

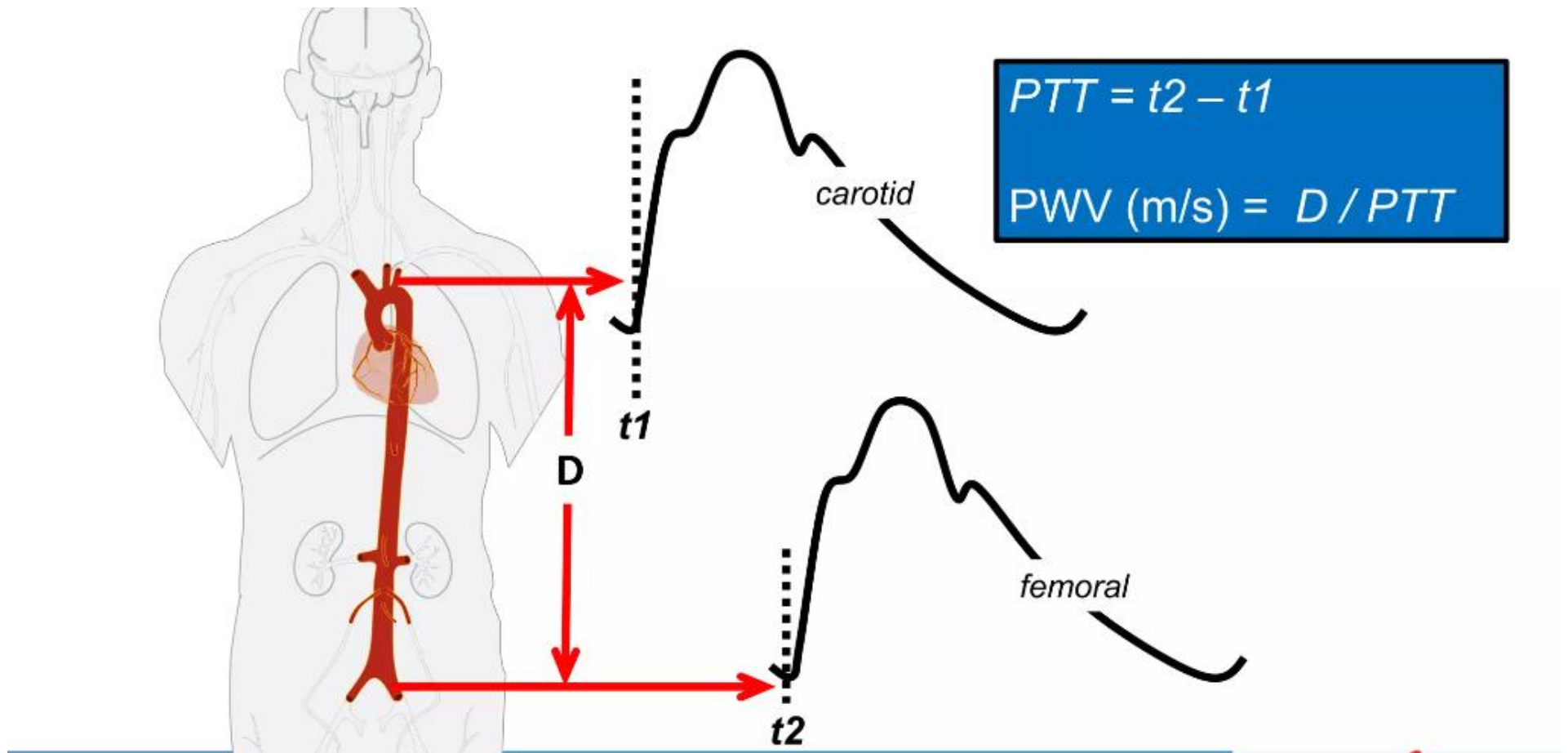
Pwv:

سرعت موج ضربان:

# مفاهيم و کلیات:

## What is PWV?

- PWV = pulse wave velocity
  - Speed of forward pressure between sites
- AS reflects:
  - Structure
  - Function
- Not homogenous along arterial tree
- Most common: aorta
  - Carotid-femoral

