Contrast-enhance ultrasonography reveals a lower cortical perfusion and a decreased renal flow reserve in hypertensive patients

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Ligue vaudoise contre les maladies cardiovasculaires

- **Background**:
- Microvascular alteration is a hallmark of arterial hypertension, especially in the kidney.
- Renal microcirculation is challenging to assess due to the lack of non-invasive, non-nephrotoxic techniques.
- *Contrast-enhanced ultrasonography (CEUS)* provides a non-invasive method to assess renal microcirculation, which may reflect broader vascular health.
- **Objective**: To compare renal microcirculation between normotensive (NT) and hypertensive (HT) participants at rest and during a stress test (Cold Pressor Test - CPT).

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Methods

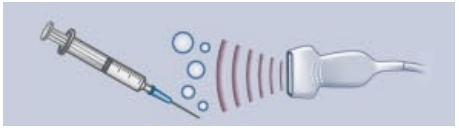
Population:
normotensive vs untreated hypertensive participants

Intervention:

- Cold pressor test (CPT)

Outcome:

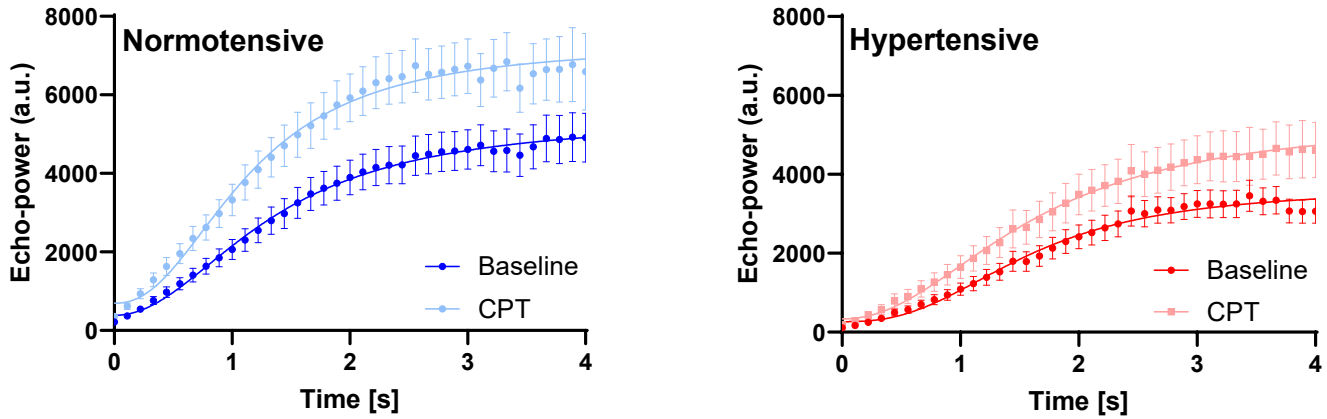
- Perfusion index (PI) on CEUS pre- and post-CPT



Key findings

- HT participants(N=32) had reduced baseline cortical perfusion index compared to NT participants (N=41; PI: HT 1476 vs NT 2062 a.u., p<0.001), suggesting microvascular impairment.
- In HT participants the increase in the PI during CPT was blunted (HT +504 vs NT +1159 a.u., p=0.013), indicating impaired renal cortical flow reserve.
- These findings highlight microvascular dysfunction in hypertensive patients, a potential early sign of broader cardiovascular risk.

Time intensity curve at baseline and CPT



Conclusions:

- Reduced renal perfusion and impaired stress response in HT patients indicate microvascular damage, which may predispose them to cardiovascular complications.
- CEUS and Doppler ultrasound can serve as important tools in *early cardiovascular care*, offering insights into microvascular health and detecting early renal microvascular damage before traditional biomarkers rise.

Implications:

- CEUS could be used to test whether physiological states or responses can be restored using antihypertensive treatment.
- Monitoring renal microcirculation could allow for earlier interventions in hypertensive patients, such as optimizing antihypertensive treatment.
- Tailored therapies to improve vascular health could prevent progression to more severe cardiovascular diseases.
- Integrating renal perfusion imaging into cardiovascular prevention protocols could enhance early risk detection and management.