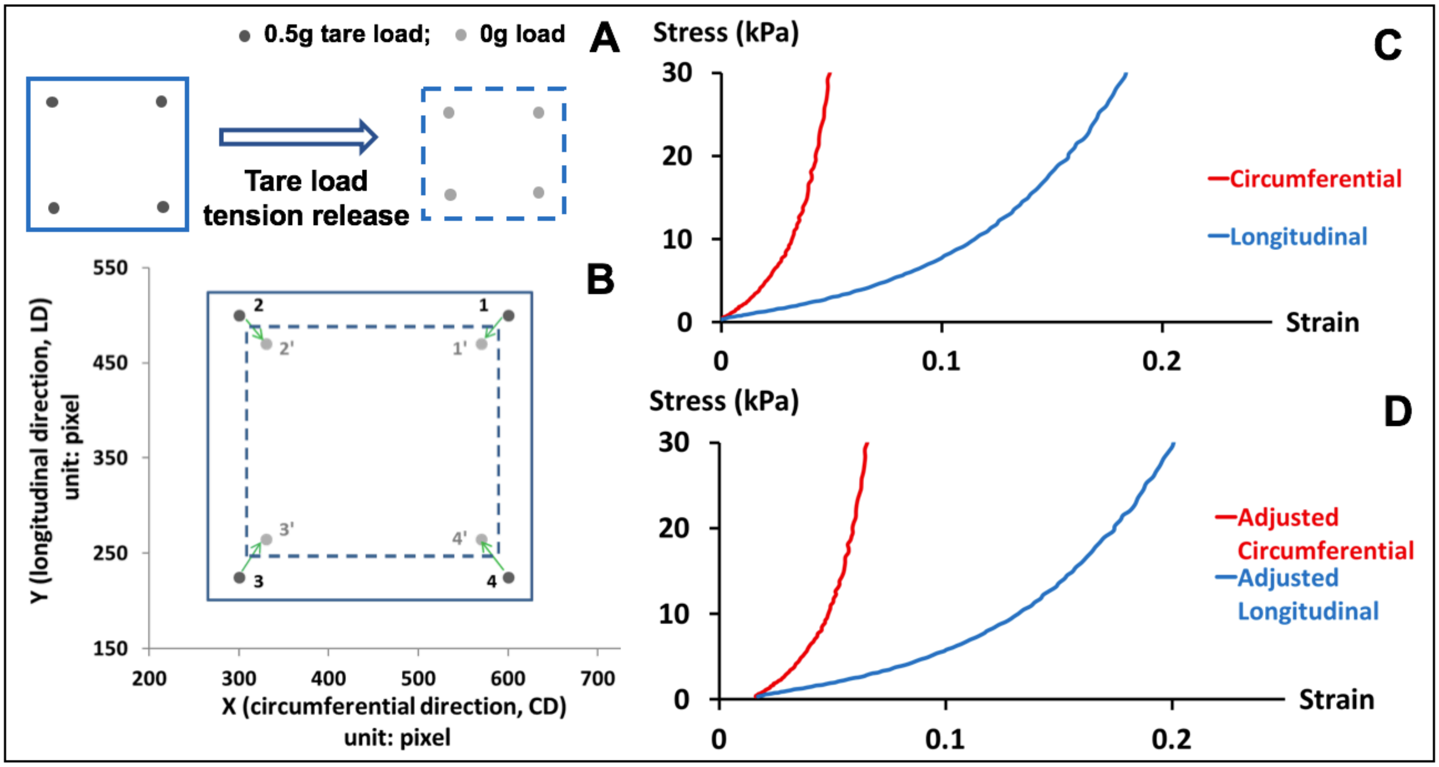
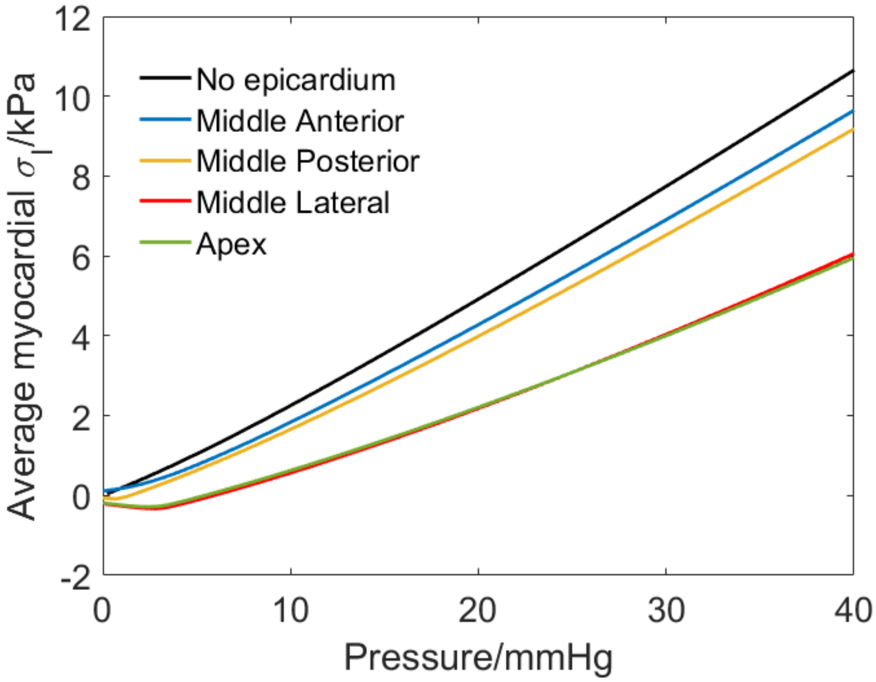
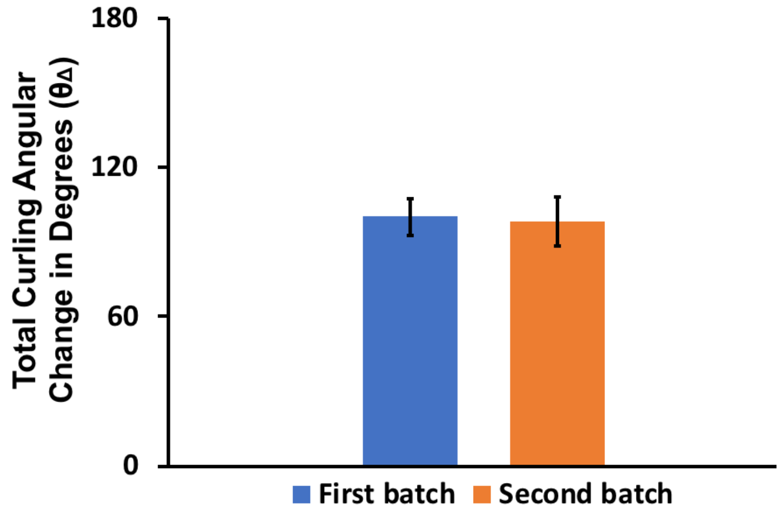


