Tables and Figures

Table 1: Enzyme, glutaraldehyde and control treatment concentrations and durations. N(axial) and N(circ) are the number of treated samples in the axial and circumferential direction respectively.

Treatment	Concentration	Temp.	Duration	N(axial)	N(circ)
Control	-	37°C	20 hours	16	16
Collagenase (Roche)	0.05 U/ml	37°C	20 hours	14	17
Elastase (Sigma Aldrich)	0.2 U/ml	37°C	20 hours	14	16
Glutaraldehyde	0.1%	4°C	20 hours	14	13

Table 2: Mean ± standard deviation of sample dimensions.

(a) Width of tissue (mm).

	Control	Collagenase	Elatase	Glutaraldehyde
Axial	9.4 ± 1.2	9.3 ± 0.8	9.3 ± 0.7	9.9 ± 1.1
Circumferential	9.4 ± 1.2	9.7 ± 0.6	9.7 ± 0.7	10.1 ± 0.9

(b) Length of tissue to be dissected (mm).

	Control	Collagenase	Elatase	Glutaraldehyde
Axial	31.4 ± 1.4	30.1 ± 2.1	30.9 ± 1.5	30.2 ± 1.9
Circumferential	31.5 ± 2.3	29.3 ± 2.2	30.5 ± 1.4	31.9 ± 3.1

Table 3: Average steady state forces per unit width and critical energy release rates ± standard deviations, with associated p values compared with control results. Units for F and G_c are N/m and J/m^2, respectively. p values were calculated from G_c data using Student's unpaired t-test.

(a) Axial.

Value	Control	Collagenase	Elastase	Glutaraldehyde
F^a	76.7 ± 25.9	53.9 ± 12.2	69.1 ± 27.0	83.6 ± 13.7
G_c^a	183.3 ± 64.2	135.8 ± 31.2	171.8 ± 71.2	186.3 ± 33.5
p value	N/A	0.018	0.647	0.876

(b) Circumferential.

Value	Control	Collagenase	Elastase	Glutaraldehyde
F^c	67.4 ± 11.7	49.3 ± 11.9	58.8 ± 17.3	91.2 ± 28.2
G_c^c	151.8 ± 27.0	108.1 ± 28.0	132.4 ± 40.0	190.1 ± 60.5
p value	N/A	<0.001	0.118	0.031

Table 4: Healthy artery peeling forces per width, F_a, F_c (N/m), and critical energy release rates, G_c^a, G_c^c (J/m^2). P, porcine and H, human. A, aorta; TA, thoracic aorta; ATA, UTA and LTA, ascending, upper and lower thoracic aorta; AA, abdominal aorta; UAA and LAA, upper and lower abdominal aorta; ICA and CCA, internal and common carotid artery; CA, coronary artery. LI, liquid infusion.

Vessel	Method	F_a	F_c	G_c^a	G_c^c	Ref.
P-UTA	LI	-		159 ± 9		[5]
H-A	LI	-		16.5		[32]
P-ATA	LI	-		43.9 ± 21.9		[26]
P-UTA	LI	-		28.4 ± 11.9		[26]
P-LTA	LI	-		29 ± 12.1		[26]
P-UAA	LI	-		18.8 ± 8.9		[26]
P-LAA	LI	-		113.4 ±40.5		[26]
H-AA	Peeling	34.8 ± 15.5	22.9 ± 2.9	76 ± 27	51 ± 6	[29]
H-ICA	Peeling	26.9 ± 7.1	-	60 ± 16	-	[34]
H-CCA	Peeling	33.7 ± 10.9	21.5 ± 4.2	75 ± 24	48 ± 10	[34]
H-ATA	Peeling	149.0 ± 7.6	126.0 ± 6.6	-		[25]
H-CA	Peeling	-		10.3 ± 5	-	[37]
P-TA	Peeling	76.7 ± 25.9	67.4 ± 11.7	183.3 ± 64.2	151.8 ± 27.0	Present