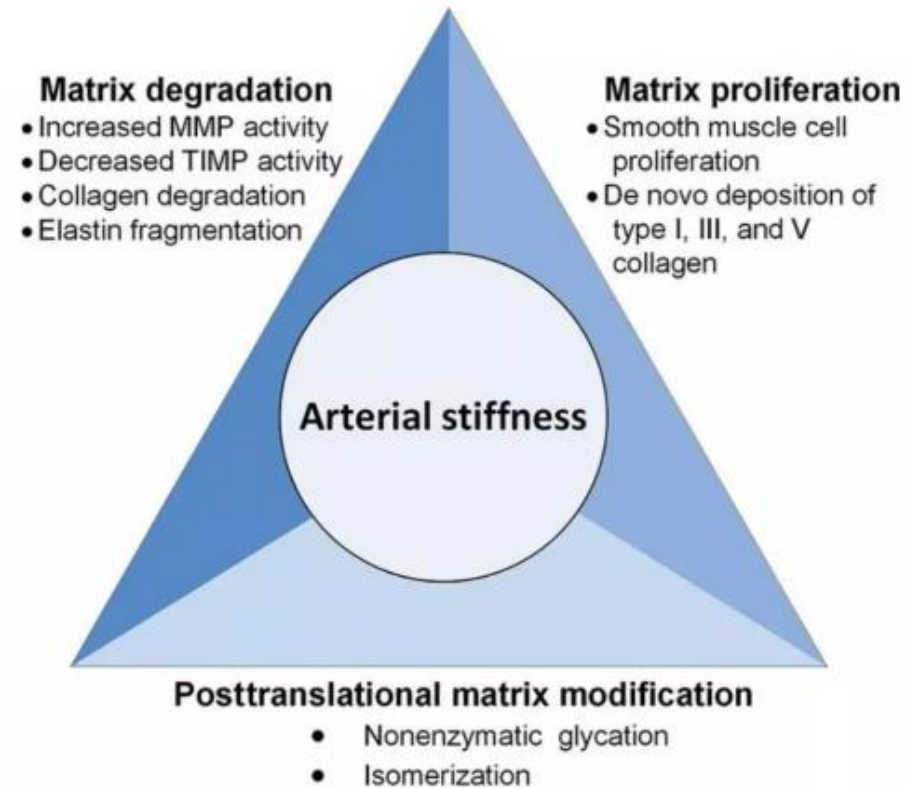


## Contents

- What is PWV?
- Importance
- Measurement Approaches
- PWV Selection Considerations
- Tips for High Quality Measurements

