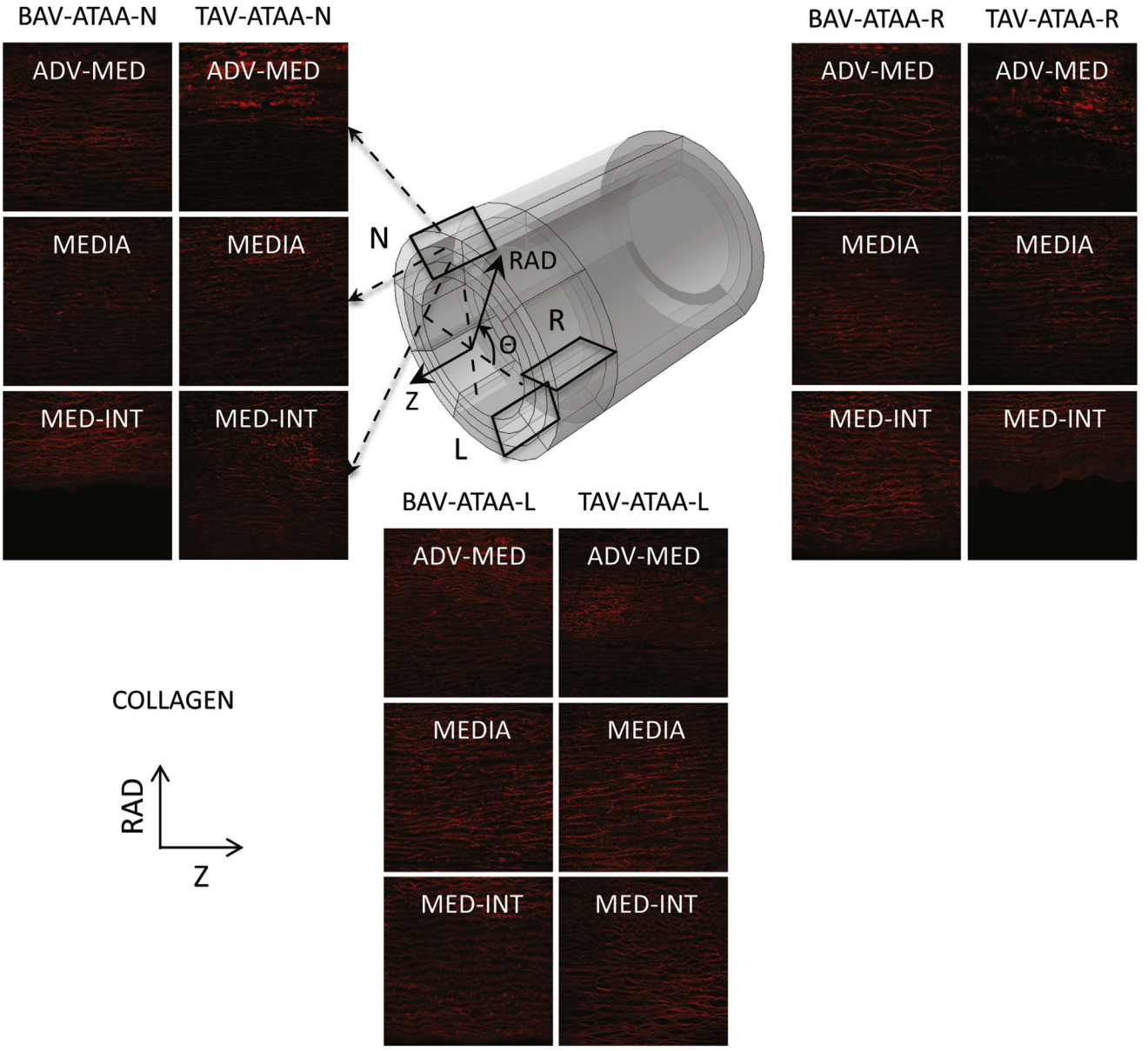

FIGURE E1. The collagen (*red*) channel of Figure 2. *BAV-ATAA-N*, Bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to noncoronary sinus; *TAV-ATAA-N*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to noncoronary sinus; *Adv-med*, adventitia-media layer; *Med-int*, media-intima layer; *N*, circumferential region with respect to noncoronary sinus*RAD*, radial; *Z*, circumferential-longitudinal plane; *Θ*, circumferential; *R*, circumferential region with respect to right coronary sinus *L*, circumferential region with respect to left coronary sinus; *BAV-ATAA-R*, bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to right coronary sinus; *TAV-ATAA-R*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to right coronary sinus; *BAV-ATAA-L*, bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to left coronary sinus; *TAV-ATAA-L*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to left coronary sinus.