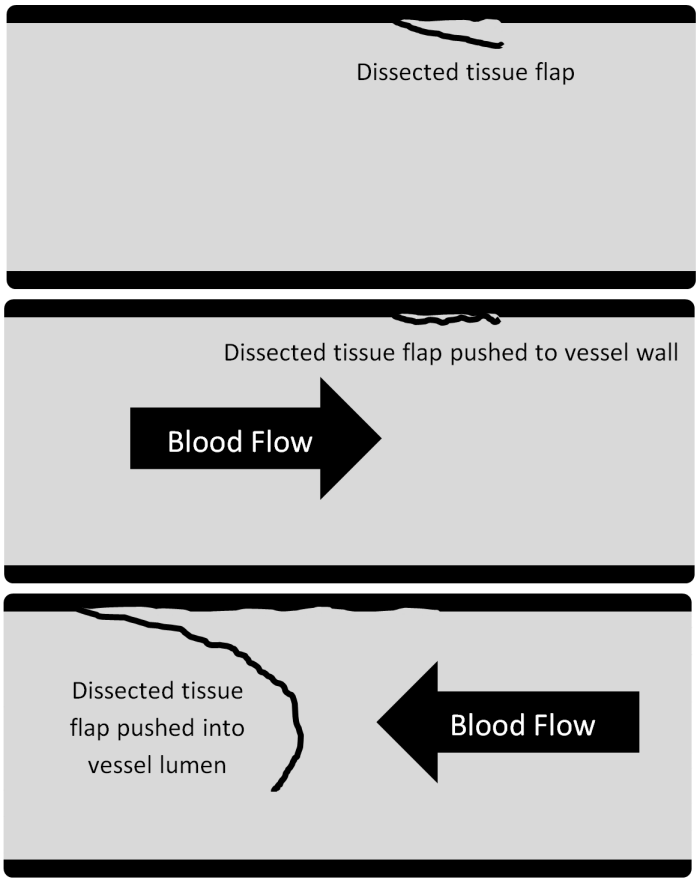

Figure 1: Schematic detailing dissection becoming benign or propagating depending on blood flow direction. Top, initial dissection with tissue flap extending in to vessel lumen. Middle, tissue flap pushed back onto vessel wall by blood flow. Bottom, further tissue peeled from vessel wall by blood pressure, with the tissue flap now obscuring a large portion of the vessel lumen.

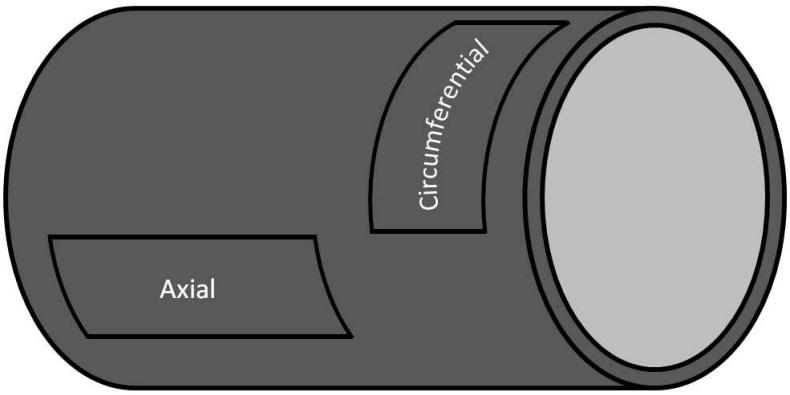

Figure 2: Schematic showing orientations of sample with respect to the artery wall.

