EXPRESSED BLOOD AS AN EFFECTIVE PERFUSATE IN HIGH-FIDELITY CADAVERIC OPERATIVE SIMULATION

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INTRODUCTION

- Cadaveric models are the gold standard in surgical simulation.
- Various methods have been used to enhance true tissue “feel” in cadaveric models.
- Recently, cadaver reperfusion has augmented surgical simulation; however, the use of crystalloid-based perfusates can unintentionally cause edema and distort tissue planes, affecting the true tissue feel.
- We aim to improve surgical simulation using the first cadaveric model reperfused with expired blood products, to improve tissue fidelity.

METHODS

- Retrograde cannulation of the right carotid artery and occlusion of the left carotid artery and bilateral femoral arteries for selective perfusion.
- Expired packed red blood cells (pRBCs) and fresh frozen plasma (FFP) were infused using a titratable flow rate pump.
- Eight surgical residents and two attending physicians were then given a survey:
  - To rate their experience working with the cadaver tissue in comparison to live tissue
  - For residents, to rate their confidence level in performing various procedures after these simulation sessions.

RESULTS

Procedures done:
- Tube thoracostomy
- Foley placement
- Thoracotomy
- Open splenectomy
- Ligamentous knee dissection
- Superficial temporal artery to middle cerebral artery bypass
- Gracilis flap
- Robotic bilateral adrenalectomy

- Eight procedures were performed on four cadavers
- Reperfused cadaveric tissue was rated as highly realistic in terms of (see Figure):
  - Appearance (mean score 9.1/10)
  - Elasticity (9/10)
  - Turgor (8.4/10)
  - Tissue edema (7.2/10)
- All residents noted increased confidence in performing these procedures after participating in these simulations.
- All survey participants endorsed applicability to real-world scenarios.

DISCUSSION

- We demonstrate that using expired blood products to reperfuse cadavers offers a higher-fidelity simulation and is also safe and feasible.
- This modality can be applied to various fields in surgery, including trauma, vascular, minimally invasive, neurosurgery, and orthopedic surgery.
- These findings support incorporating cadaveric simulation in surgical training, using a perfusate that does not compromise tissue authenticity.
- Future studies can expand this cadaveric simulation to other operations and even help simulate surgical complications.