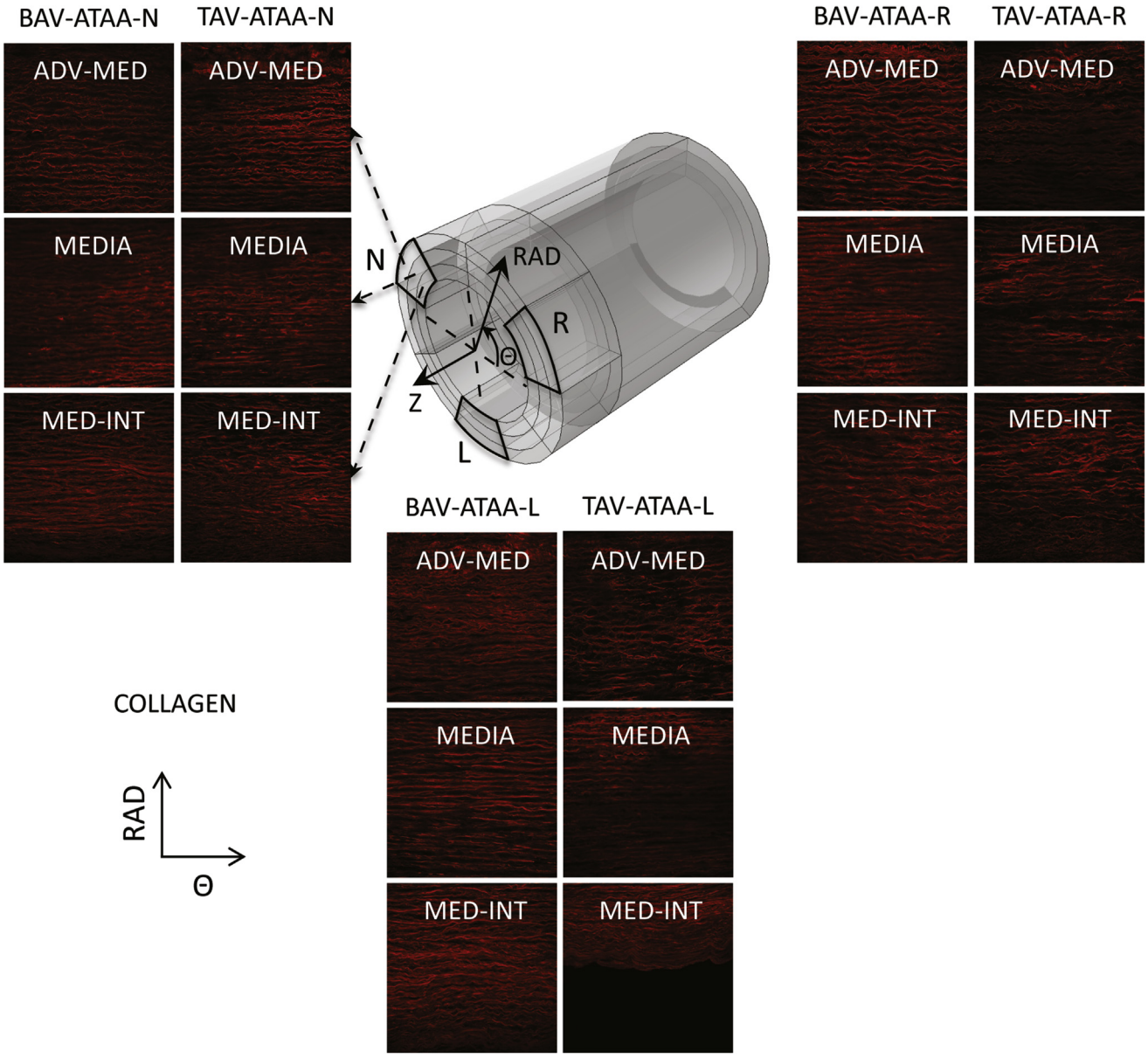

FIGURE E2. The collagen (*red*) channel of Figure 3. *BAV-ATAA-N*, Bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to noncoronary sinus; *TAV-ATAA-N*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to noncoronary sinus; *Adv-med*, adventitia-media layer; *Med-int*, media-intima layer; *N*, circumferential region with respect to noncoronary sinus*RAD*, radial; *Z*, circumferential-longitudinal plane; *Θ*, circumferential; *R*, circumferential region with respect to right coronary sinus *L*, circumferential region with respect to left coronary sinus; *BAV-ATAA-R*, bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to right coronary sinus; *TAV-ATAA-R*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to right coronary sinus; *BAV-ATAA-L*, bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to left coronary sinus; *TAV-ATAA-L*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to left coronary sinus.