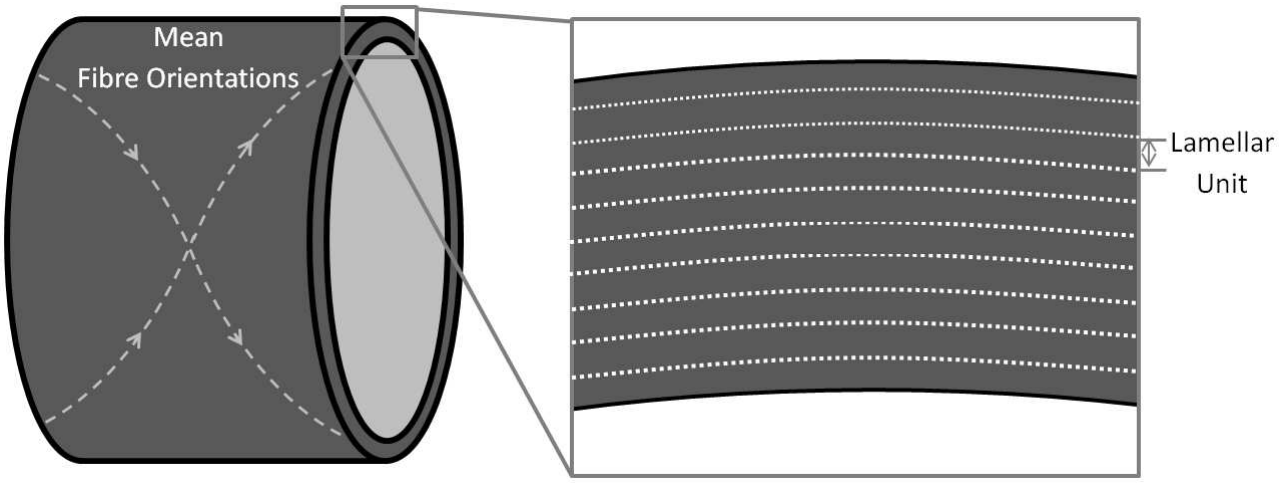

Figure 3: Idealised representation of the organisation of the aortic media. Families of fibres are oriented predominately into helices around the vessel wall, as shown on the left, with mean orientations closer to circumferential, rather than axial direction. The lamellae are stacked upon one another with interconnecting fibres providing some radial resistance.

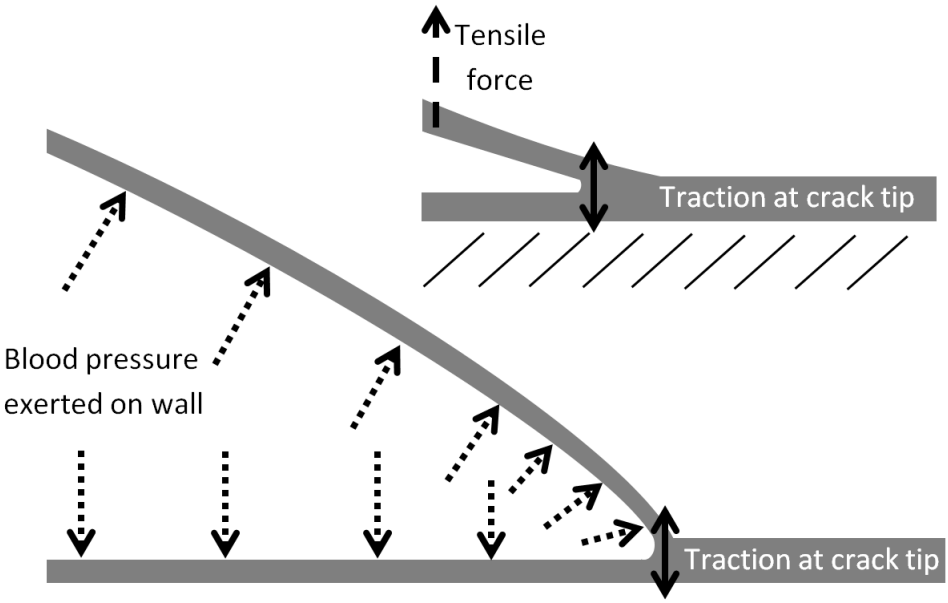

Figure 4: 2D schematic illustrating the similar tractions at the crack tip for peeling and blood pressure propagation of the dissection.

