**Title:** Cardiac amyloidosis preferentially compromises subendocardial LV wall thickening strain but not torsion

**Background:** Deposition of amyloid fibrils in patients with cardiac amyloidosis (CA) leads to thickening and stiffening of the left ventricular (LV) wall. Cardiac magnetic resonance (CMR) imaging derived LV strains can serve as diagnostic indicators, but regional strain patterns in CA are unclear.

**Method:** In 12 participants (6 CA, 6 controls; 17/CEN/226), cine displacement encoding with stimulated echoes (DENSE) CMR images were acquired to quantify regional circumferential (ECC), longitudinal (ELL), wall thickening (ERR), and torsional (ECL) strains using a 3D biophysical modelling approach. Strain differences between patients with CA and controls were examined using two-sample t-tests.

**Results:** Compared to control, CA was associated with significantly lower overall mean ECC (-0.19 ± 0.03 vs. -0.11 ± 0.04; p<0.01), ELL (-0.16 ± 0.02 vs. -0.06 ± 0.03; p<0.01), and ERR (0.59 ± 0.24 vs. 0.24 ± 0.10; p<0.01). There was a greater reduction in subendocardial ERR (0.72 ± 0.26 vs. 0.26 ± 0.13; p<0.01) compared to subepicardial ERR (0.45 ± 0.14 vs. 0.22 ± 0.07; p<0.01). ECL was more variable in CA compared to control (CoV: 0.42 vs. 0.11), while mean values were not significantly different.

**Conclusion:** Patients with CA exhibited more variable torsional strain, with a diminished transmural gradient of wall thickening strain compared to control. This motivates studies into the potential clinical role of regional strain estimates, in particular for discriminating LVH phenocopies.