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SHARING EXPERTISE

Einstein*Vision*® 3D
Camera System

SCOPE FOGGING AND IMPAIRED VISION IMPLICATIONS FOR MINIMALLY INVASIVE SURGERY

COMPROMISED VISUALISATION IN ENDOSCOPIC SURGERY

THE ISSUE OF IMPAIRED VISION

Impaired vision is one of the longest standing challenges associated with Minimally Invasive Surgery, and is experienced across all surgical specialties.[1, 3, 5, 6, 8, 9, 12]

The issue has been likened to driving with a dirty windscreen and having to step out of the car to clean it before continuing the journey.[6]

Lens fogging and impaired vision are major impediments to a clear visual field during endoscopic surgery and are mainly caused by condensation of the distal part of the endoscope, but the causes can be multi-factorial.[1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12]

The aetiology of lens fogging is related to condensation occurring when the temperature of the endoscope is at or below the dew point temperature of the anatomical cavity, much like when wearers of spectacles enter a warm room directly from a very cold environment.[1, 4, 5, 8, 9. 10, 12]

Water vapour and electrosurgical smoke are additional causes of impaired vision, as in a stable pneumoperitoneum (laparoscopy) there is little or no movement of CO_2. The white smoke rapidly becomes impenetrable to the human eye, especially in confined spaces.[1, 2, 5, 8, 9]

Moisture can also build up between detachable camera heads and endoscopes, necessitating disconnection and cleaning, potentially compromising the sterile field.[8]

The average time lost to dealing with lens fogging is estimated to be 6 minutes for procedures of up to 45 minutes duration.

One study found that in some laparoscopic procedures, 37% of the time was spent with impaired vision. The same study analysed different aspects of the issue and found that whilst lens cleaning was necessary throughout the procedures, 34% of all cleaning procedures occurred during the 1st quarter of the surgery, impeding its progress. There was an average of 15.3 lens contamination events during laparoscopic procedures in the study, but on occasions there were as many as 35 episodes of lens cleaning.[6]

Data has identified that lead surgeons were involved in scope cleaning 56% of the time, 1st assistants 48% of the time, and scrub nurses 20% of the time.[6]

THE IMPACT OF IMPAIRED VISION

Impaired vision during endoscopic procedures can be dangerous as there is no tactile / haptic feedback. Visual input is the only sensory modality available to the endoscopic surgeon.[1, 4, 8, 9, 10]

Numerous studies have shown that impaired vision during endoscopic surgery leads to increased operative time and suboptimal views. Repeated removal and cleaning of the endoscope compromises the fluidity of movement and slows surgical progress.[2, 3, 4, 5, 6, 8, 9, 10]

Often, and paradoxically, vision is most likely to be impaired just where the best vision is required, in tight spaces and close to critical structures.[6, 8, 9]

A World Health Organisation report identified that problems associated with laparoscope lenses may contribute to surgical errors such as incorrect use of devices or placing instruments on structures other than those intended.[8, 14]

Patient safety is ultimately compromised by sub-optimal visualisation, and can affect surgeon performance, with increased risk of surgical complications and increased financial costs.[1, 2, 3, 4, 6, 8, 9, 10]

Continual and repeated episodes of lens fogging leads to irritation and frustration for the surgeon, and scrub nurses experience stress trying to resolve issues around lens fogging. Their concentration is also disrupted by these episodes, and this may result in lack of continuity due to disrupted activity and increased stress levels.[1, 3, 4, 6, 8, 9, 10, 11, 13]

Compromised visualisation during endoscopic procedures, increases operating time and has potential morbidity.[1, 3, 5, 6, 7, 8, 9, 10]

NEED FOR CHANGE

Current methods of dealing with scope fogging are not entirely effective as they do not address the core issue of the temperature differential between the front of the endoscope lens and the anatomical cavity.[1, 2, 3, 6, 8, 9, 11, 12]

Studies have shown that endoscopes with integrated heating can eliminate the need for extracorporeal cleaning cycles and can deliver unimpeded vision.[1,3, 8, 9, 10, 12]

Furthermore the issue of electrosurgical or ultrasonic water vapour, and of electrosurgical smoke can be addressed by active exsufflation and smoke evacuation.[8, 9]

Indeed these characteristics are recommended as key determinants for optimal, clear vision.[1, 8, 9]

THE SOLUTION

B. Braun offer a solution in the form of the Aesculap **Einstein***Vision*® 3D camera system.

The system incorporates an integrated camera head and endoscope, eliminating the interface where there is potential for moisture to collect and so eliminating one of the potential causes of impaired vision.

Furthermore, the laparoscopes have an integrated heater at the distal tip of the endoscope, to heat the distal part of the lens. This eliminates the biggest cause of impaired visualisation, condensation of the distal lens with resultant lens fogging.

As part of the visual tower system, the 50 litre insufflator offers active smoke evacuation by providing exsufflation to remove troublesome water vapour and smoke produced from electrosurgery and advanced energy devices. The insufflator dynamically compensates for exsufflation in order to preserve the intra-abdominal pressure and protect the pneumoperitoneum.

The stereoscopic endoscopes also deliver a narrower field of view which offers increased magnification. This results in the scope(s) being further away from the target tissues with a significant reduction of the incidence of endoscope contamination and decreased requirement for scope cleaning due to soiling.

These features have the potential to significantly reduce surgical procedure times, help maximise patient safety and help improve theatre efficiency.

SUMMARY

Adopting the B. Braun Aesculap **Einstein***Vision*® 3D camera system offers potential to improve theatre efficiency, reduce procedural costs and allow for increased activity and increased revenue.

Utilising this technology could assist with meeting a key NHS objective of improving operating theatre efficiency by enabling more surgical procedures to be performed.

Based on eliminating 6 minutes of wasted time per procedure, and assuming 4 endoscopic procedures per day, a saving of 24 minutes could be realised per day.

Assuming 300 operating days throughout the year, this represents 7,200 minutes, or 120 hours of additional operating time. With the hourly cost of running an operating theatre at £1,200, **this represents an annual saving of £144,000.**

Utilising this additional theatre time could allow for an additional 240 Minor Laparoscopic or Endoscopic, Upper Genital Tract Procedures (MA10Z), **generating an additional £1,022 per procedure, and £245,280 per annum.**

The **Einstein***Vision*® technology also incorporates a unique sterile sheath concept, negating the need for reprocessing endoscopes, offering potential for additional savings from reprocessing costs and repair costs associated with endoscope repairs.

Accounting for the investment and running costs of the **Einstein***Vision*® 3D camera system, **£1,100,400 could be generated over 5 years, through additional revenue and efficiency savings,** based on performing 1,200 endoscopic procedures per annum.

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