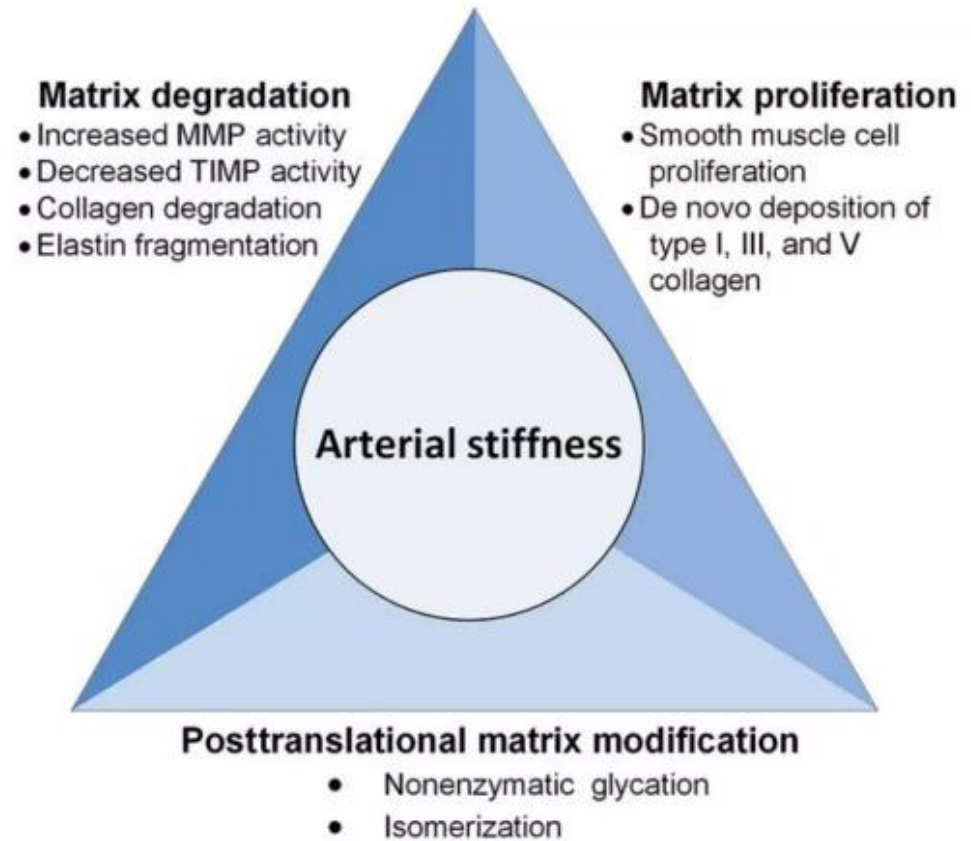
## Importance

- Why is AS important?
- Overview of vascular system
- Clinical Importance



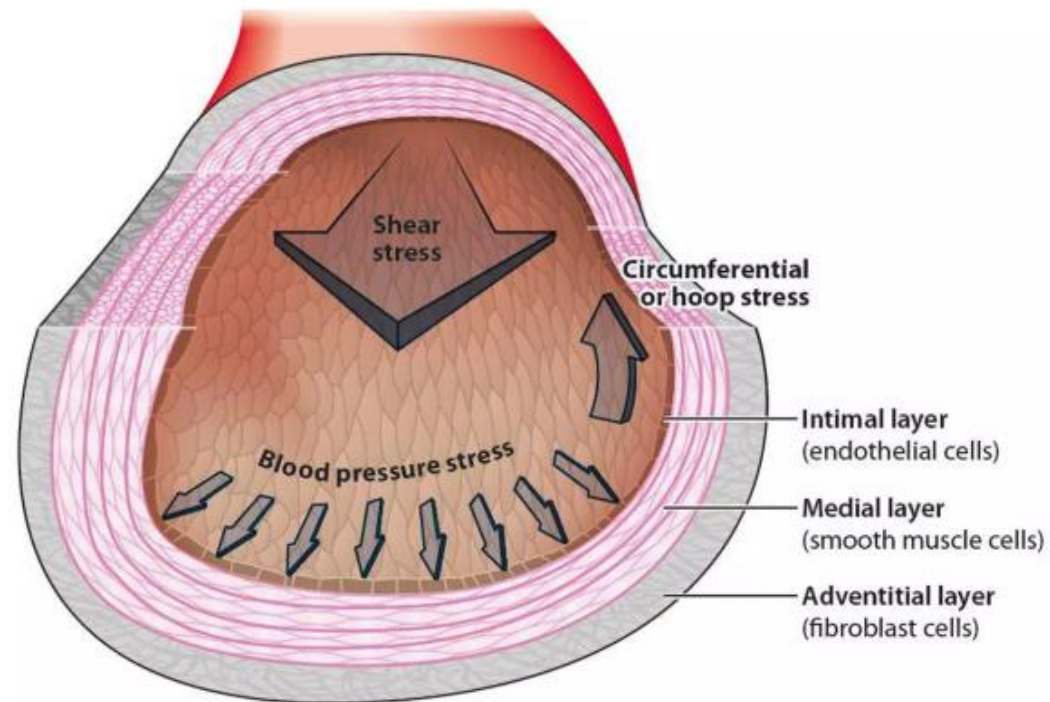
## What is AS?

- AS reflects:
  - Function
    - Endothelial function
  - Structure
    - Vessel wall extracellular matrix

