BRITISH ASSOCIATION OF PAEDIATRIC ENDOSCOPIC SURGEONS

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TITLE (capitals)

ILLUMINATION UNIFORMITY IN ENDOSCOPIC IMAGING

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AIMS

To develop a simple method to assess the illumination uniformity of the endoscopic field

METHODS

Standardised endoscopic digital images were taken and analysed using an image analysis software (National Instruments Vision Assistant version 7.1.1). The luminance plane was extracted and the pixel intensity distribution was determined along a horizontal line at the position of highest average intensity (centroid). The data was exported to MS Excel and the pixel intensity (y-axis) was plotted against pixel position (x-axis). A trendline using a 2nd order polynomial curve was fitted to each data set. The resultant equation for each curve was compared with equations obtained from other images taken under various illumination conditions and settings.

RESULTS

All data sets have excellent fit to curves in the form of $y = ax^2 + bx + c$ ($R^2 > 0.94$). The second order derivative $d^2y/dx^2 = 2a$ represented the convexity of the curve, i.e. the change in illumination intensity from the periphery to the centre.
Using a 10mm 0° endoscope, the convexity of the curve did not change significantly (-0.048 to -0.052) at usual range of illumination output (17-83%), scope-target distance (field diameter ≥4cm) or tilt of scope (±30°). However, the shape of the curve flattens when the zooming function was used from endoscopic field of 8cm (2a = -0.052) to 4cm (2a=-0.016). This method was not useful when non-concentric illumination sources were used as seen with 10mm 30° endoscope.

CONCLUSION

The described method can be used to compare the relative uniformity of illumination provided by different endoscopic light sources. This will help the development of illumination systems which address the problem of spatial variation in illumination of current endoscopic systems.

Abstracts should be divided into 4 headings: AIMS, METHODS, RESULTS, CONCLUSIONS. DO NOT TYPE OUTSIDE THE FRAME.

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