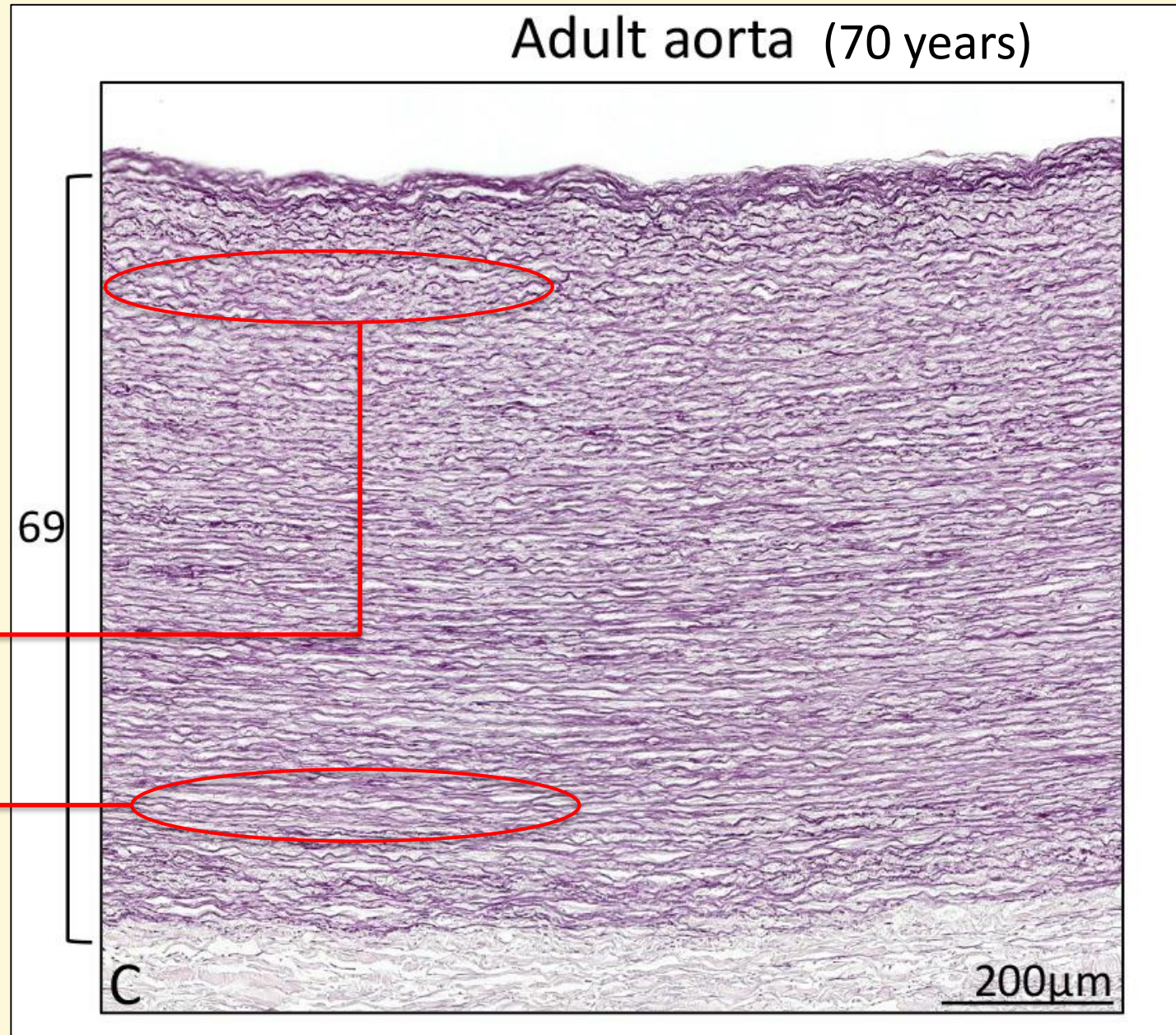


# Results

In the adult aorta (69 lamellae), progressive elastic fiber pathology is seen, resulting in decreased aortic wall strength.