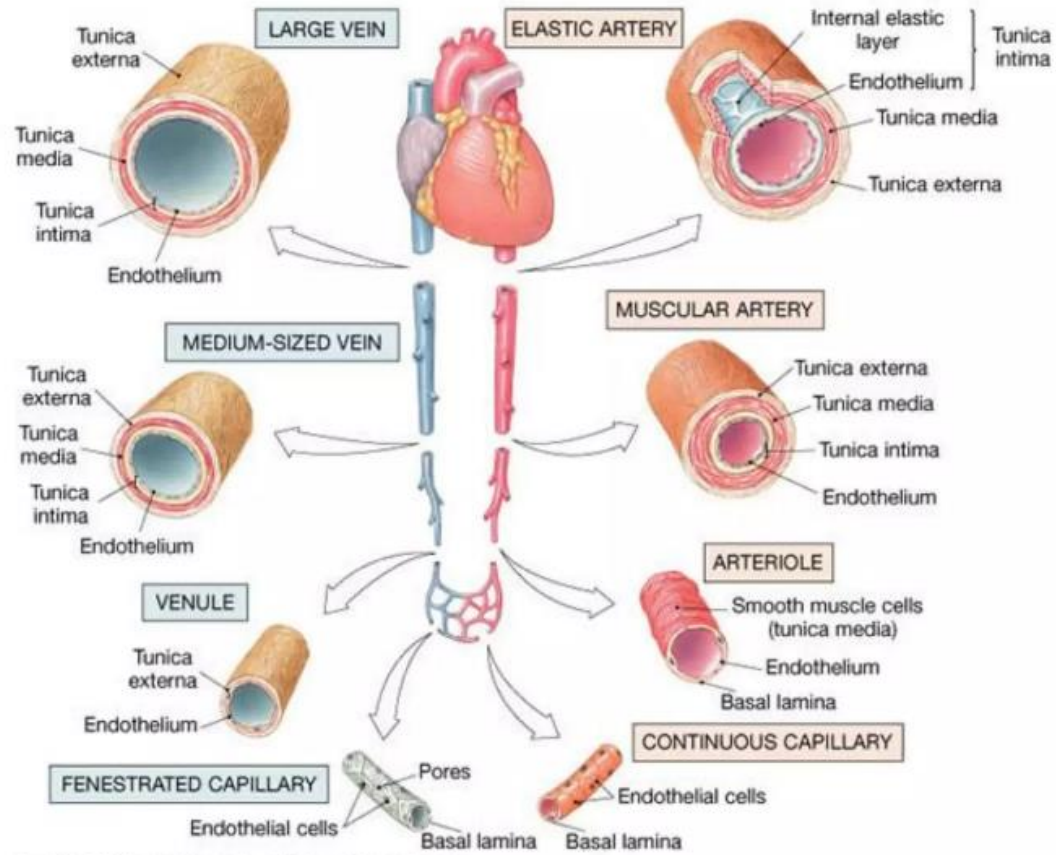


## Vascular Anatomy

- Intima
  - Endothelium cells
- Medial
  - Smooth muscle cells
  - Controls tone
- Adventitial (Externa)
  - Connective tissue
  - Maintains shape
  - Numerous nerves



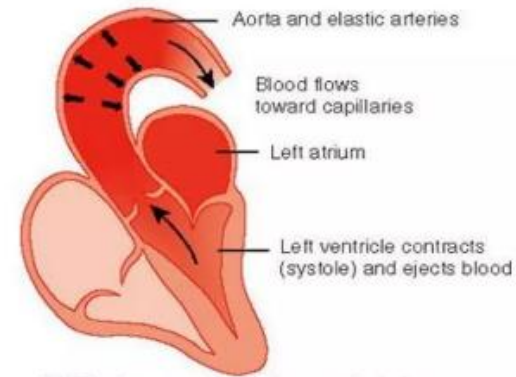
# Arterial Tree



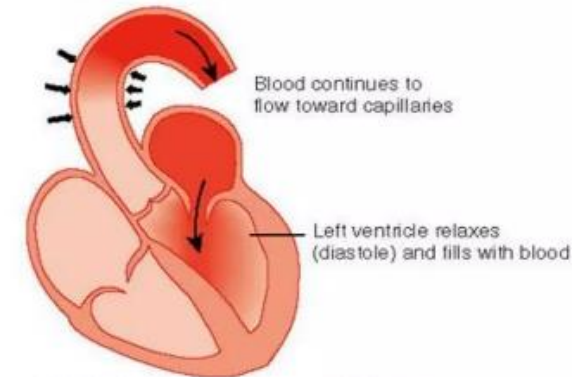


## Aorta = Elastic Arteries

- Thin walls relative to diameter
  - Well defined connective tissue
    - Many elastic fibers
      - Elastic lamellae
- Pressure Reservoir
- Propels blood forward
  - Stretches
  - Mechanical energy stored
  - Recoils



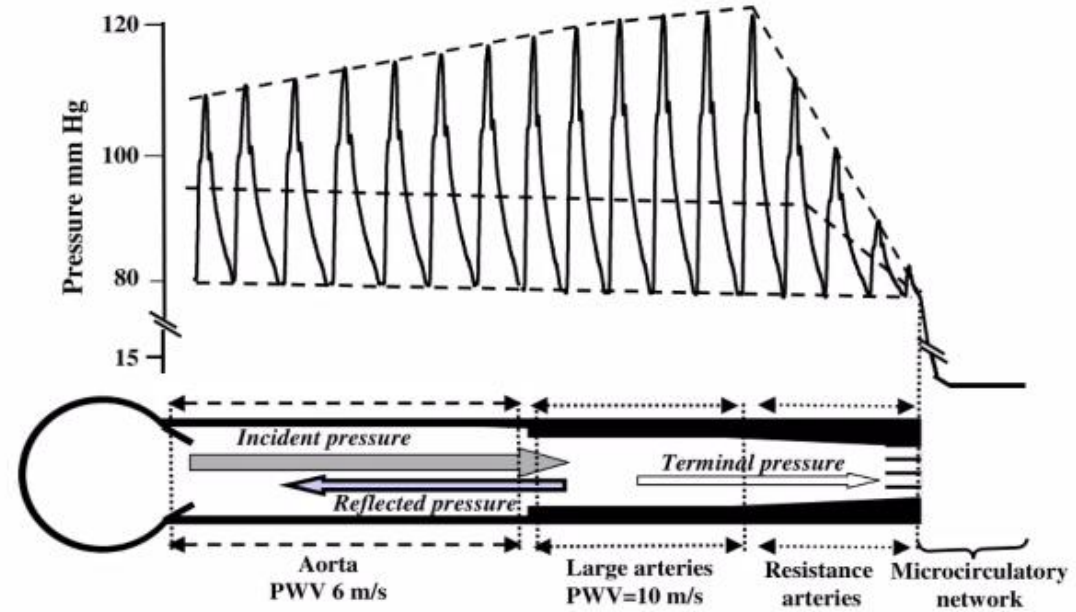
(a) Elastic aorta and arteries stretch during ventricular contraction