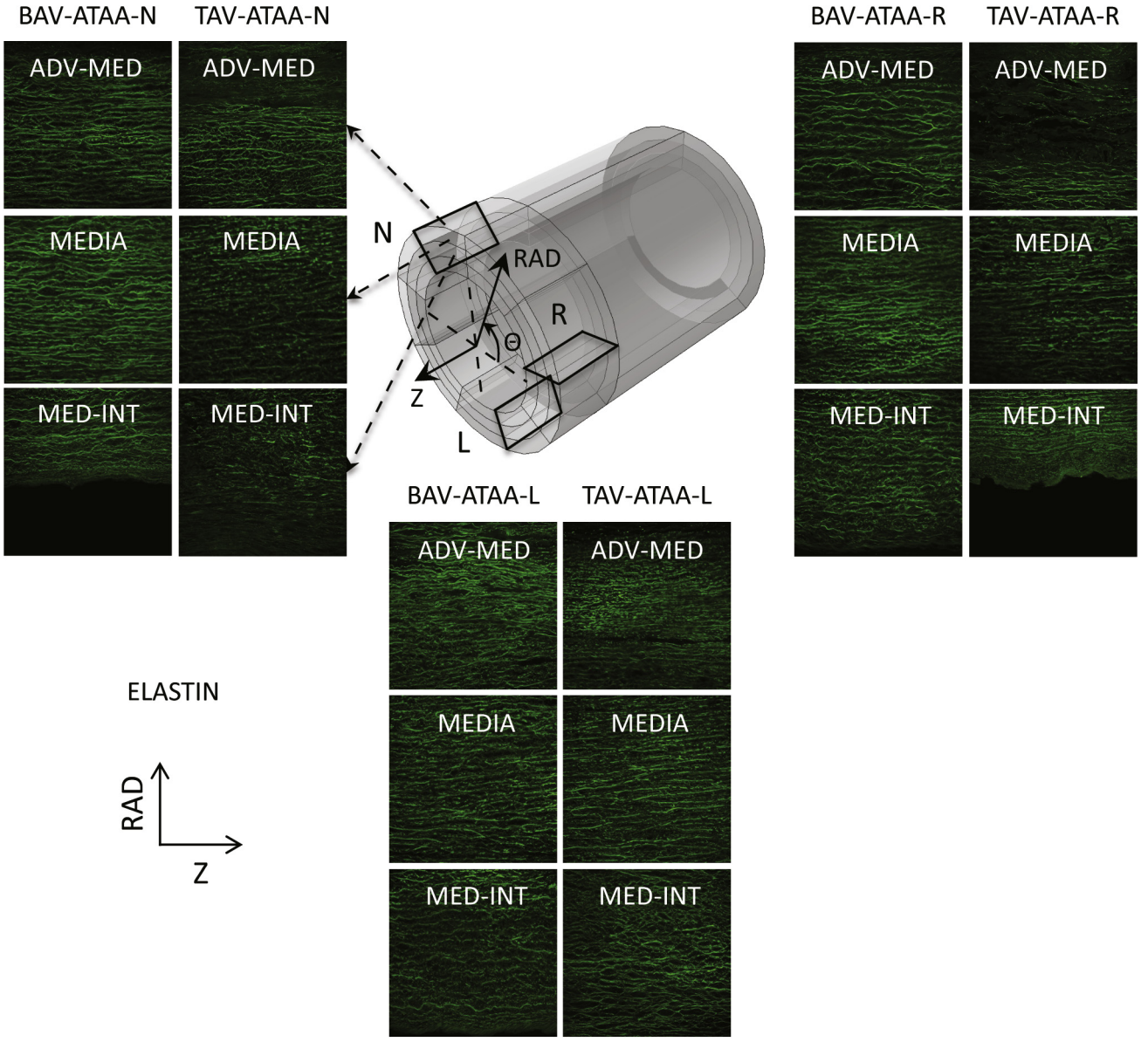

FIGURE E3. The elastin (*green*) channel of Figure 2. *BAV-ATAA-N*, Bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to noncoronary sinus; *TAV-ATAA-N*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to noncoronary sinus; *Adv-med*, adventitia-media layer; *Med-int*, media-intima layer; *N*, circumferential region with respect to noncoronary sinus*RAD*, radial; *Z*, circumferential-longitudinal plane; *Θ*, circumferential; *R*, circumferential region with respect to right coronary sinus *L*, circumferential region with respect to left coronary sinus; *BAV-ATAA-R*, bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to right coronary sinus; *TAV-ATAA-R*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to right coronary sinus; *BAV-ATAA-L*, bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to left coronary sinus; *TAV-ATAA-L*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to left coronary sinus.

