Skin oxygenation, biomarkers of endothelial injury and their association with severity of illness in patients with septic shock

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Introduction:
In septic shock endothelial damage can lead to failure of microcirculation and low microcirculatory oxygen saturation. In the skin this is seen as mottling and can be quantified using hyper spectral imaging. There is insufficient data about associations between skin oxygenation, severity of illness, biomarkers of endothelial damage and mortality in patients with septic shock.

Methods:
This single centre observational study was performed in 24 consecutive intensive care patients with septic shock. Within 24 hours of admission hyper spectral imaging of knee area skin was performed and blood was sampled for assay of biomarkers of endothelial cell damage (plasminogen activator inhibitor -1 (PAI-1), soluble intercellular adhesion molecule (sICAM-1), soluble vascular cell adhesion molecule (sVCAM-1), thrombomodulin, angiopoietin-2). Nonlinear fitting of optical density spectra was used to calculate relative skin oxy/deoxy hemoglobin concentration and obtain oxygen saturation. The association between skin oxygen saturation, biomarkers, sepsis severity (APACHE II, SOFA) and 28-day mortality was analyzed.

Results:
The median (IQR) age of patients was 71 years (62 to 76), and 60% were males. The median SOFA and APACHE II scores were 9 (7 to 12) and 24 (19 to 27) and 28-day mortality rate was 29%. 7 patients (37%) had mottling. There was a relationship between skin oxygenation, plasma biomarkers (thrombomodulin and sVCAM-1) and sepsis severity assessed by SOFA and APACHE II scores, P < 0.05. Using logistic regression analysis, skin oxygenation and biomarker concentrations were not associated with 28-day mortality rate.

Conclusion:
In our cohort of patients with septic shock, skin oxygenation and biomarkers of endothelial injury were strongly associated with initial severity of sepsis but poorly predictive of 28-day mortality.