Category :**Cardiovascular: Monitoring**

A222 - ***Mri as research tool for cuff-based physiological measurements***

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Introduction:

Cuff devices offer ample possibilities to modulate blood flow and pulse propagation. Vasculature response to occlusion perturbations may enable measurement of arterial compliance, peripheral resistance, and beat-to-beat BP calibration [1]. However, in standard practice the cuff is still only used for intermittent, largely inaccurate BP measurements. Strong assumptions are required to explain vascular occlusion mechanisms. Additional research modalities are needed for further development of cuff measurements.

Methods:

In this study, we employed MRI to provide new insights over the influence of the cuff on arterial pulsations. We performed MRI scans on 10 healthy participants to observe vasculature, tissue, cuff interaction.

Results:

The images provide insights into several assumptions. Unpredictable cuff folding occurs during inflation; compression of the arm is not isotropic (Fig.1). This effect possibly hinders accurate modulation of arterial transmural pressure. The artery location is subject dependent; oscillations of superficial arteries are likely expressed differently than oscillations of arteries located within subcutaneous fat. Complex tissue compression/displacement occurs under the cuff; arterial volume pulsations might not be equivalent to arm volume pulsations. Artery size is quantified revealing non-linear collapse characteristics and non-uniform collapse across the length of the cuff. No significant changes in arterial properties were detected during two consecutive inflations.

Conclusion:

These results are useful for improving existing BP measurements and enabling measurement of arterial compliance, peripheral resistance and beat-to-beat BP. The cuff interaction with the vasculature is oversimplified by existing models. MRI is an essential research tool for further development of cuff-based physiological measurements.

References:

[1] Bogatu et al, *Sensors* 2021, *21*, 5593.

Written informed consent was obtained from the participants. The data collection was registered with MEC-U as nWMO W20.090.

Image :

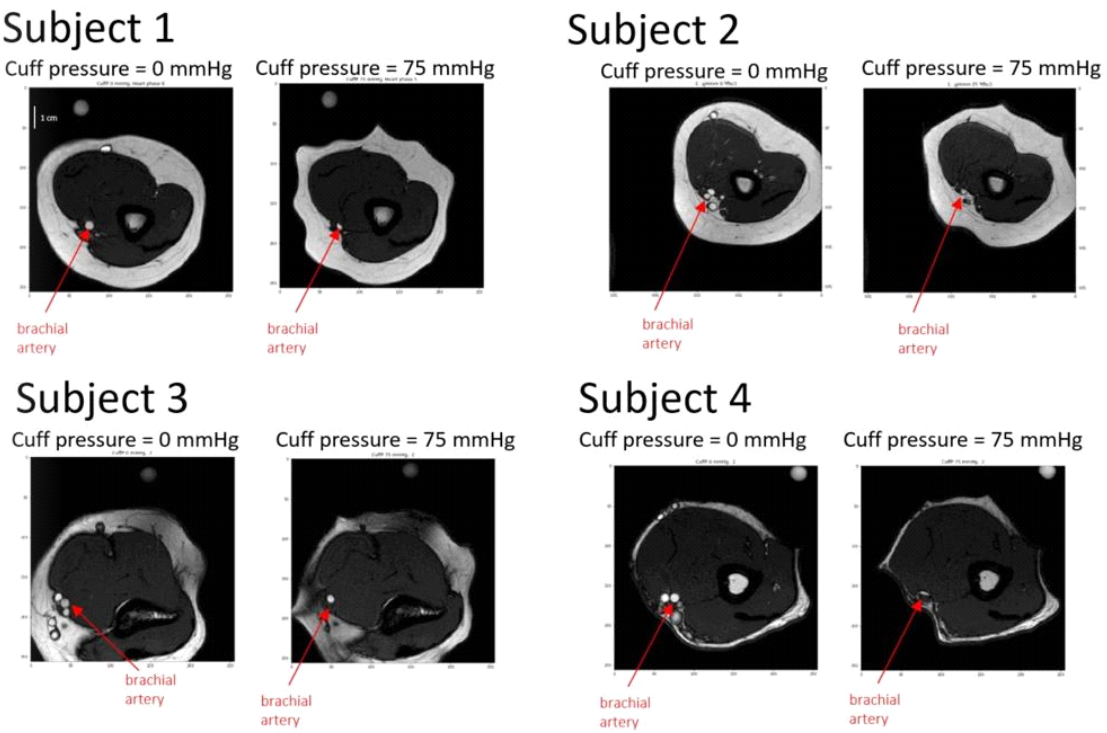

Fig.1 Cross-sectional view of the upper arm during cuff inflation.