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Vascular graft storage solution preserves endothelial function

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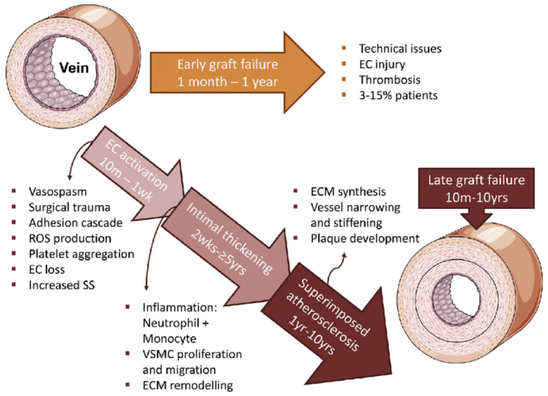
Objective

Early graft failure primarily occurs due to ineffective storage or surgical stress during surgery causing significant damage to the endothelium, which ultimately results in impaired vasoactive response and risk for thrombosis. Aims: to assess the effect of DuraGraft©, a novel intraoperative graft treatment solution, on human saphenous vein segments, rat aortic segments and human umbilical vein endothelial cells (HUVECs) in comparison to saline.

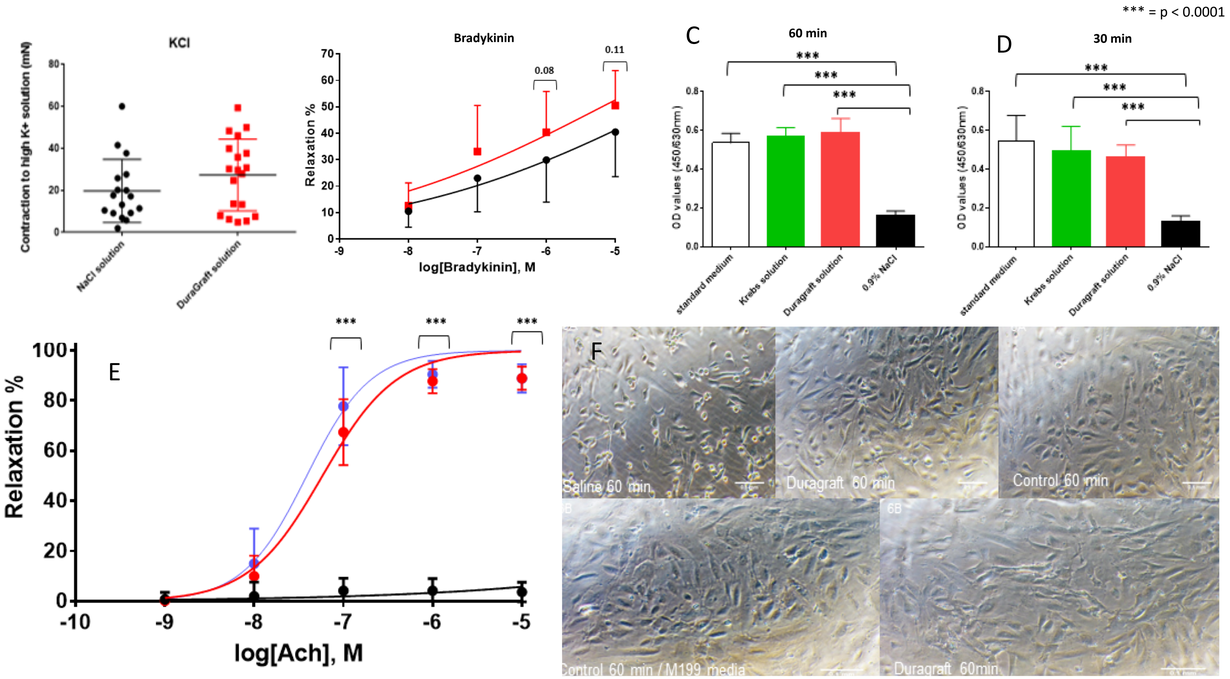


Patients and Methods

Within **12 patients** undergoing aortocoronary bypass surgery, saphenous vein graft segments were randomized to DuraGraft© (n=12) or saline (n=12) solution before intraoperative storage. Vascular reactivity on these segments were **assessed by wire myograph**. In addition, to further evaluate the vascular protective effects of DuraGraft©, **rat aorta** segments were used to compare vascular function between DuraGraft©, and Krebs-Henseleit solution (KHS), a physiologic organ buffer solution. Additionally, human umbilical vein endothelial cells **(HUVECs) were used for cell viability tests.** Viability was measured after 30min and 60min in solution of saline and DuraGraft©.

Results

Induced contraction increases in the DuraGraft© treated veins (24.73±16.22 vs. 15.59±9.53 N/m2, P=0.066). In addition, segments stored in DuraGraft© preserved endothelium-dependent vasorelaxation in response to cumulative dosage of bradykinin compared to saline treated segments. Rat aorta segments (n=6) stored in saline showed significantly impaired vasoconstriction ($p<0.0001$) and vasorelaxation compared to KHS (n=6) and DuraGraft© (n=12) ($p<0.0001$, respectively). Saline treatments at 30 and 60 minutes markedly reduced cell viability ($p<0.0001$ vs control cell culture media). In contrast, cell viability was similar between control media and DuraGraft© group after 30 and 60 minutes, suggesting the cytoprotective effects of DuraGraft©.



Figures: Contraction to KCL **(A)** and relaxation **(B)** to Bradykinin trends towards to improve in human saphenous vein segments (from patients undergoing to elective CABG) were preserved in DuraGraft©. DuraGraft© n=12; Black: NaCl n= 12 segments. Vascular function was assessed by DMT Wire Myography. **(C&D)** Cell viability standard medium (white), NaCl (black), DuraGraft® (red) and Krebs solution (blue) on HUVEC cells viability after 30 min (D) and 1 h incubation (C) with the respective conditions. **(E)** Endothelial-dependent vasorelaxation in rat aorta segments were kept in saline (black), Krebs solution (blue) and DuraGraft© (red). **(F)** Representative images (40x magnification) of HUVEC cells were treated with cell culture media, saline or DuraGraft©. Data are mean ±SD, n=6-12 replicates/conditions , $p<0.001$.

Conclusion

Conclusion: DuraGraft© demonstrated a **favorable effect on graft relaxation and contraction** indicating preservation of vascular endothelial function when compared to saline. Saline is clearly not only inferior to a specialized solution but may show additional direct harmful effects on human vascular endothelium and its functions.