

Background

- Reconstruction of complex defects often requires autologous transfer of vascularized tissues. In the United States alone ~ 62,000 flaps are performed every year¹
- **Current Limitations**
 - ~ 5% flap failure rate¹
 - Patient morbidity, increased costs, longer stay
 - Microsurgical repair of vascular pedicle²⁻³
 - Challenging for vessel-depleted patients (multi-operated and irradiated patients, multiple comorbidities (DM, PVD, Renal Failure, Prior Rx)
 - **Study Aim**
 - 24hrs EVNP of fasciocutaneous flaps
 - **Hypothesis**
 - EVNP can maintain fasciocutaneous free flaps in near physiologic conditions for 24 hours without edema or weight gain

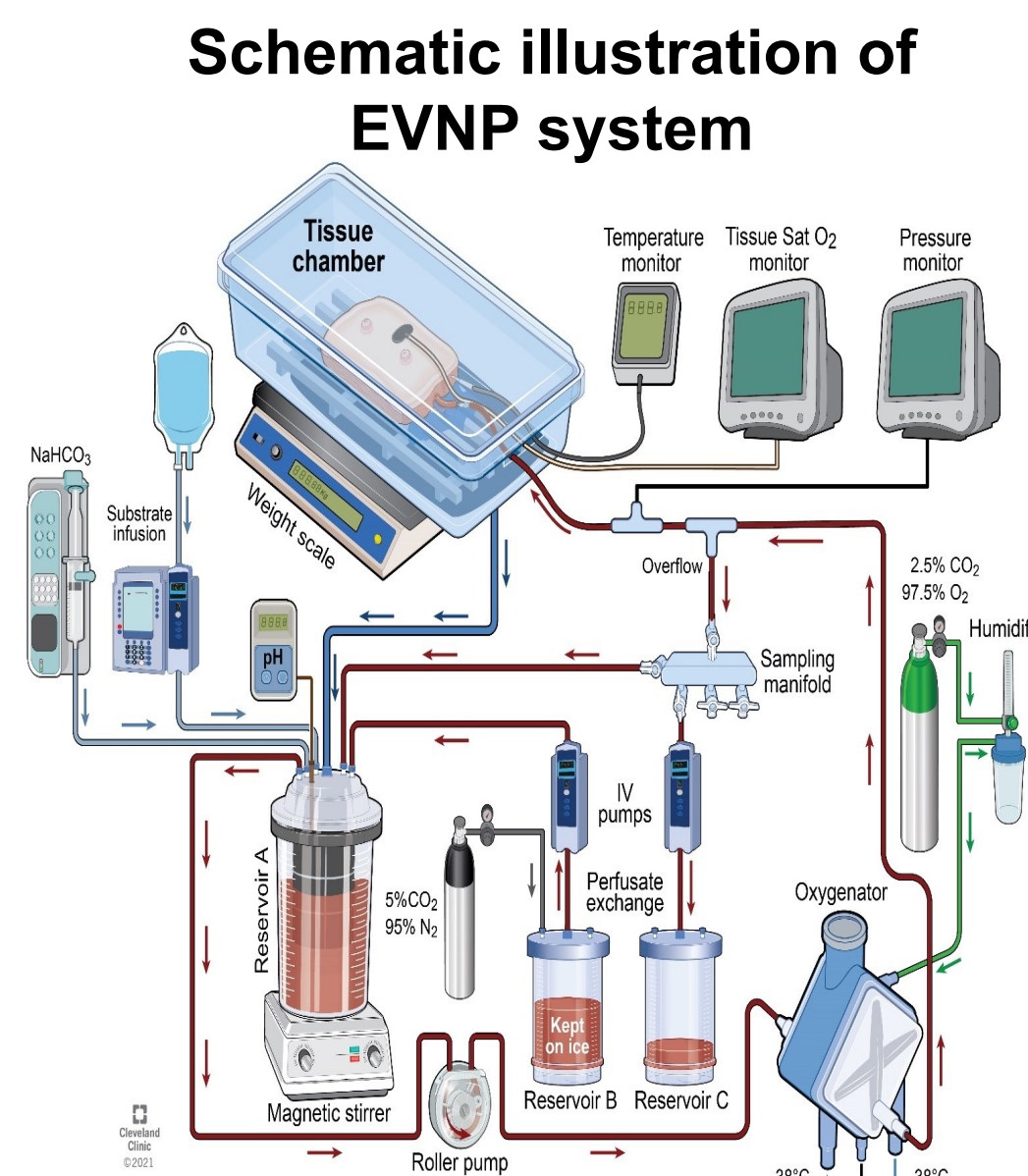
Methods

Study Design

- Twenty superior epigastric artery perforator flaps were procured from ten Yorkshire pigs
- Experimental flaps underwent EVNP for 12h (n=5) and 24h (n=5) and were perfused with an oxygenated colloid solution containing a hemoglobin-based oxygen carrier (HBOC-201)
- Control flaps were preserved at 4°C for 12h (n=5) and 24h (n=5)
- Indocyanine green angiography (ICG), thermography, and skin biopsies were completed

