

Title: Microscopic degeneration in Ascending Aortic Aneurysms: Comparative Analysis by Anatomical Location

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Abstract

The study is based on surgical aortic tissue samples grouped by the anatomical location of the aneurysm. The objective is to investigate whether histopathological changes, particularly medial degeneration, vary between different locations of ascending aortic aneurysms (AAAs). Comparisons were performed across three topographic groups using the SCVP-AECVP classification system. This research may deepen understanding of aneurysm behavior and contribute to individualized risk assessment and treatment planning.

We aimed to evaluate whether histopathological changes in the aortic wall differ according to aneurysm topography and whether these associations are influenced by aortic valve cuspidity.

Patients undergoing surgery for AAA at Tampere University Heart Hospital were included (n = 296). Histological sections were systematically assessed for medial and adventitial degeneration using semi-quantitative scoring. Ordinal variables were analyzed with Kruskal–Wallis and Mann–Whitney U tests, and binary variables with chi-square tests. Subgroup analyses were performed for tricuspid and bicuspid valves.

In patients with tricuspid aortic valves, aneurysms involving the tubular ascending aorta showed more advanced medial degeneration compared with isolated sinus of Valsalva dilatation. Tubular involvement was also associated with more pronounced adventitial alterations. In contrast, among patients with bicuspid valves, no consistent histopathological differences were observed between anatomical subgroups.

Histopathological degeneration of the ascending aorta varies by aneurysm topography, with tubular involvement showing more advanced degenerative changes than isolated root dilatation. These findings suggest distinct pathogenic mechanisms across subtypes and highlight the importance of integrating anatomical patterns with valve morphology in research and practice.