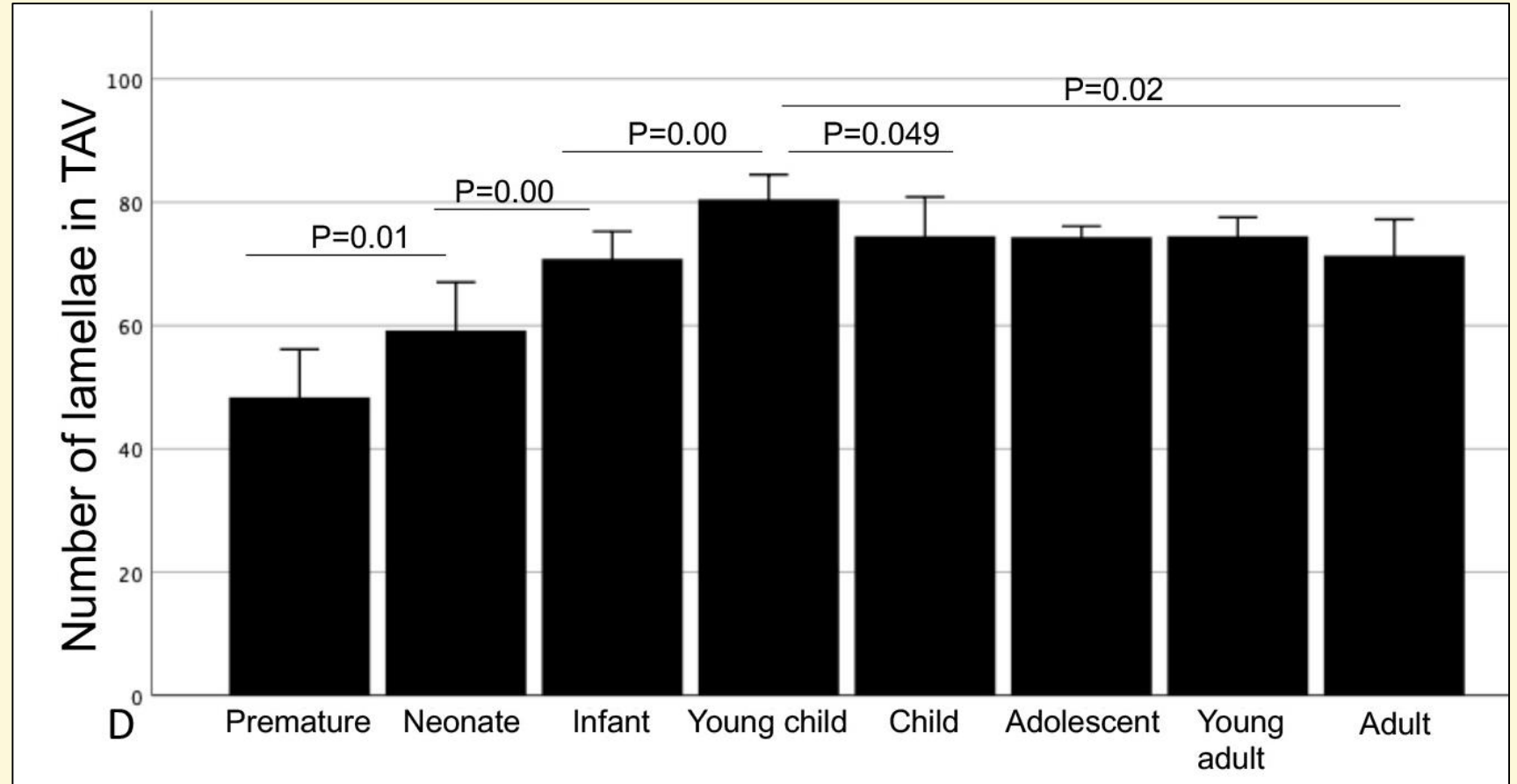
Elastic fiber fragmentation

Elastic fiber thinning



# Results

- Premature group contains lowest lamellar number
- This increases significantly till young childhood (age 6)
- A slight decrease is observed in adolescence
- Further decrease is observed through adulthood



Significant difference in number of lamellae seen between various age categories

# Results

The literature search yielded 287 articles, of which **only 5** contained estimations of lamellar counts

1967

## A Lamellar Unit of Aortic Medial Structure and Function in Mammals

By Harvey Wolinsky, M.D., and Seymour Glagov, M.D.

### ABSTRACT

The close association of elastin, collagen, and smooth muscle in the mammalian aortic media results in viscoelastic properties that account for many of its static and dynamic mechanical features. The structural components of

1970

## Comparison of Medial Growth of Human Thoracic and Abdominal Aortas

By Harvey Wolinsky, M.D., Ph.D.

### ABSTRACT

Recent morphologic studies of adult mammalian thoracic and abdominal aortic segments have shown that the adult human abdominal aorta deviates significantly from the usual pattern of medial lamellar architecture. In the

Evolving Technology/Basic Science

Pasta et al

## Effect of aneurysm on the mechanical dissection properties of the human ascending thoracic aorta

Salvatore Pasta, PhD,<sup>a,b,c,d,e</sup> Julie A. Phillippi, PhD,<sup>d,e,f,g</sup> Thomas G. Gleason, MD,<sup>d,e,f,g</sup> and David A. Vorp, PhD<sup>b,c,d,e,g</sup>

THE ANATOMICAL RECORD 2000

## Extracellular Matrix of the Human Aortic Media: An Ultrastructural Histochemical and Immunohistochemical Study of the Adult Aortic Media

KOERT P. DINGEMANS,\* PETER TEELING, JAAP H. LAGENDIJK, AND ANTON E. BECKER

Department of Cardiovascular Pathology, University of Amsterdam, Academic Medical Center, 1105 AZ Amsterdam, The Netherlands

1992

*American Journal of Pathology*, Vol. 140, No. 4, April 1992  
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## Alteration of Elastic Architecture in the Lathyrotic Rat Aorta Implies the Pathogenesis of Aortic Dissecting Aneurysm