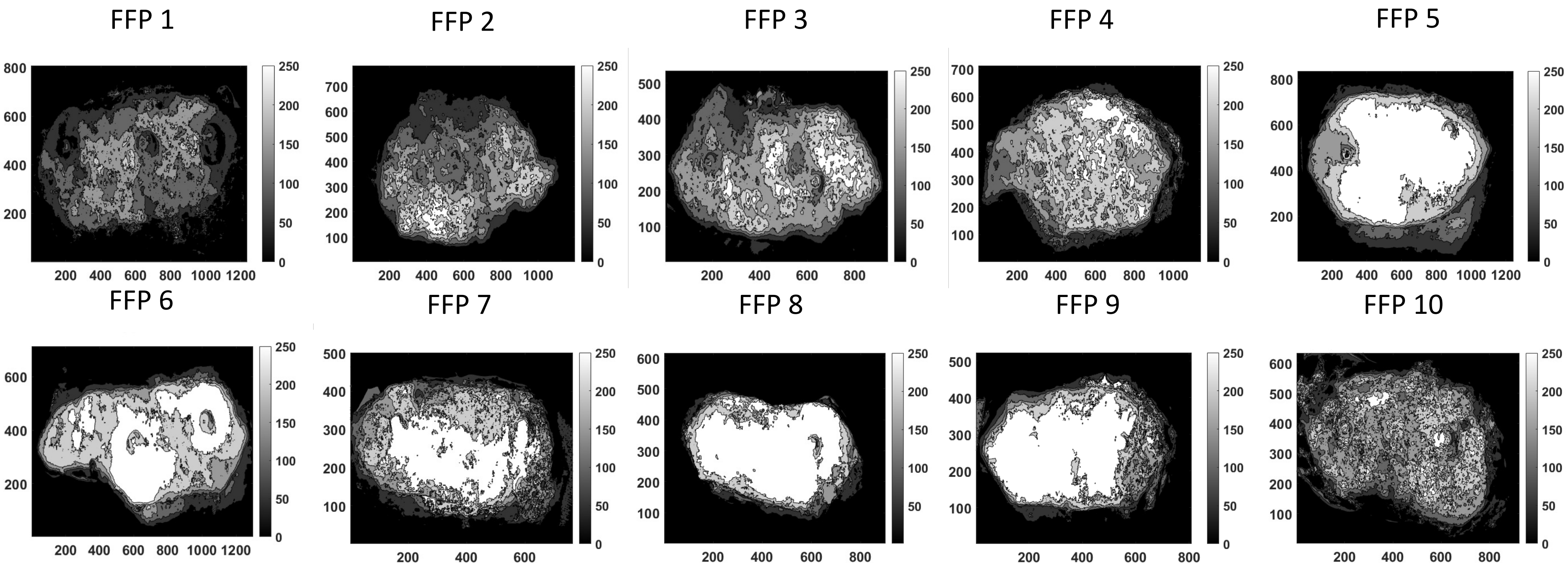
Outcomes Measured

- Flap Weight
- Metabolites
- Perfusate Dynamics
- Electrolytes
- Temperature
- Gases