Supplemental Figure 1: **Adjusting the biaxial stress-strain curves to the real 0g load reference.** During biaxial mechanical testing, a 0.5g tare load was applied to allow the running of the software load control protocol. (A) Schematic illustration shows a sample mounted onto the biaxial machine with the 0.5g tare load applied first. The coordinates of four markers were saved as the 0.5g tare load reference file. The tare load was then released by adjusting the motor movement to 0g in both the circumferential direction and longitudinal direction, and the coordinates of four markers were saved as the 0g load reference file. (B) The compensatory strains of the 0.5g tare load status compared to the 0g load status were calculated ($\varepsilon_{X(0.5)}$ and $\varepsilon_{Y(0.5)}$). The compensatory strains were then used to adjust the biaxial stress-strain curves obtained under 0.5g tare load (C), by adding $\varepsilon_{X(0.5)}$ and $\varepsilon_{Y(0.5)}$ into the corresponding toe regions. (D) After the adjustment to the real 0g load reference status, the biaxial curves shifted towards the right.



Supplemental Figure 2: Effect of epicardial parameters from different locations. We employed the prestrain and the mechanical parameters from different locations on our homogeneous model and computed the average myocardial first principle stress as a function of the pressure. The results showed that, though the effects were varied, the parameters from different locations all had confining capability.



Supplemental Figure 3: Verification of curling measurements. The total curling angular change measurements of the LD apex at various times. In our protocol verification, we grouped the measurements as the first batch (N=4) and the second batch (N=5), which took place at various times. The total curling angular changes estimated from the first batch and second batch showed no significant difference.

Supplemental Table 1. The compensatory strains estimated by comparing the 0.5g tare load status to the 0g load status in each anatomical location.

	Compensatory Strain	
Basal Anterior (B1)	$\varepsilon_{X\,(0.5)}$	1.26%
	$\varepsilon_{Y\,(0.5)}$	3.05%
Basal Lateral (B2)	$\varepsilon_{X\,(0.5)}$	1.61%
	$\varepsilon_{Y\,(0.5)}$	1.71%
Basal Posterior (B3)	$\varepsilon_{X\,(0.5)}$	1.43%
	$\varepsilon_{Y\,(0.5)}$	1.14%
Middle Anterior (M1)	$\varepsilon_{X\,(0.5)}$	0.98%
	$\varepsilon_{Y\,(0.5)}$	1.33%
Middle Lateral (M2)	$\varepsilon_{X\,(0.5)}$	1.12%
	$\varepsilon_{Y\,(0.5)}$	1.39%
Middle Posterior (M3)	$\varepsilon_{X\,(0.5)}$	3.10%
	$\varepsilon_{Y\,(0.5)}$	4.10%
Apex	$\varepsilon_{X\,(0.5)}$	1.66%
	$\varepsilon_{Y\,(0.5)}$	2.99%