Monitoring of microsurgical flaps with the INVOS™ system

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Introduction

Early detection of circulatory compromise threatening free flap viability is essential for offering surgical intervention and offering better outcome in flap salvage. Usually clinical examination is the method for postoperative monitoring of free flaps but sometimes it is not quite accurate. The **INVOS™ system** is a non-invasive optical method that utilizes near-infrared spectroscopy for measuring regional tissue saturation of O₂ (STisO₂). This device is most frequently used in cerebral oxygenation monitoring. The objective of the study is to determine if this system **could be useful to detect early problems** in the microvascular anastomosis.

Material and methods

This a **prospective observational study** of patients who underwent a free flap procedure conducted from April to October of 2017. At the end of surgery the probe was placed to the skin of the flap, where vascular anastomosis was performed. **StisO₂** was monitored and recorded during 24 hours postoperatively. The baseline

value was registered and further values every 4 hours. A decline of 50% from the baseline value (50%-BV) was determined as an alarm limit. The U of Mann Whitney was used for comparing quantitative variables and the Chi-square for categorical variables. A p value ≤0.05 was considered significant.

Results and discussion

Forty-eight patients were included, 35 female (73%) and 13 male (27%), age 52 (25-77); 32 (67%) from breast surgeries, 2 (4%) from head and neck and 14 (29%) from extremities. The medium stay in the Postoperative Unit was 26 hours (24-72). **Fourteen flaps (29%) required surgical intervention (SI), with 32 (87%) flap survival.** The SI was in 6 cases for venous thrombosis, 3 cases were arterial compromise, 1 hematoma and 4 infections. Twelve patients without 50%-BV required SI and 2 with 50%-BV required SI (p=0.079). The median rate of hospitalization days was 15.81 days (5-93) and the patient survival was 98% (47 patients).

	SI (n=14)	Not SI (n=34)	p
STisO ₂ -baseline	57 (31-77.5)	73.5 (64-84.7)	0.02
STisO ₂ -4h	38.5 (28.5-74)	72 (60.5-85)	0.01
STisO ₂ -8h	57 (38-80)	70 (57-83)	0.07
STisO ₂ -12h	44 (34-79)	71 (57-83)	0.11

Conclusions

Lower values of **STisO₂** are associated to a higher incidence of SI of free microsurgical flaps. A 50%-BV is not an adequate cut-off value for determining SI as it offers a low sensitivity and high specificity. Whether a lower cut-off value may increase sensitivity should be further studied.

References

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