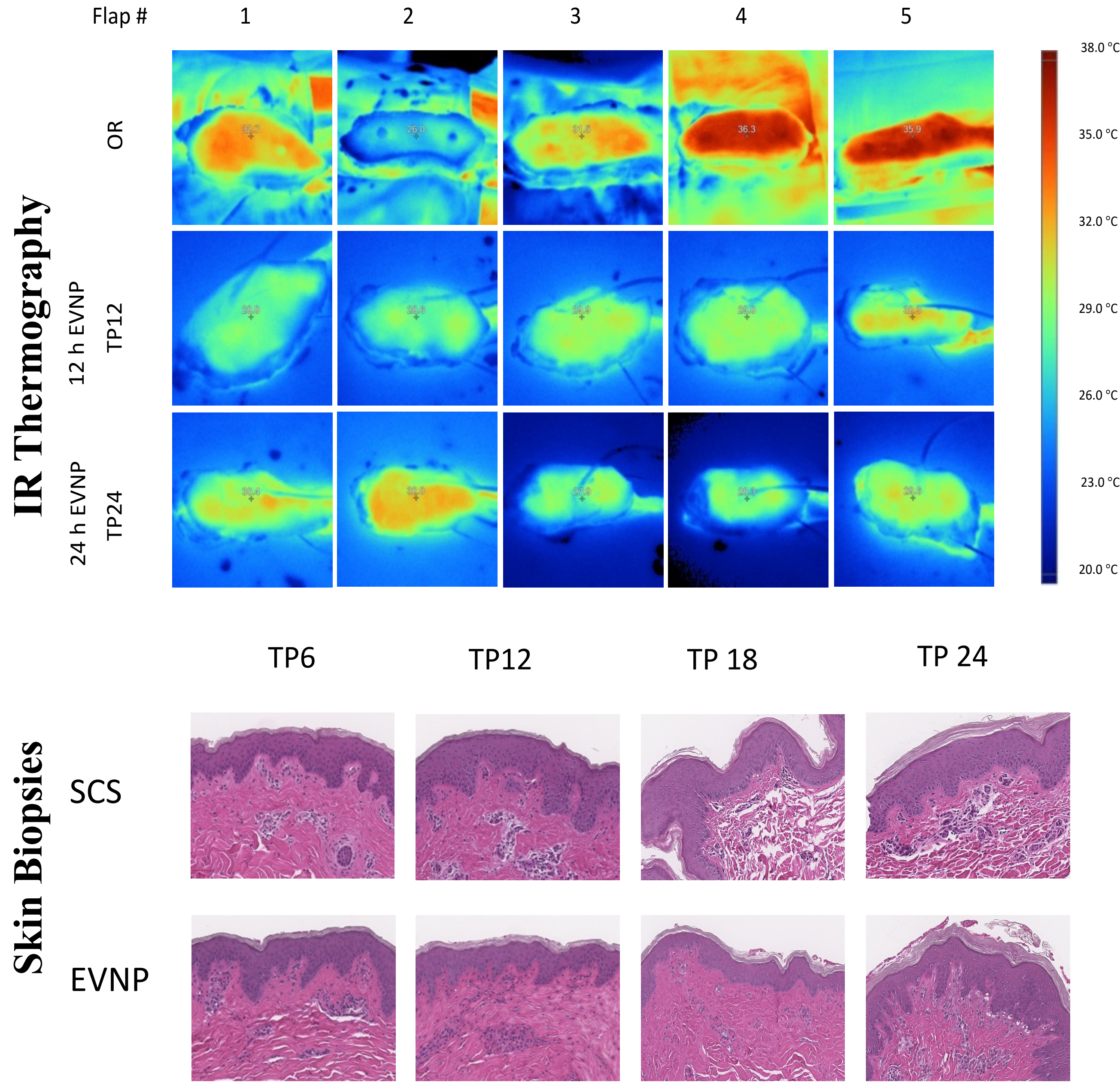
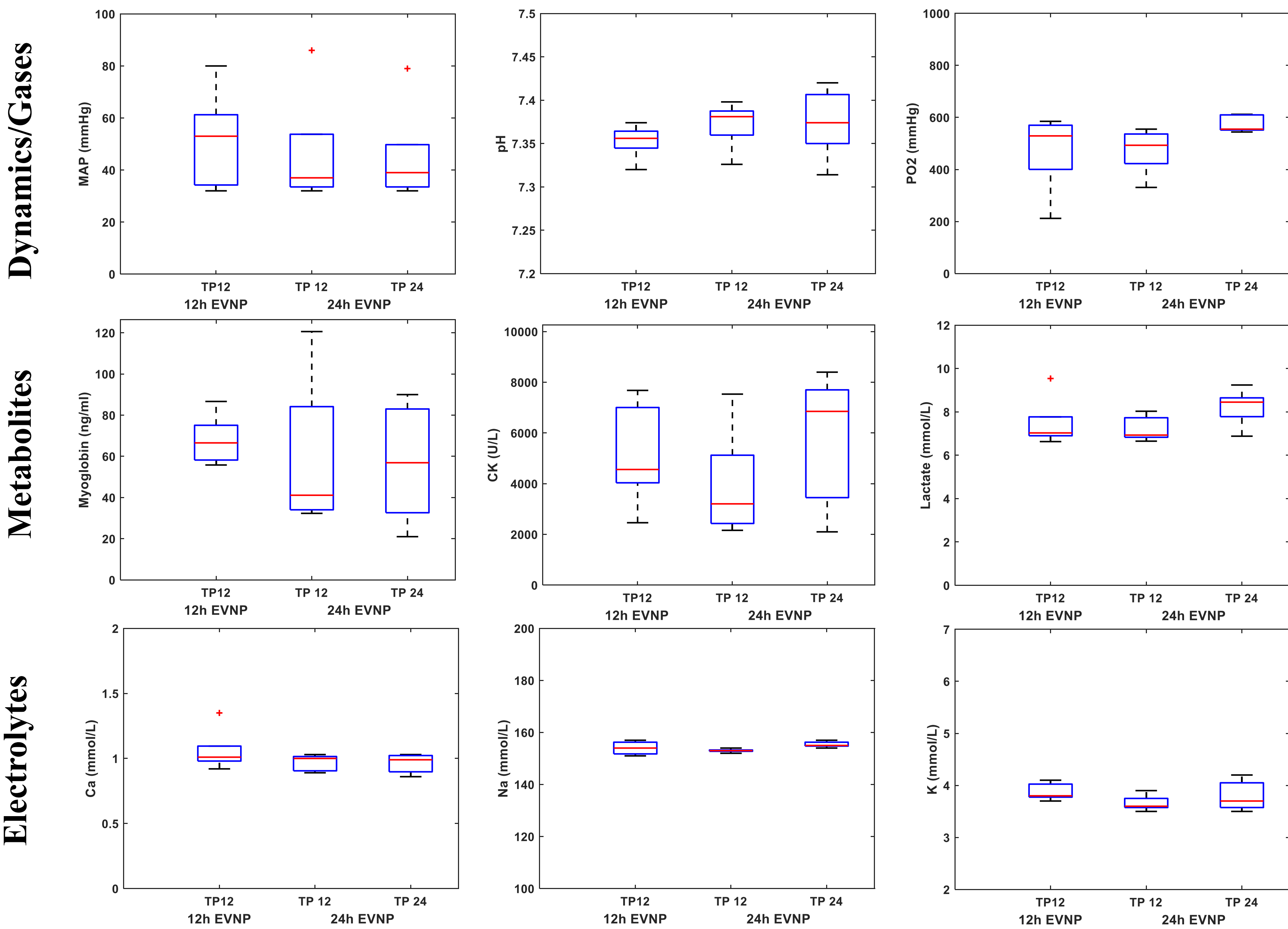