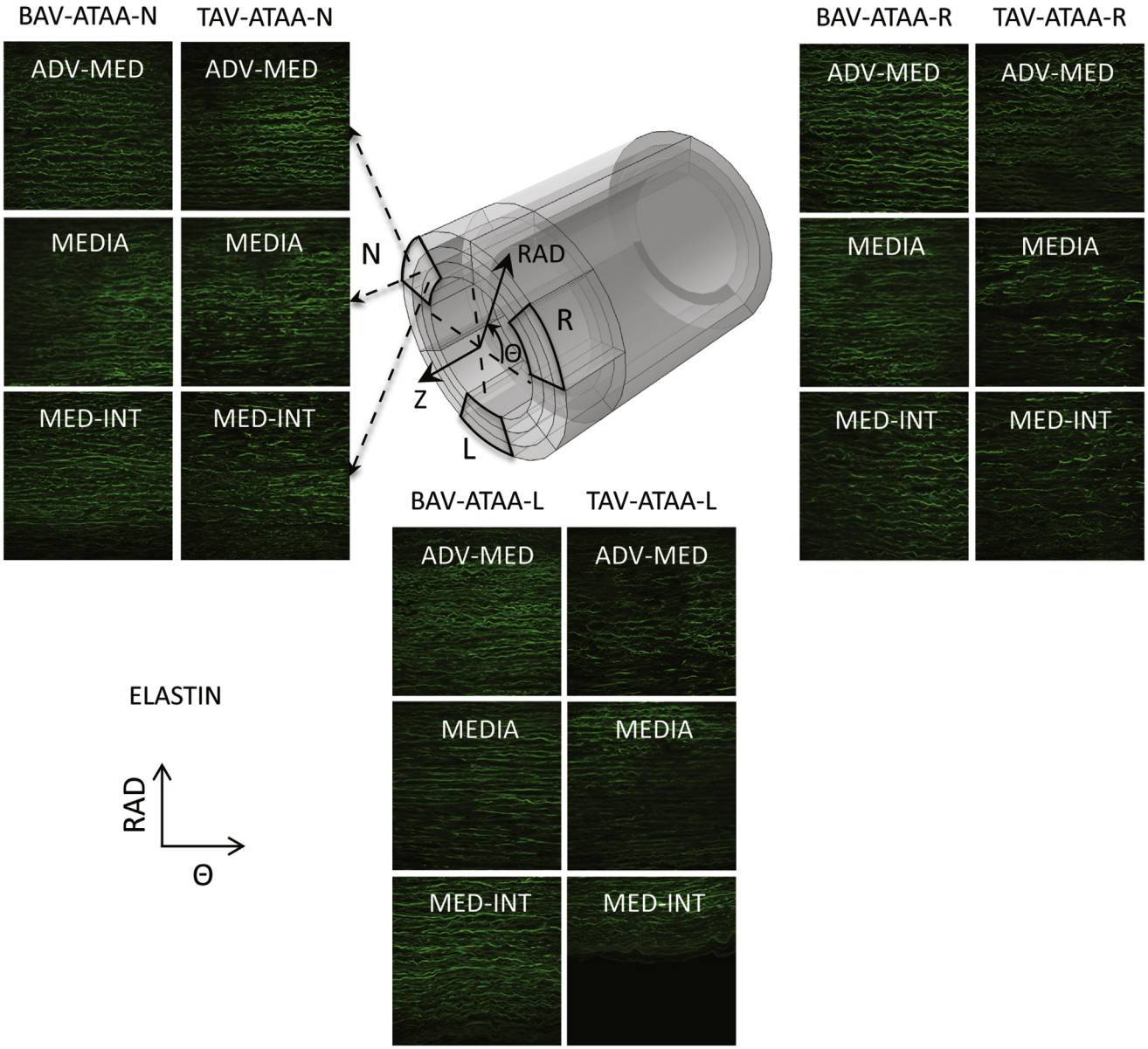

FIGURE E4. The elastin (*green*) channel of Figure 3. *BAV-ATAA-N*, Bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to noncoronary sinus; *TAV-ATAA-N*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to noncoronary sinus; *Adv-med*, adventitia-media layer; *Med-int*, media-intima layer; *N*, circumferential region with respect to noncoronary sinus*RAD*, radial; *Z*, circumferential-longitudinal plane; *Θ*, circumferential; *R*, circumferential region with respect to right coronary sinus *L*, circumferential region with respect to left coronary sinus; *BAV-ATAA-R*, bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to right coronary sinus; *TAV-ATAA-R*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to right coronary sinus; *BAV-ATAA-L*, bicuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to left coronary sinus; *TAV-ATAA-L*, tricuspid aortic valve ascending thoracic aortic aneurysm circumferential region with respect to left coronary sinus.

