

Background

The assessment of the optimal transection point in the proximal colon is decided by clinical judgement in the vast majority of colorectal resections. Recently, the development of fluorescence angiography (FA) has allowed an objective assessment of perfusion using near infrared cameras. However, this assessment lacks quantitative values. Furthermore, there is no correlation of fluorescence intensity with physiological markers of tissue oxygenation and other surrogate markers of tissue ischaemia.

Multispectral imaging (MSI) is an alternative imaging modality that can quantify tissue oxygen saturation by measuring visible light absorption by oxy and deoxyhaemoglobin at specific wavelengths.

The aim of the present study is to find the correlation of fluorescence intensity in the colon and tissue oxygen saturation obtained through MSI.

Methods

Patients submitted to colonic resection as part of their care were recruited. FA is used routinely. The whole duration of fluorescence angiography was recorded, and two sequences of multispectral imaging obtained for each case. The two cameras were calibrated and representative frames corresponding to the maximum perfusion intensity were extracted from FA recording. Likewise, representative frames were extracted from the MSI recording.

Using the camera calibration and binary mask of the colon, corresponding regions of interest were obtained along the longitudinal axis of the colon to compare fluorescence intensity and tissue oxygen saturation. Pixel values were sampled from the regions of interest and averaged. The Spearman's correlation coefficient was calculated and a p-value under 0.05 was considered statistically significant.

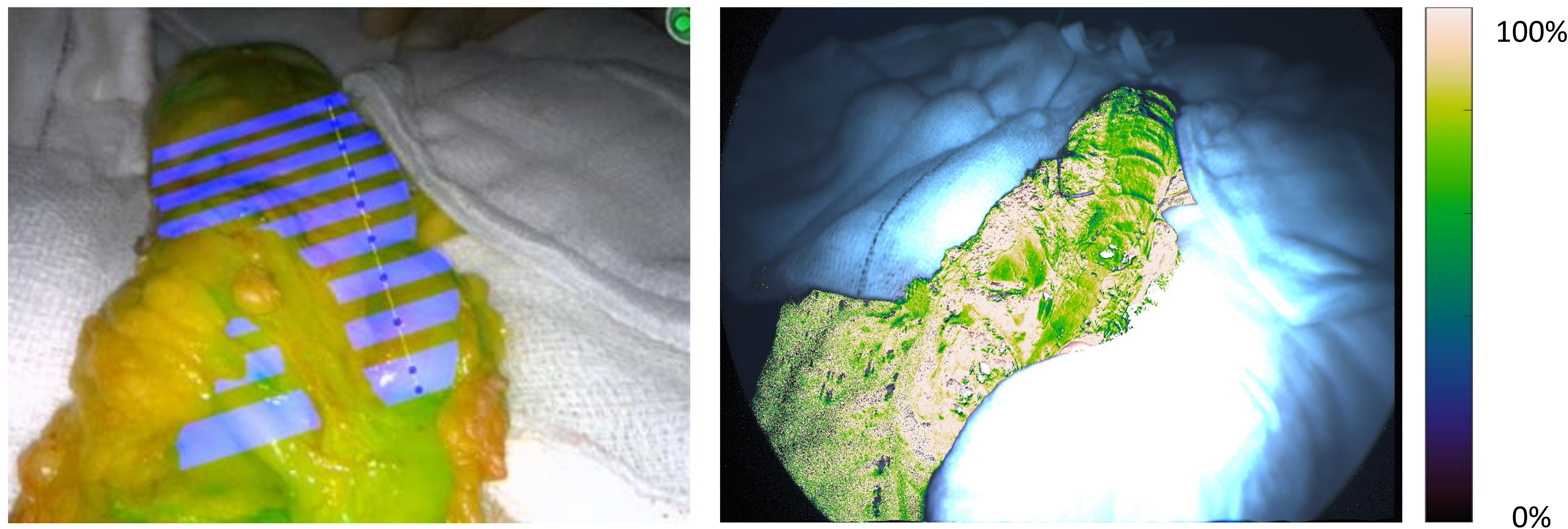


Figure 1: Left - Selection strategy for regions of interest selection (blue shade) in near infrared image overlay
Right - multispectral image with corresponding tissue oxygen saturation (sidebar).

