Extracellular matrix variation along the human aorta: an autoptic observational study focusing on highly sulphated proteoglycans

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Purpose Differences in the distribution of elastic and collagenic components between the proximal and the distal aorta are well known. We sought to determine the changes in content and organization of non-collagenic constituents of the extracellular matrix, focusing in particular on highly sulphated proteoglycans (PGs) throughout the normal human aorta.

Methods Histochemical staining with Alcian Blue pH 0.2 allowed for tinctorial distinction of highly sulphated proteoglycans on complete 1-cm transverse rings removed from the ascending and descending thoracic aorta and abdominal supraceliac, suprarenal, and infrarenal aorta of young subjects at autopsy. Counterstaining with Orcein and Sirius Red allowed comparing with the total content of elastin and collagen. Light microscopy and image analysis were used to determine changes in total and relative content of highly sulphated proteoglycans at each level, along with the variation of collagen and elastin.

Results Collagen/elastin ratio increases from the proximal to distal aorta as the elastin content decreases from the supradiaphragmatic to the abdominal aorta. The proportion of highly sulphated proteoglycans does not change significantly throughout the thoracic and thoraco-abdominal aorta, while a significant increase in total highly sulphated proteoglycans content is observed at the infrarenal site.

Conclusion The infrarenal aorta differs histologically and biochemically from the remainder of the aorta. Highly sulphated proteoglycans in the distal aorta bear an increased load as compared to the proximal aorta. A decrease in infrarenal elastin without a corresponding decrease in collagen may effect the compliance and integrity of the distal aorta. These anatomic differences may be important in predisposing the infrarenal aorta to atherosclerosis and aneurysm formation.

Key words
Morphology, Aorta, Proteoglycan, Extracellular Matrix