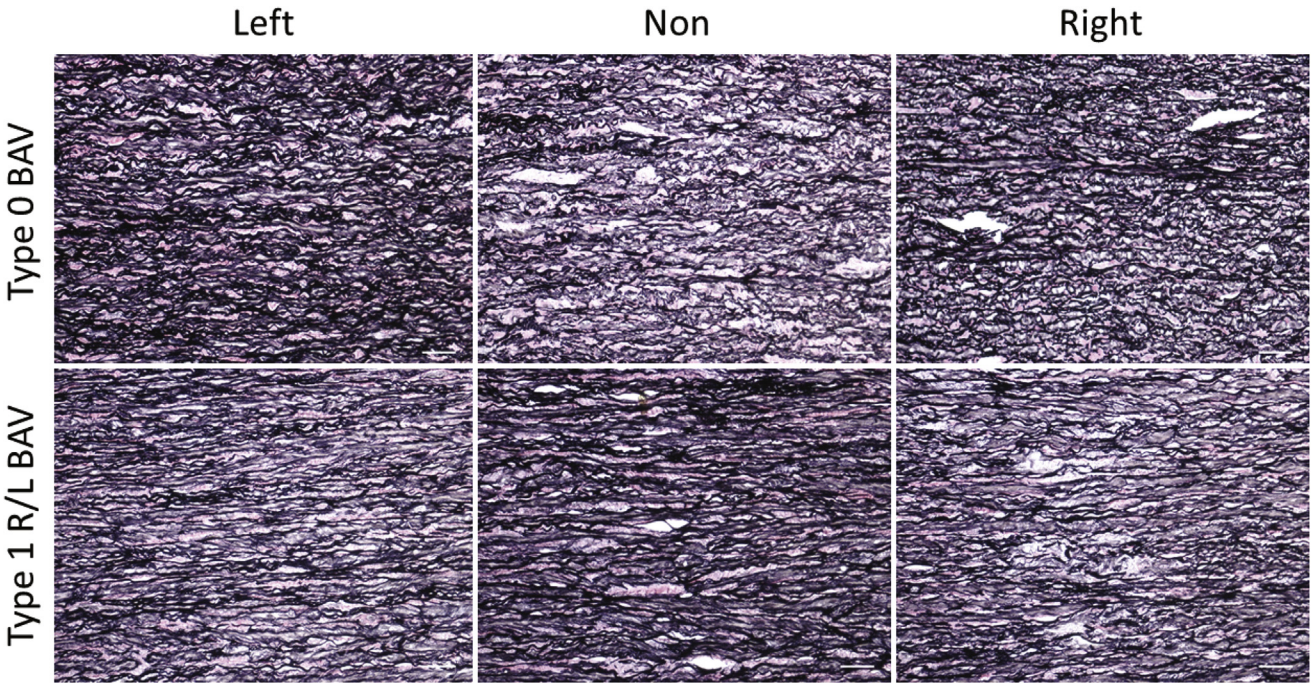

FIGURE E5. Human ascending thoracic aortic specimens from 3 circumferential regions with respect to proximity to the aortic valve cusps (left coronary [*Left*], noncoronary [*Non*], and right coronary [*Right*]) from 2 bicuspid aortic valve (*BAV*) patients displaying the 2 most common morphotypes (type 0, *top row*, and type 1 right/left, *bottom row*). Five micron sections of formalin-fixed and paraffin-embedded specimens were evaluated for elastin composition and integrity using Verhoff-Van Gieson's stain. Specimens were visualized using bright field microscopy and a 20× objective. More extensive cystic medial degeneration was noted for regions *Non* and *Right* for BAV patients exhibiting both morphotypes. Scale *bars* = 50 μm.