(b) Elastic aorta and arteries recoil during ventricular relaxation

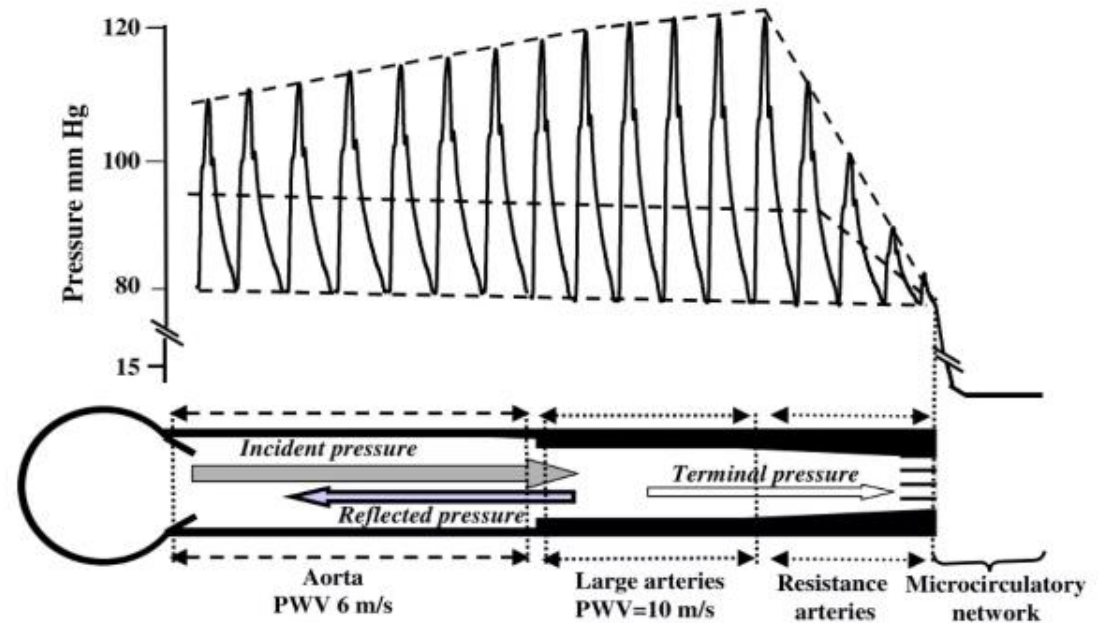
## Why is AS Important?

- Vasculature gradually stiffens from ascending aorta to periphery



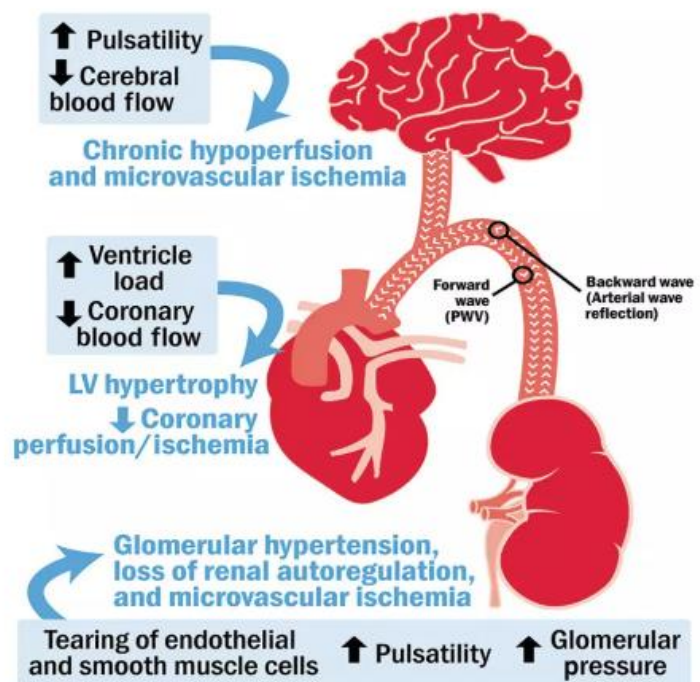
## Why is AS Important?

- Vasculature gradually stiffens from ascending aorta to periphery
- Importance
  - Consistent blood flow – inc. diastole
  - Attenuates forward travelling pressure waves
  - Moderate wave reflection
    - London 2010. *Nephrol Dial Transplant*;25(12):3815-23




