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Long-term Evaluation Of Anti-calcification Histology Of Bovine Pericardial Membrane With Non-aldehyde L-hydro Treatment.

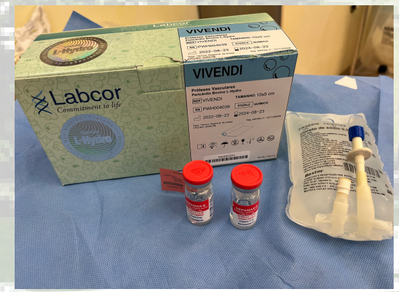
Background: Bovine pericardium is the main patch used in congenital pediatric heart surgery, but in reoperations, intense calcification is observed. Ideal material would be malleable, stable after implantation, resistant to calcification and non-sensitizing. None of the glutaraldehyde-fixed available have all of these characteristics. We evaluated the calcification of L-HYDRO Bovine pericardium collected from two reoperations of a cohort using this material.

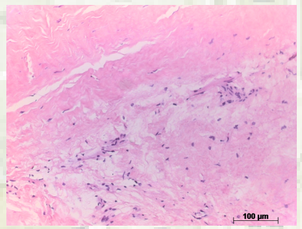
Methods: Retrospective review of all patients undergoing surgical correction of congenital heart defect using an L-HYDRO patch and histological evaluation of fragments removed from reoperations.

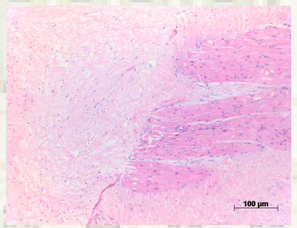
Results: Between 2011 and 2023, 276 surgeries were performed using the L-HYDRO and only two patients underwent reoperations. One had CAVC correction in 11/2013 and other PAVSD in 10/2017. Reoperations were 9,5 years later due to subaortic membrane and moderate left AV valve insufficiency and 7 years later for severe left AV valve regurg. Fragments of the L-HYDRO were removed during opening of the interatrial septum and sent to two different pathological anatomy laboratories. Histological reports showed hypocellular connective tissue with rare mononuclear inflammatory cells around vessels with delicate walls, with no calcification or relevant inflammation in the sample. The histological aspect was compatible with pericardial tissue within normal limits.

Aspect of the L-HYDRO graft after 9 years of implantation

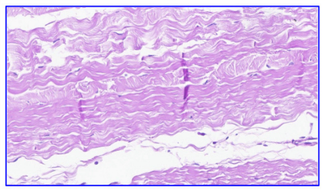
L-HYDRO graft needs to be immersed in heparin solution for 15 minutes before implantation

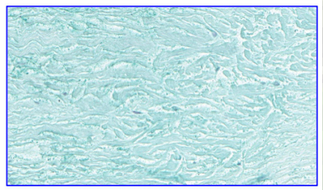




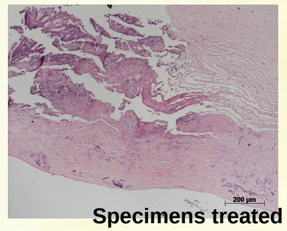


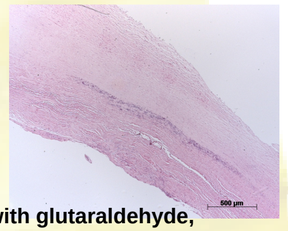
Specimens treated with L-HYDRO, and removed 7 years after implant, demonstrating no calcification (patient 2)



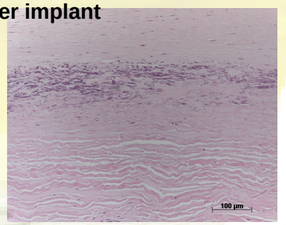


Specimens treated with L-HYDRO, and removed 10 years after implant, demonstrating no calcification (patient 1)



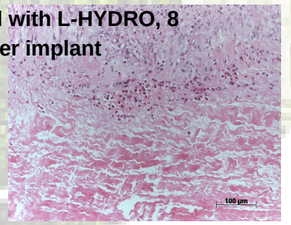


Specimens treated with glutaraldehyde, 10 years after implant



Photomicrography of one sample showing a central band of calcified collagen fibers (purple lines). In the superior part there is a dense connective tissue with mature fibroblasts and in the inferior part of the image one can see collagen fibers with absent or very scarce cells.

Specimens treated with L-HYDRO, 8 months after implant



Photomicrography of one sample showing a dense inflammatory infiltrate that surrounds an area of acellular connective tissue with eosinophilic collagen fibers. At the periphery of the acellular connective tissue there are several giant-cells of the Langerhans type. The infiltrate is rich in polimorphonuclear eosinophils and has also histiocytes and lymphocytes.

Conclusion: Non-aldehyde L-HYDRO treatment pericardial membranes had excellent histological characteristics after 9,5 and 7 years of implantation. Unlike all other existing materials, the L-HYDRO did not show calcification in histology and may bring a strong anti-calcification characteristics to this xenograft.