Characterization of Beta-Adrenergic Receptors in Human Aortic Abdominal Aneurysm Tissue and Human Aortic Smooth Muscle Cells

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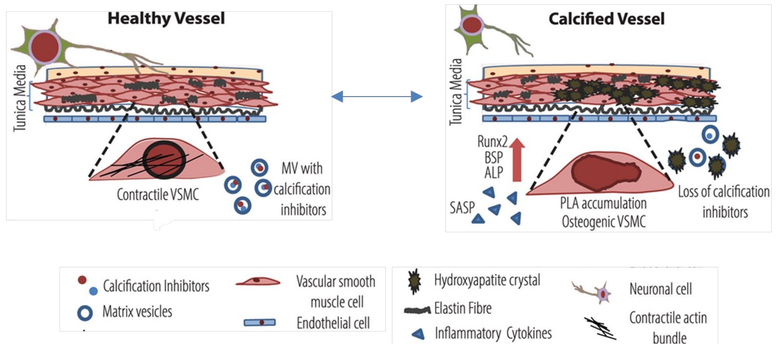
Introduction

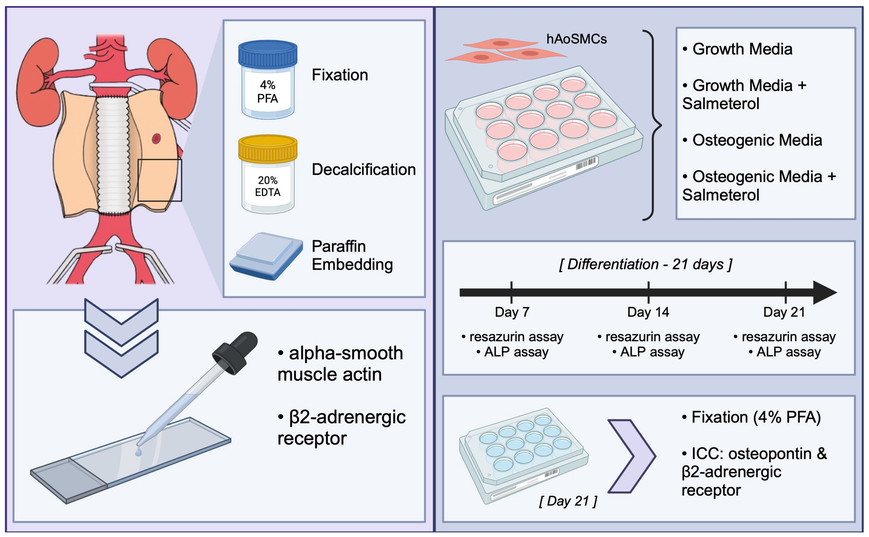
- Aortic calcification is a significant pathological process that resembles bone formation.
- During calcification, aortic smooth muscle cells switch from a contractile phenotype to an osteo-chondrogenic (bone-like) phenotype. [1]
- The sympathetic nervous system influences bone remodeling via β2-adrenergic receptors (β_2-ARs), which play a critical role in regulating valve calcification. [2]
- However, the impact of β2-adrenergic signaling on vascular calcification remains relatively unexplored.



Goal: Characterize the effect of β2-adrenergic signaling on receptor expression and smooth muscle phenotype in human aortic tissue.

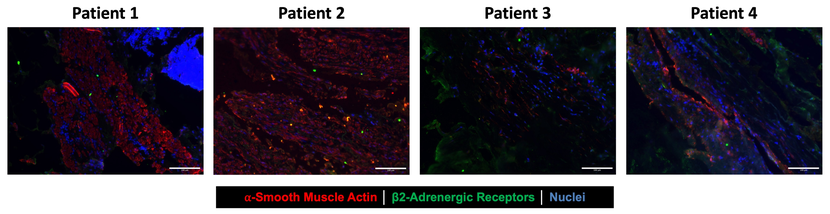
Hypothesis: β2-adrenergic receptor agonists will promote contractile smooth muscle cell phenotype and function.

Methods

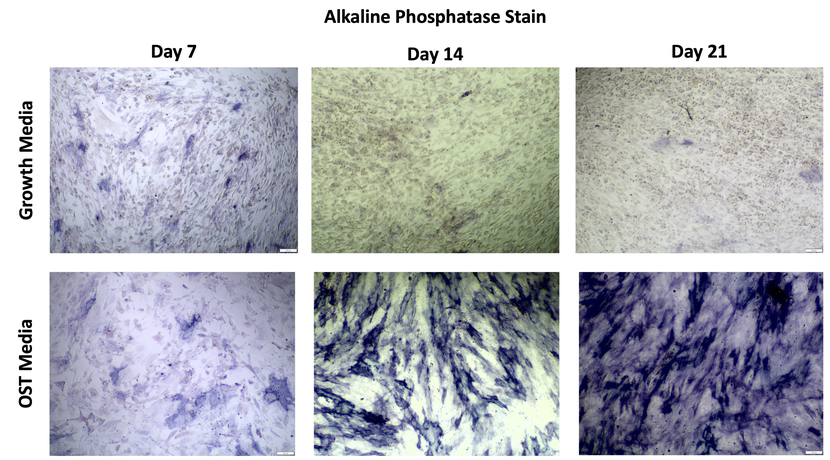


Results

Samples of abdominal aortic wall segments show differential expression of β2-adrenergic receptors between patients with abdominal aortic aneurysms.