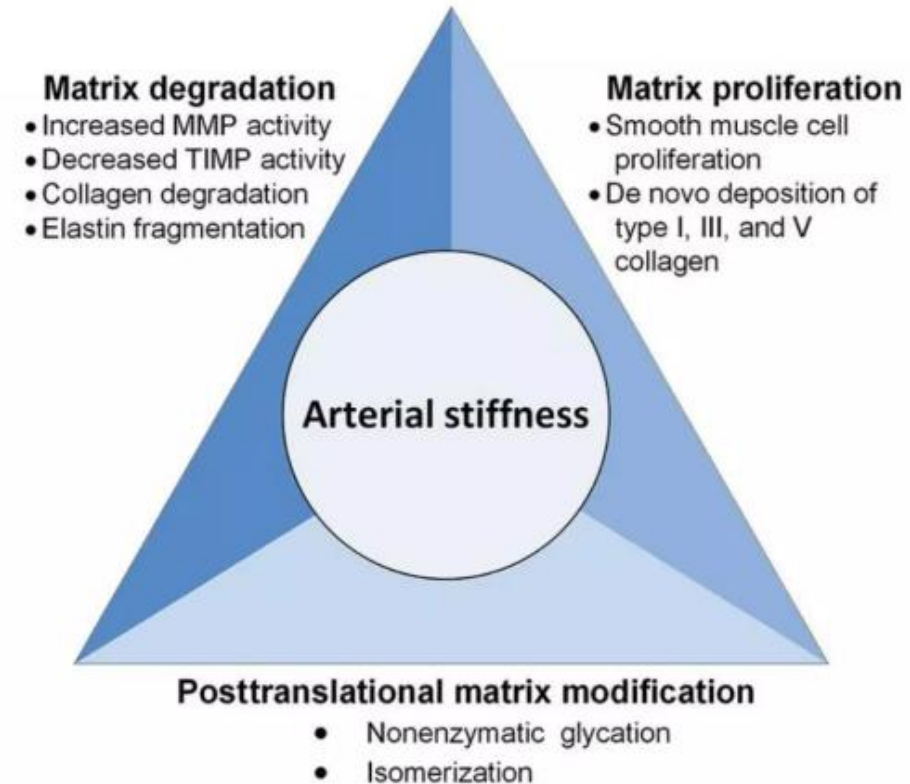
## Determinants of Vascular Age: An Epidemiological Perspective

Anna M. Kucharska-Newton<sup>1</sup>, Lee Stoner<sup>2</sup>, and Michelle L. Meyer<sup>3</sup>



## Importance

- Why is AS important?
- Overview of vascular system
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## Clinical Importance

- Early in disease progression
- Predicts CVD
- Normative data





## Clinical Importance

- Early in disease progression
- Predicts CVD
- Normative data



## Predicts CVD

- Predicts CV events in a range of patients
- Carotid-Femoral Pulse Wave Velocity
  - Gold standard
  - 1 m/s = 15%↑CVD risk

**Prediction of cardiovascular events and all-cause mortality with arterial stiffness: a systematic review and meta-analysis**

[Charalambos Vlachopoulos](#), [Konstantinos Aznaouridis](#), [Christodoulos Stefanadis](#)