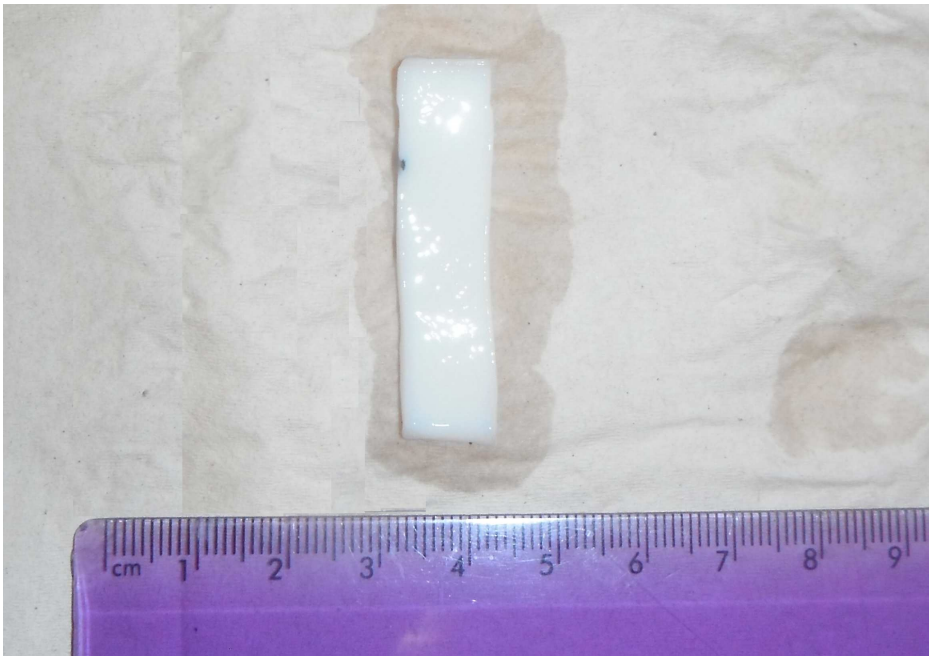

Figure 5: Sample before peeling. The initial tear began at the top of the specimen and extended to the black marker.