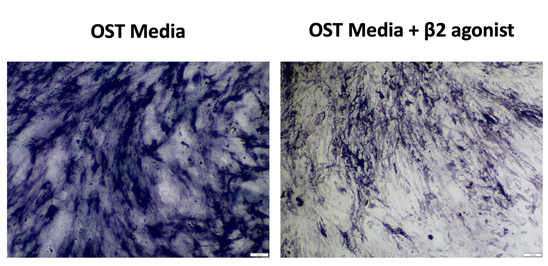


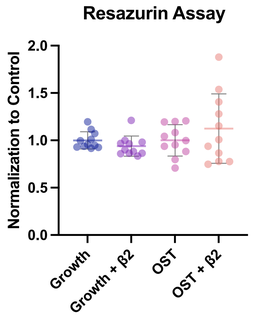
Culturing human aortic smooth muscle cells (hAoSMCs) in osteogenic (OST) media for 21 days successfully induced an osteogenic phenotype as evidenced by increased alkaline phosphatase (ALP) activity over time.

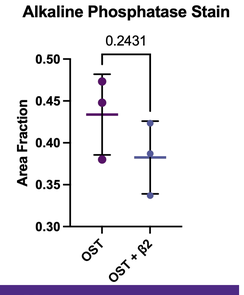


Delivery of β2 agonist salmeterol to human aortic smooth muscle cells cultured in both growth media and osteogenic media showed no significant difference in metabolic activities after 21 days.

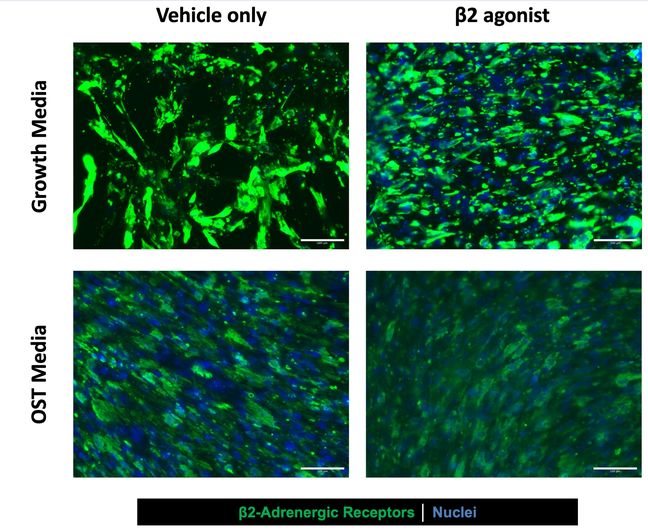
Osteogenic cells treated with salmeterol demonstrate less alkaline phosphatase activity at day 21.



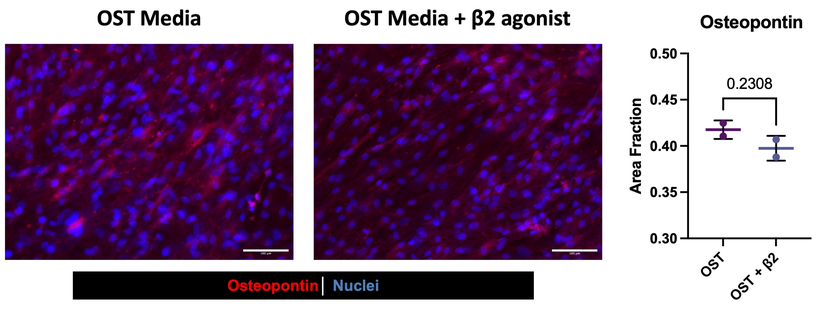




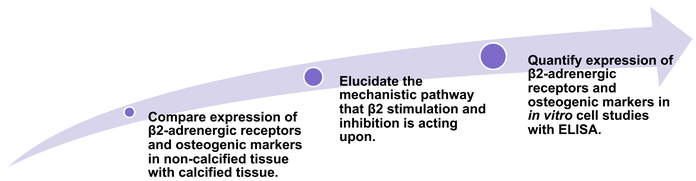
Osteogenic differentiation of human aortic smooth muscle cells downregulates β2-adrenergic receptor expression. Stimulation of osteogenic smooth muscle cells with a β2 agonist, salmeterol, further downregulates receptor expression.



Osteopontin expression decreased in osteogenic human aortic smooth muscle cells treated with salmeterol.



Future Directions



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