Audit

Minimally invasive surgery: only as good as the picture

Nigel E Drury, Rebecca Pollard, Jonathan P Dyer

Department of Urology, Royal Hampshire County Hospital, Winchester, UK

Background: In minimally invasive surgery, there is increased reliance on real-time 2-dimensional images. The fibre-optic light lead is one of the most frequently damaged elements of the 'imaging chain', leading to a poor quality picture.

Methods: Light leads with a honeycomb projection were connected to a light source and the resulting beam directed at a sheet of paper. Darkened sectors with diminished or absent light transmission were recorded.

Results: All suitable light leads in routine use were examined. A mean of 22.2% (SD 7.8%) of the projection had diminished or absent light transmission.

Conclusion: Sub-optimal endoscopic equipment was in routine use.

Key words: Light leads – Damage – Honeycomb projection – Laparoscopy

Continuous biofeedback is essential for operative success. In minimally invasive surgery, the reliance on real-time 2-dimensional images is increased as tactile and other senses are limited.¹ The 'imaging chain' comprises the equipment conducting the image from the operative field to the surgeon; this includes the telescope, light source, light cable, camera head, video signal box, video cable and monitor.² Picture quality depends on the working order of each component and 'the chain is only as strong as its weakest link'.

The fibre-optic light lead is one of the most frequently damaged elements of the imaging chain in the operating room and during sterilisation. With cumulative trauma, individual light-conducting fibres in the optic bundle are irreversibly broken, leading to refractory darkening of the picture. This audit study was undertaken to assess the working quality of endoscopic light leads currently used in our hospital.

Methods

All light leads in routine use at the Royal Hampshire County Hospital were examined during an audit afternoon. They were divided into two groups of roughly equal proportions – those with a single beam of light and those producing a honeycomb projection (Olympus); the latter leads formed the study group. Each was connected in turn to an endoscopic light source (Olympus CLV-U20), fixed in a vice and directed at a sheet of paper positioned 30 cm from the lead. Any darkened sectors were marked on the paper and analysed to determine the area of diminished (grey) or absent (black) light transmission as a percentage of the total projection.

Results

Eight light leads were examined from the departments of urology and general surgery (3), orthopaedics (2), and

gynaecology (2) and from the day surgery unit (1). The mean area of diminished light was 8.6% (SD 10.1%) and absent transmission 13.6% (SD 8.0%). Overall, an average of 22.2% (SD 7.8%) of the projection was affected, with little difference between departments.

Discussion

The condition and working-order of theatre equipment is of paramount importance – a scalpel would not be tolerated if it was blunt. Increasing dependence on advanced technology requires an understanding of basic principles and a working knowledge for troubleshooting – just ‘turning up the gain’ or the brightness will not improve a dull picture if the lead has been repeatedly trampled. Poor image quality directly contributes to the risk of complications associated with laparoscopic instrument use.³ Such equipment failure represents an avoidable and, therefore, unacceptable risk to the patient.

Conclusions

Sub-optimal endoscopic equipment was in routine use prior to this study. These outcomes have been brought to

the attention of theatre management, to implement further quality-control checks and allow the audit cycle to be completed.

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