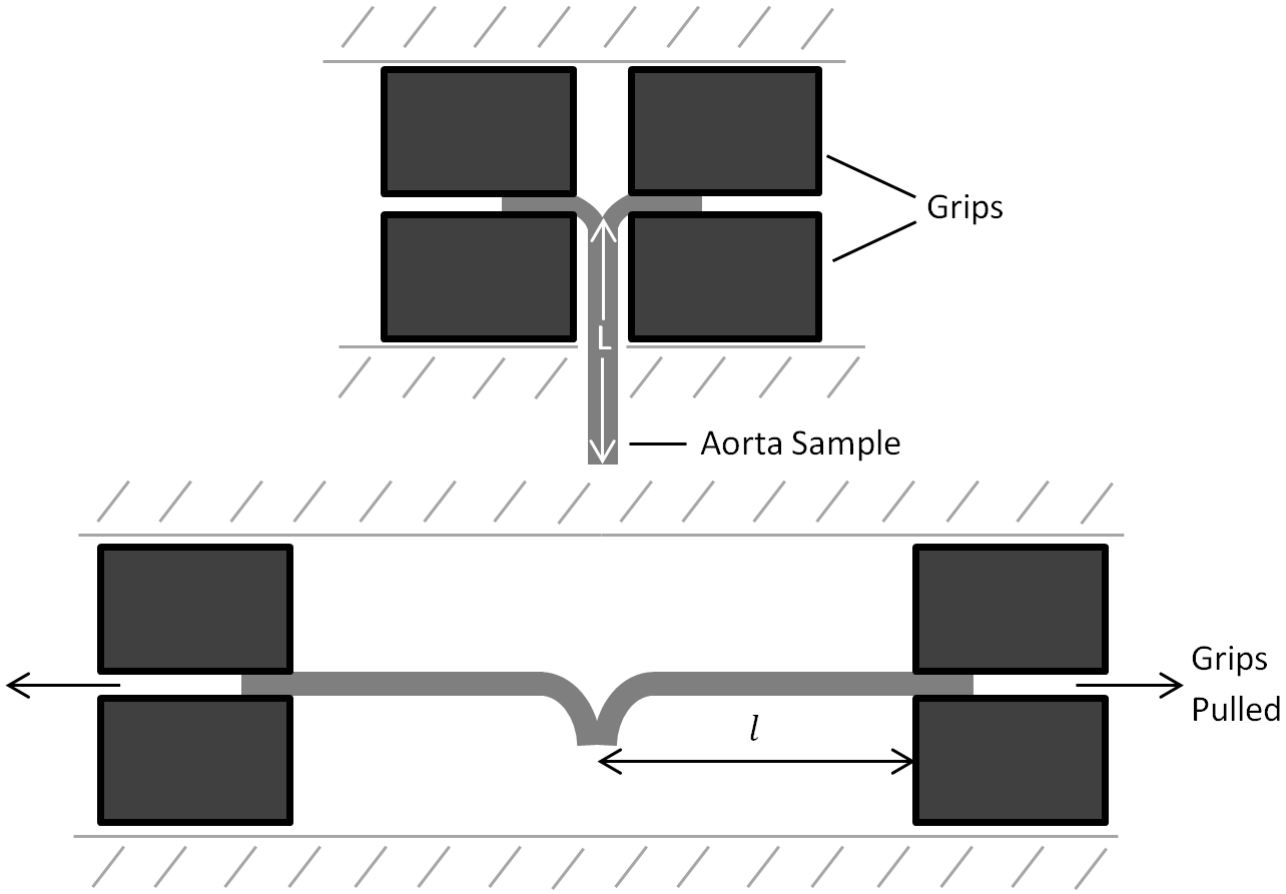

Figure 6: Schematic of experimental set up before loading and immediately before full separation. The top image shows the free tongues, made by the initial manual tearing, held by grips. L is the length of tissue to be dissected. In the bottom image, l is the length of the tissue at full separation.

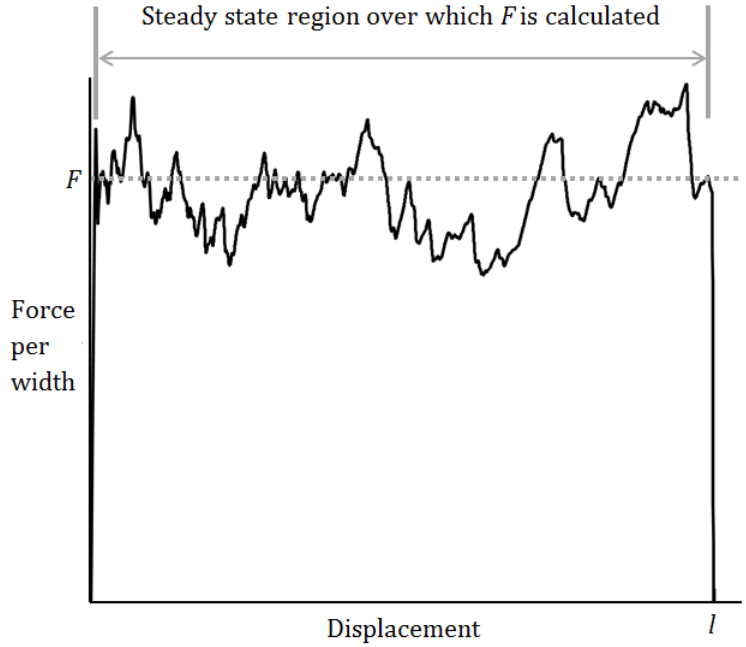

Figure 7: Representation of the force displacement data from a peel test, and indicating the region over which the mean peeling force F is calculated. The displacement l of the loading grips at full separation is also shown.

