A holistic view of the vascular mechanics addressed to the clinical diagnosis of Arterial Hypertension.

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Recherches Hydrauliques sur la circulation du sang
Circa 1857
ARTERIAL IMPEDANCE

HYDRAULIC LOAD

RESISTENCE
MICROCIRCULATION
POISEUILLE LAW

WAVE REFLECTION
CENTRAL PULSE WAVE ANALYSIS & AUGMENTATION INDEX

STIFFNESS
ARTERIAL STIFFNESS
HOOKE LAW
ARTERIAL STIFFENING & Blood Pressure Waveform Complexity

Arterial stiffening and probably earliest arrival of reflected waves produce an unwrinking of femoral arterial pressure, independently of the arterial pressure level

1. Arterial fe stiffening (AS) was confirmed by increases of Ceff, Epd and β with respect to ca (p<0.05*).

2. Concomitantly, a decrease in fe BP waveform FD was observed (p<0.05*).

3. FD and Epd (r=-0.47, p<0.05) and FD and β (r=-0.48, p<0.05) were inversely related while non-correlation was found between Ceff and FD for the whole pool of data.

4. Arterial PP and AI were higher in Fe than in Ca (p<0.05).

*Paired t test (p<0.05)

Blood Pressure Waveform Complexity Provides Insightful Information About Arterial System Dynamics

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WAVE REFLECTION & Blood Pressure Waveform Complexity

in both the aorta and the iliofemoral artery, arterial clamping and unclamping significantly modify the Augmentation Index normalized to 75 beats-per-minute and the Fractal Dimension (FD).

Fig. 2: Average arterial radial pressure tracings over 20-s intervals before and after each event (clamping/unclogging) for one representative patient undergoing vascular surgery. The end of diastole, end of systole, early systole and late systole pressures were detected on arterial pressure tracings. The Augmentation Index normalized to 75 beats-per-minute (AIX@75) and the Fractal Dimension (FD) were calculated for each state.
The scope of this pilot work is to provide initial validation of this method in order to develop a compact miniaturized device that allows the integration of wireless central blood pressure monitoring into a wearable system.
Questions?
Thank you!