Results

Intraoperative data was recorded from 8 patients. Figure 1 shows an example of the pixel sampling strategy in the selected regions of interest. The global correlation coefficient is 0.7869 (p value < 0.01). Figure 2 shows the correlation of tissue oxygen saturation and pixel intensity.

The exponential mathematical model shown explains 59% of the variability in the data obtained.

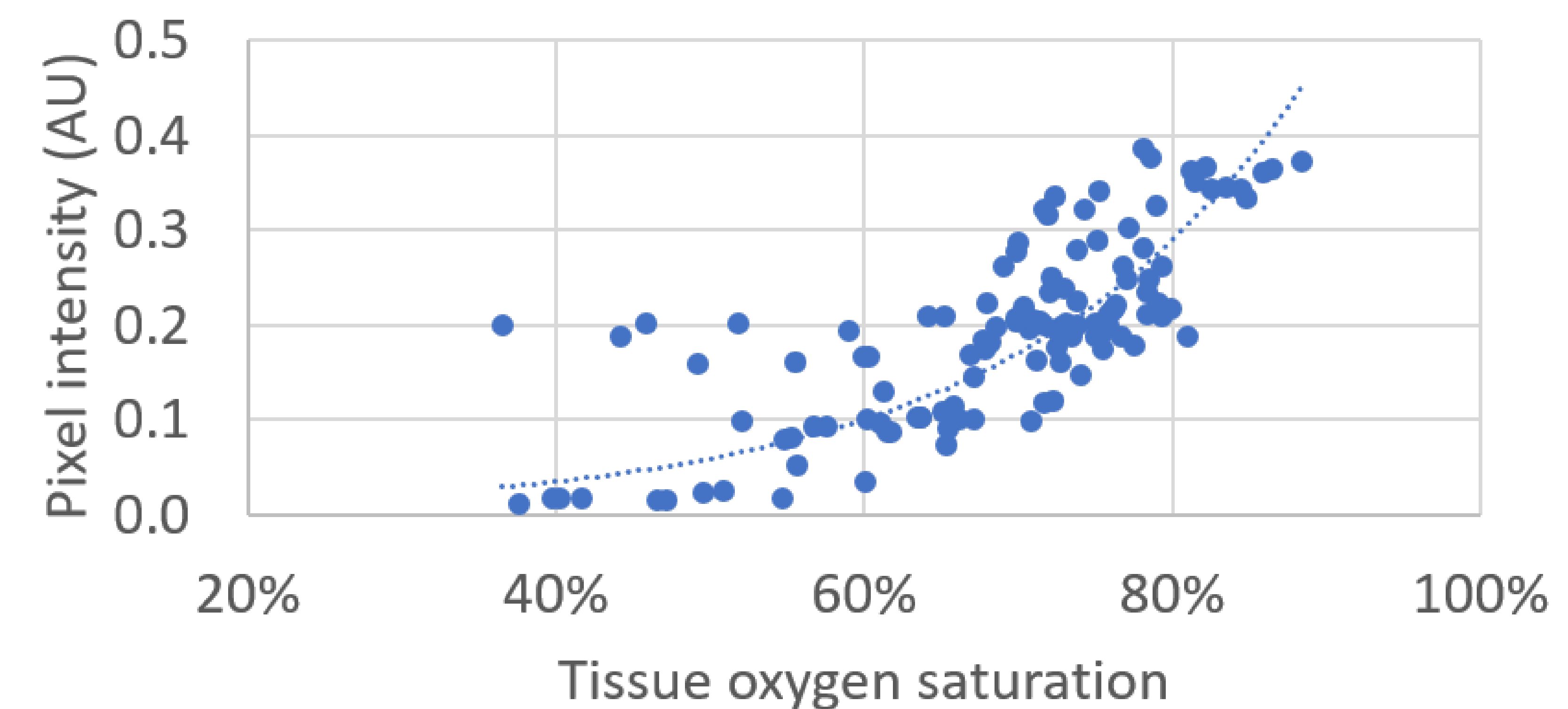


Figure 2 - Correlation of tissue oxygen saturation and pixel intensity in the colon.

Conclusion

Pixel intensity during perfusion assessment of proximal colon with indocyanine green is positively correlated with tissue oxygen saturation. This finding should be addressed in further controlled studies to optimise the technique of fluorescence angiography.