Analysis of the aortic root in Tetralogy of Fallot patients undergoing early repair: form follows function.

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Objective:
Aortic root dilatation remains of concern in patients late after repair for tetralogy of Fallot (ToF). The underlying mechanism is unclear - both hemodynamic and intrinsic wall abnormalities have been suggested. In a previous study we demonstrated that indexed aortic root diameters decrease progressively when correction is performed early in life. To test if aortic wall changes are intrinsic or acquired, a histological study was performed, focusing on the ascending aortic wall characteristics in infants at early repair.

Methods:
In 24 of 31 consecutive infants (mean age 5.9 ± 4.9 months) undergoing ToF repair, full-thickness aortic biopsies were obtained from the proximal ascending aorta, and evaluated histologically. The aortic root z-values and indexed diameters were then prospectively followed up to 2 years postoperatively.

Results:
None of the aortic specimens showed signs of important medial degeneration, increased fibrosis, elastic fragmentation, mucoid accumulation or apoptosis. The aortic root was dilated in all infants at the time of repair (mean indexed diameter of annulus 38 ± 5.7 mm/m², sinus 47.9 ± 6 mm/m² and sinotubular junction 38.8 ± 5.4 mm/m²), and regressed significantly within 2 years (mean indexed diameter of annulus 27.9 ± 5.1 mm/m², sinus 37.1 ± 5.6 mm/m² and sinotubular junction 31.1 ± 6.5 mm/m² at 2 years; p<0,0001).

Conclusions:
Infants with ToF undergoing repair around 6 months of age show no histological features of important intrinsic aortic degradation at the time of repair. Prospective echocardiographic follow-up demonstrates progressive and significant reduction in indexed aortic root diameters. These findings support a hemodynamic mechanism underlying late aortic root dilatation and favor a strategy of early surgical repair to prevent ongoing aortic dilatation.