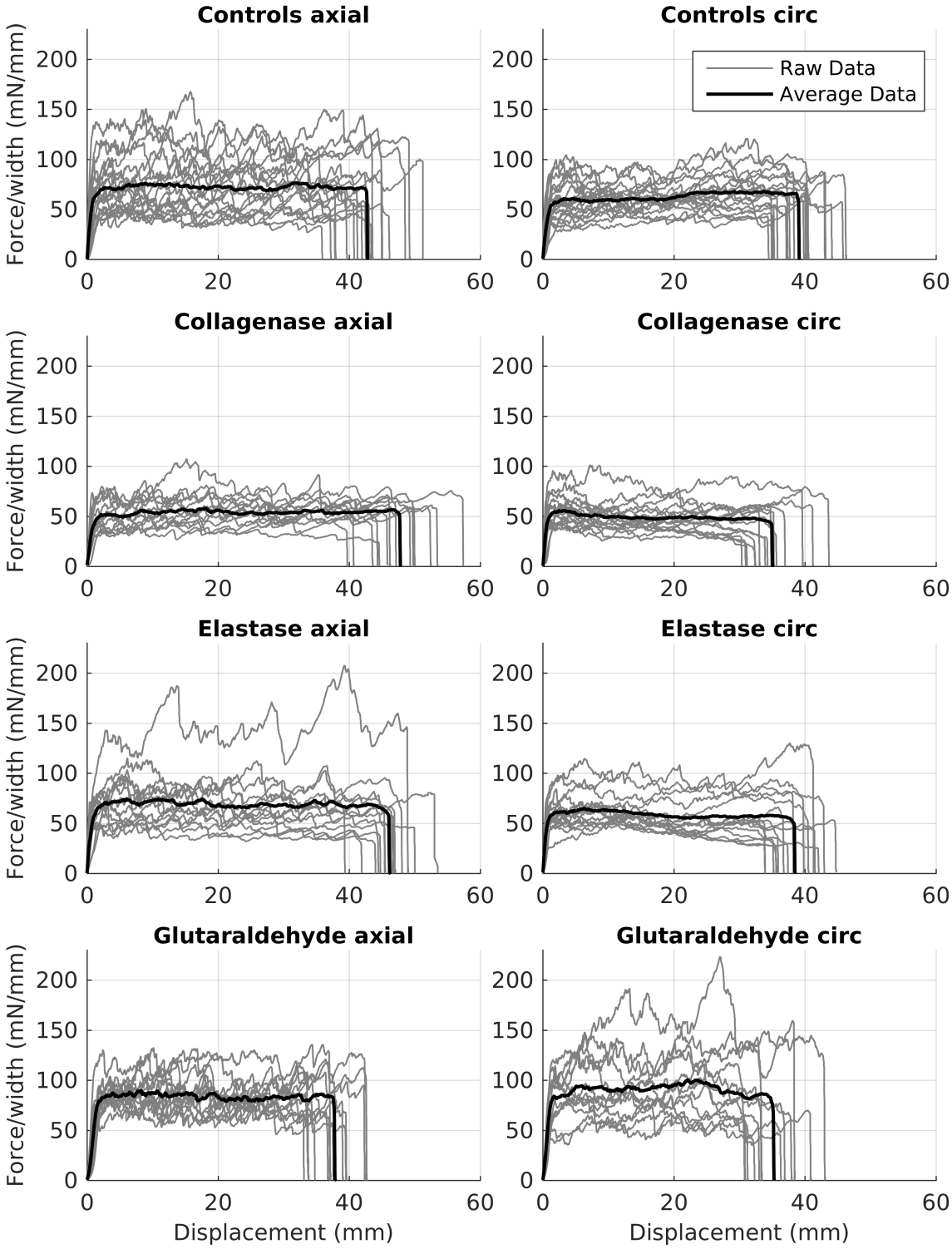

Figure 8: Force per unit width versus displacement for peel tests in the axial and circumferential directions.