Yutaka Nakashima and Katsuo Sueishi  
From the First Department of Pathology, Faculty of Medicine, Kyushu University, Fukuoka, Japan

dissecting aneurysm.<sup>1-3</sup> Investigating the elastic architecture of the ascending aorta in type A dissecting aneurysm (Stanford classification,<sup>4</sup> namely, a dissection from

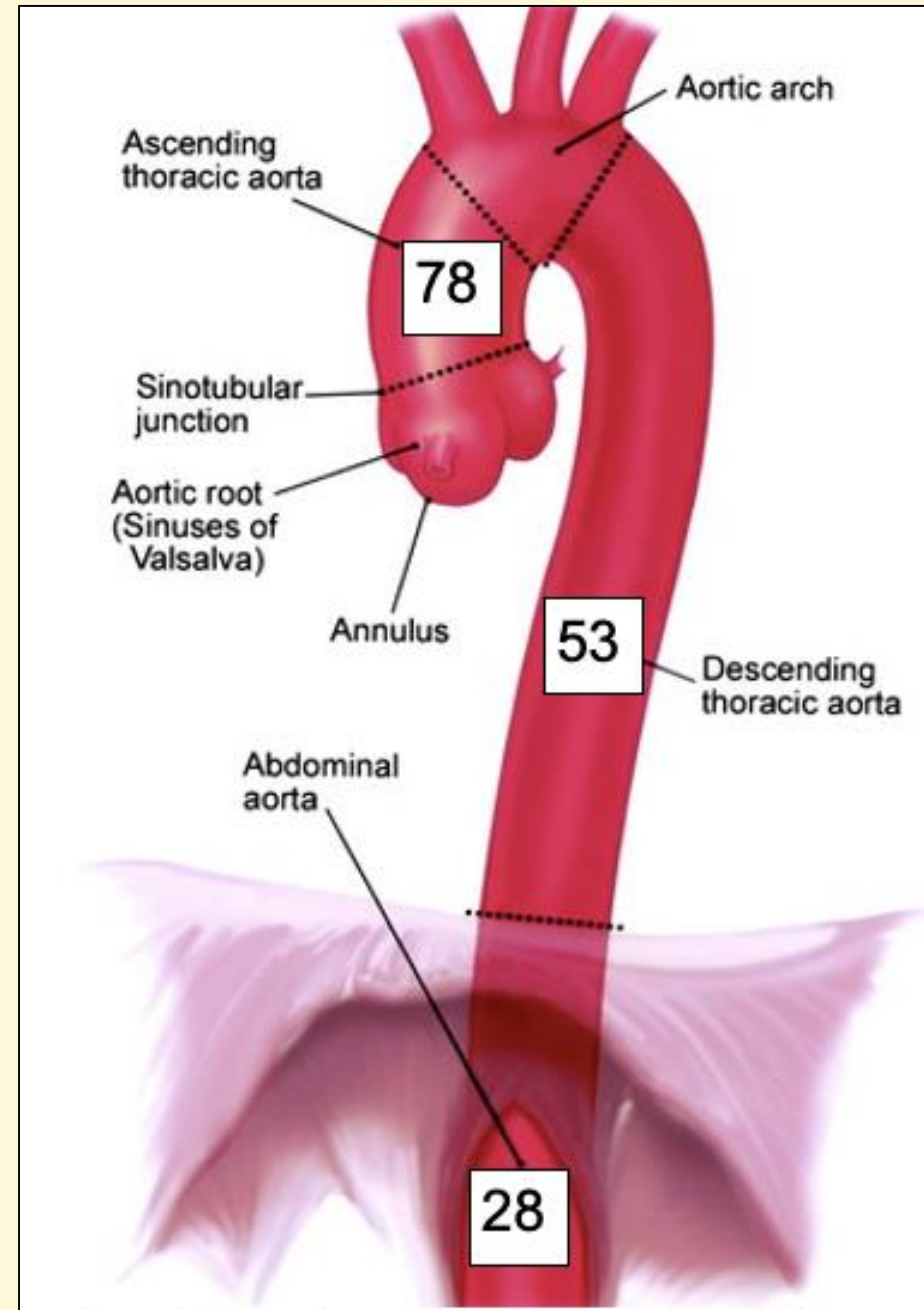


# Results

- Mammalian lamellar units  $\propto$  aortic radius  $\propto$  animal body size; the smaller the mammal, the fewer the lamellar layers.
- Human studies estimate 53-78 lamellar layers in the ascending aorta, 45-56 in the thoracic segment, and 28 in the abdominal aorta.

# Results

Lamellar count decreases as one descends the human aorta



# Conclusions

- Dedicated studies on lamellar number in phylogeny and number and progression of lamellar layers with aging are scant.
- In phylogeny, the number of aortic layers increases proportionately with animal body size.
- The adult human aorta contains approximately 50-75 lamellar layers, with lamellar number decreasing progressively along the course of the aorta.
- After an initial increase in number until age 6, lamellar layers decrease progressively with advanced age, possibly contributing to enhanced adverse aortic events rates in the elderly.