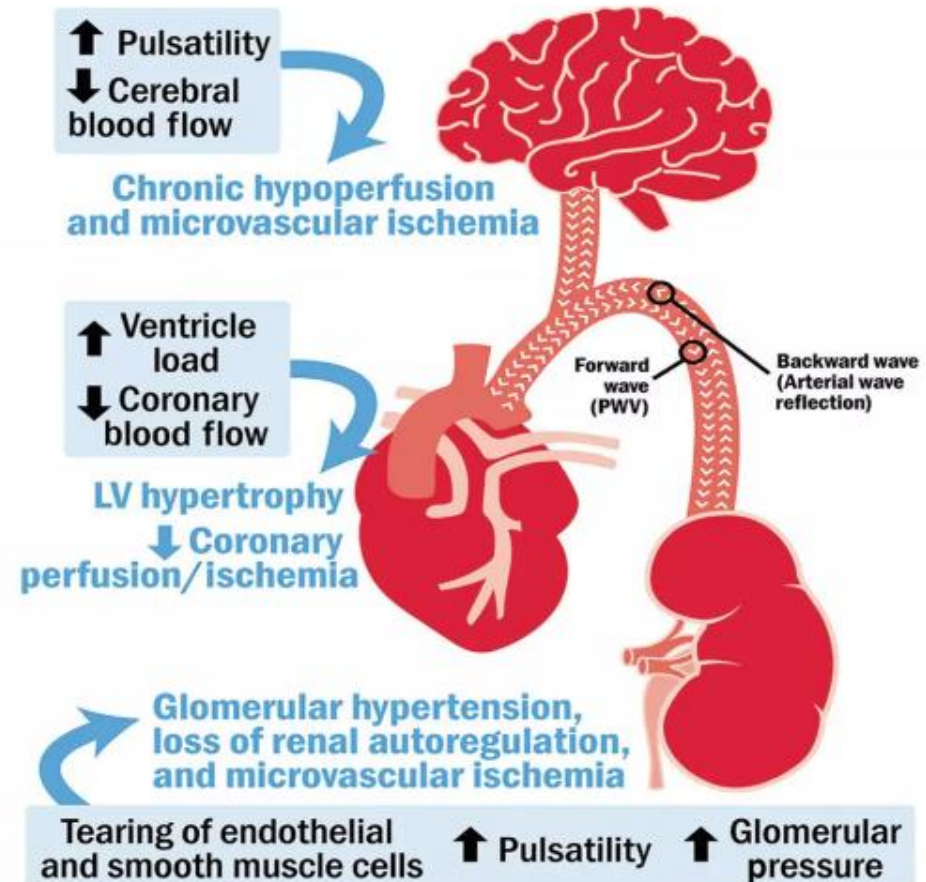


## Determinants of Vascular Age: An Epidemiological Perspective

Anna M Kucharska-Newton, Lee Stoner, Michelle L Meyer

- $\uparrow 0.2 - 0.7 \text{ m/s}$   
every 5 y

<https://doi.org/10.1373/clinchem.2018.287623>

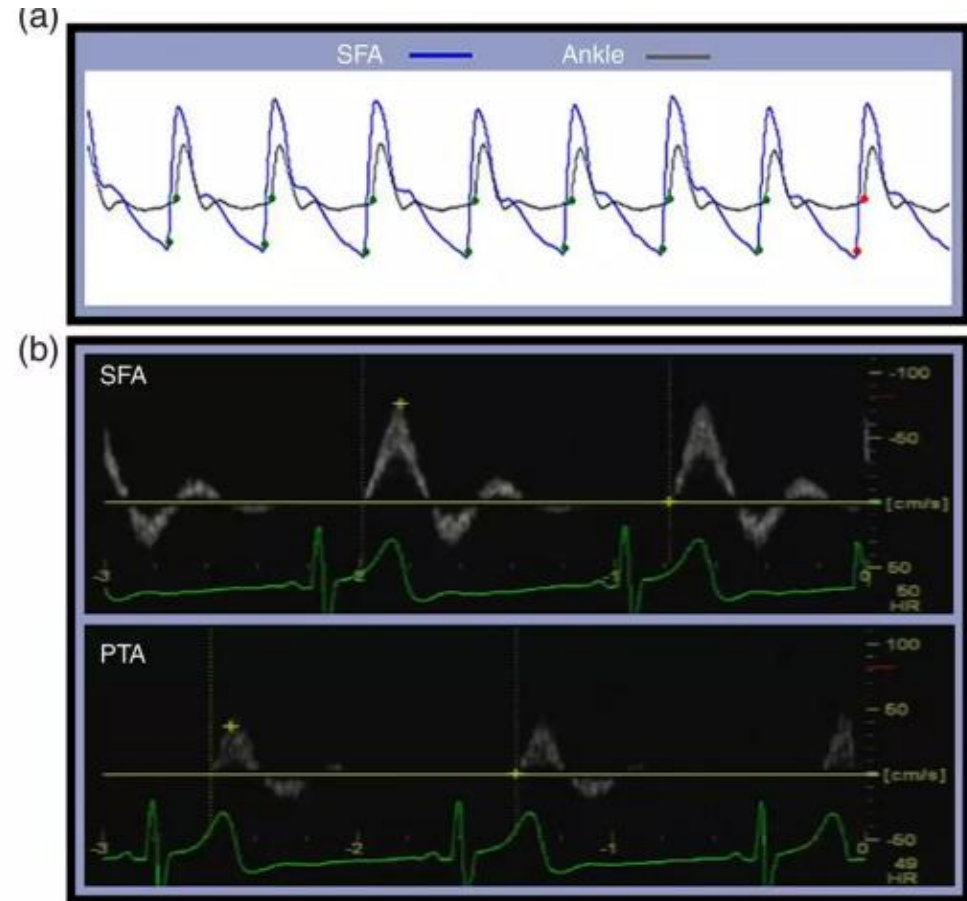


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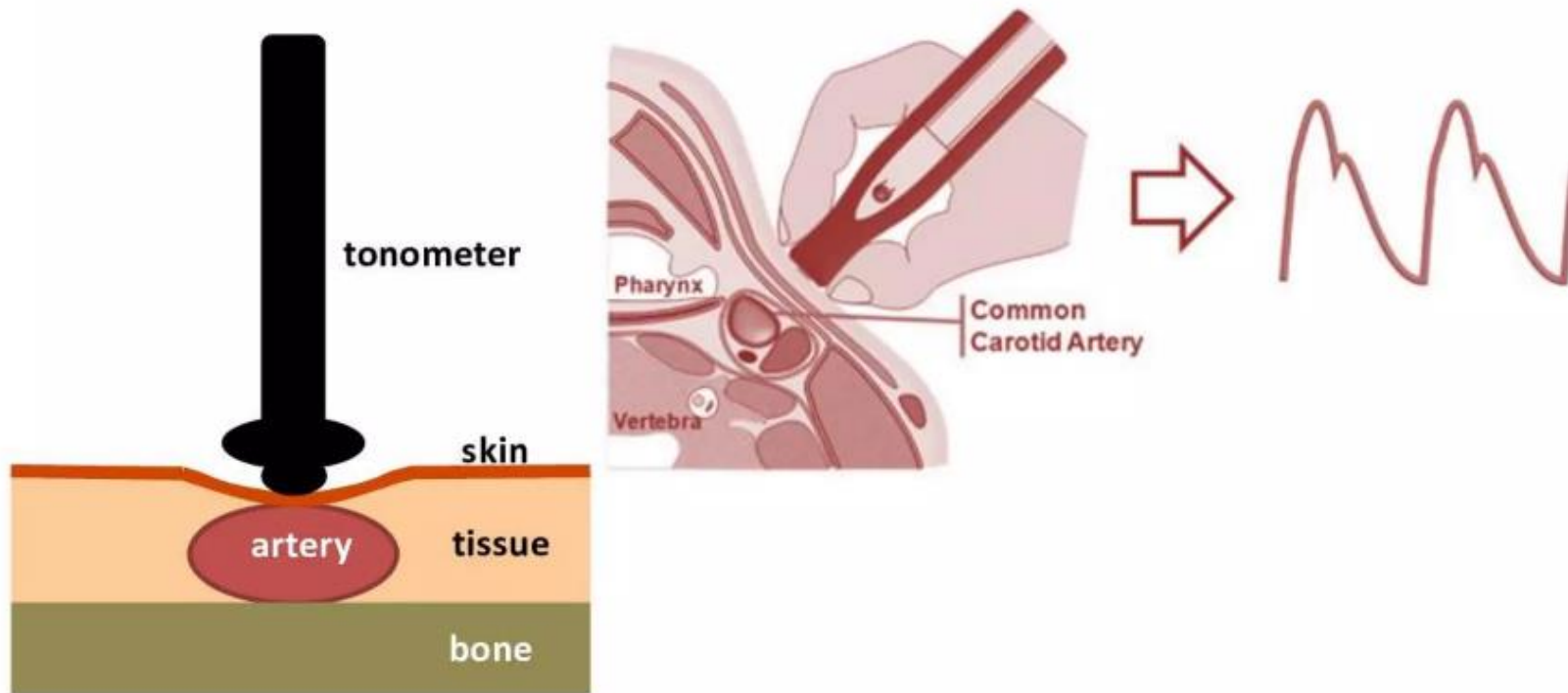
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## Devices

- Tonometry
- Oscillometry
- Ultrasound
- Electrocardiogram