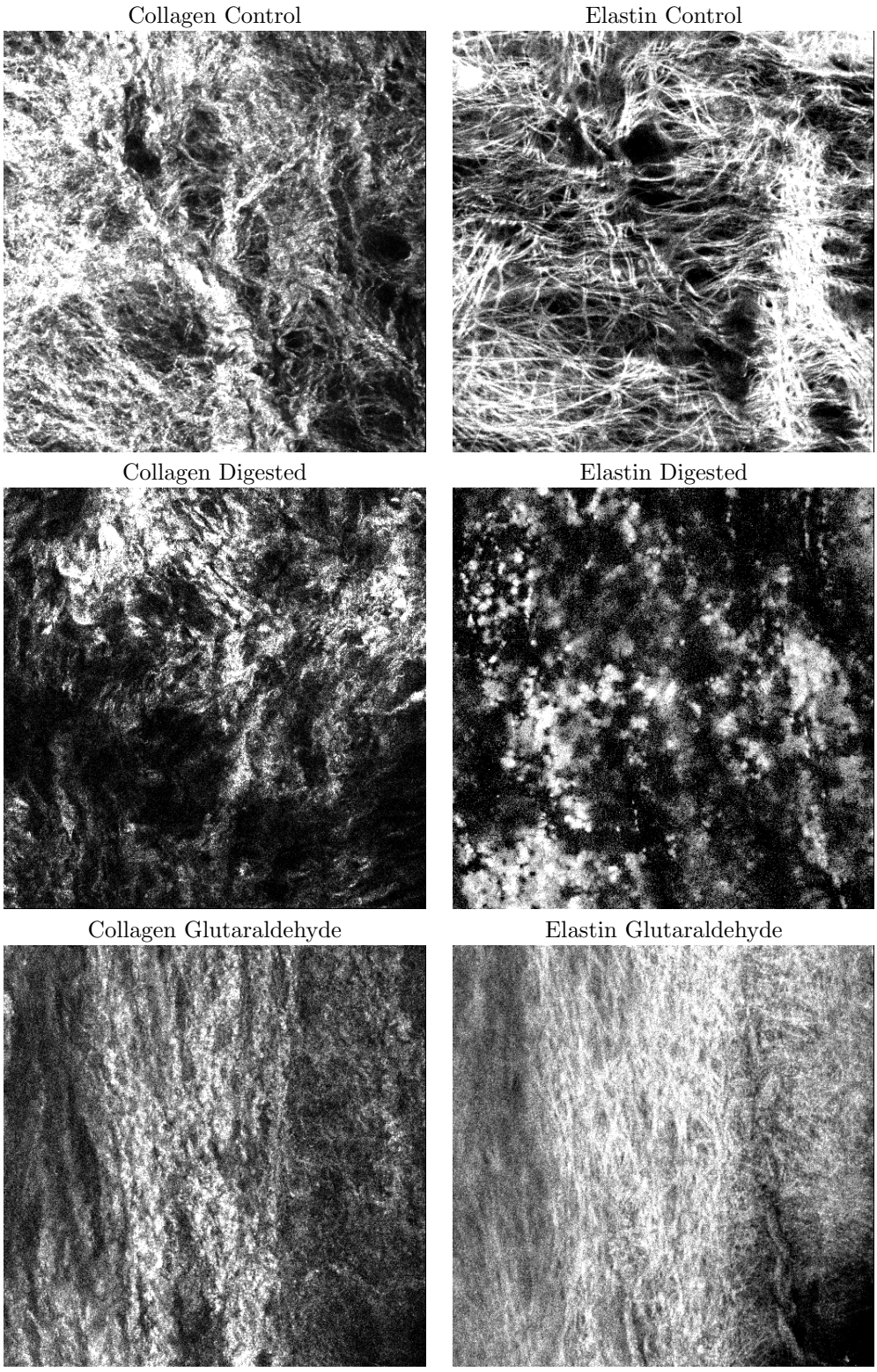

Figure 9: SHG images of collagen and TPM images of elastin (at depth of 19.5μm) for controls, samples with either proteins digested by their respective enzyme and each protein following glutaraldehyde treatment. Intimal side of the axial-circumferential plane is presented to demonstrate the protein loss.