- There were no significant differences between the 12h EVNP and 24 EVNP groups at perfusion end for these parameters: MAP (p=0.63), pH (p=0.77), pO2 (p=0.20), myoglobin (p=0.95), CK (p=0.89), lactate (p=0.28), Ca⁺ (p=0.29), Na⁺ (p=0.31), K⁺ (p=0.61)
- There was no significant difference in % weight change between 12 EVNP (1.2%) and 24 EVNP (2.3%) (p=0.37) Flap weight did not change significantly from beginning to end of perfusion in either group (12h EVNP TP0 214±39 g vs. TP12 217±47 g, p=0.50; 24h EVNP TP0 175±53 g vs. TP24 193±60 g, p=0.31)
- H&E staining showed no histopathological changes during EVNP. SCS TP18 showed an increase in vacuolization of epidermal cells, which is a sign of early necrosis
- ICG/IR thermography revealed perfused VCAs with regional differences. There was no difference between the groups' average ICG intensity values (p=0.08)

ICG Perfusion



Results



Conclusion

- Ex vivo normothermic perfusion preserved flaps in physiologic conditions for 24 hours
- Physiologic parameters were maintained without edema or weight gain

References

1. Kwok, A.C. and J.P. Agarwal, An analysis of free flap failure using the ACS NSQIP database. Does flap site and flap type matter? Microsurgery, 2017. 37(6): p. 531-538.
2. Ishimaru, M., et al., Risk Factors for Free Flap Failure in 2,846 Patients With Head and Neck Cancer: A National Database Study in Japan. J Oral Maxillofac Surg, 2016. 74(6): p. 1265-70.
3. Offodile, A.C., 2nd, et al., Impact of increasing operative time on the incidence of early failure and complications following free tissue transfer? A risk factor analysis of 2,008 patients from the ACS-NSQIP database. Microsurgery, 2017. 37(1): p. 12-20.