- Photoplethysmography
- Transcranial doppler
- Magnetic resonance imaging



# Tonometry



## Tonometry

SphygmoCor

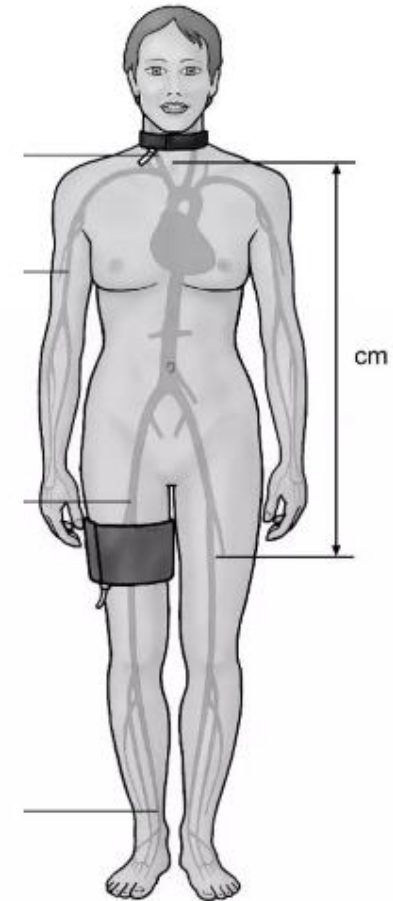


Complior



# Oscillometry

## Vicorder





## Combination

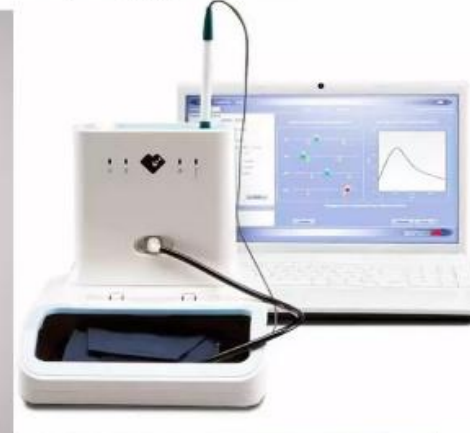


## SphygmoCor

## Combination



## SphygmoCor





## Carotid vs. Brachial

- Carotid-femoral
  - “Gold-standard”
  - Normative data
- Brachial-femoral
  - Signal : noise
  - Ease of use

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