Conflicts of interest

The authors have no conflicts of interest.

Author contributions

Study design: Rafael Calleja Lozano, Francisco Javier Medina Fernández. Manuscript writing: Rafael Calleja Lozano, Francisco Javier Medina Fernández. Data acquisition (surgeons): César Antonio Díaz López, Eva María Torres Tordera, Julia Carrasco Valiente, Rafael Calleja Lozano. Critical revision: Francisco Javier Medina Fernández, Francisco Javier Briceño Delgado.

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Supporting Information

The video may be found in the online version of this article and also on the Colorectal Disease Journal YouTube and Vimeo channels:

Video S1. A combined robotic approach of a synchronous upper rectal cancer and prostate cancer

Supplementary Material

Gas leaks through laparoscopic energy devices and robotic instrumentation – a video vignette
doi:10.1111/codi.15278

Dear Editor,

The COVID-19 pandemic has focused surgeons and healthcare systems on the hazards of minimally invasive surgery and its devices [1,2]. Energy and articulating laparoscopic and robotic instruments contain hollow spaces in their shafts and handles to allow cabling to transmit electrical energy to the instrument tip and tissue. While much attention has been placed on the management of smoke that occurs during cauterby instrument activation [3,4], it may be less obvious that such instruments may act as chimney flues for intraperitoneal gas to flow unfiltered directly into the operating room environment. This gas will contain smoke but also simply the carbon dioxide (CO₂) used to distend the abdominal cavity and any associated aerosolized cells and virions.

The associated Video S1 demonstrates this in both bench and clinical scenarios. High-speed schlieren imaging in a high-fidelity surgical model (porcine cadaver) shows how CO₂ is directly channelled to the exterior via the instrument shaft of a Ligasure device (Medtronic, Minneapolis, Minnesota, USA) and also a robotic instrument (da Vinci, Intuitive Surgical, Sunnyvale, California, USA) (CO₂ is optically distinct from room air by its density and so is dynamically detectable by this assessment modality). Clinically, a specific thermographic camera (the FLIR GF 343, FLIR Systems Ltd, West Malling, UK) confirms this mechanism of CO₂ effluvium during actual operations for these instruments by its sensitive visualization of CO₂ gas via its specific near-infrared absorption characteristic. In addition, it shows a greater tendency for the gas to move around the operating room versus the laboratory due probably to the impact of in-theatre airflow around the operative field (a combination of positive pressure room ventilation and additional factors such as surgical movement and patient temperature). This confers the potential for pollutants and pathogens in microdroplets and vapour in the gas to contaminate the operating room team. Interestingly, hook diathermy instrumentation and an ultrasonic dissection device (Harmonic Scalpel, Johnson and Johnson Ethicon, New Brunswick, New Jersey, USA) did not carry gas through their instrument shafts but did still cause gas leaks at the level of the trocar. While smoke evacuation will reduce smoke within the peritoneal cavity, unfiltered gas and smoke can still escape via instrument accesses [5] and trocars [6] during minimally invasive surgery.

This information reinforces the rationale for personal protective equipment [7] alongside adherence to guidance regarding smoke management and trocar etiquette. While it also suggests a benefit in risk mitigation for more simple solid instrumentation like hook diathermy, it emphasizes that surgeons really need to understand the construction as well as performance of their instruments to make sure they provide due duty of care for their patients and operating room teams.

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thermographic training by Mr David Doyle, Butler Technologies, Ireland.

Conflicts of interest

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References

1 Francis N, Dort J, Cho E et al. SAGES and EAES recommendations for minimally invasive surgery during COVID-19 pandemic. Surg Endosc 2020; 34(6): 2327–31. Epub 2020 Apr 22. PMID: 32323016

2 Cahill RA, Dalli J, Khan F, Flood M, Nolan K. Solving the problems of gas leakage at laparoscopy. Br J Surg 2020; in press.

3 Zakka K, Erridge S, Chidambaram S et al. Electrocautery, diathermy, and surgical energy devices: are surgical teams at risk during the COVID-19 pandemic? Ann Surg 2020. Online ahead of print. PMID: 32541232

4 Mowbray NG, Ansell J, Horwood J et al. Safe management of surgical smoke in the age of COVID-19. Br J Surg 2020. Online ahead of print PMID: 32363596.

5 Khan MF, Cahill RA. Carbon dioxide gas leaks during transanal minimally invasive surgery. Tech Coloproctol 2020. Online ahead of print. PMID: 32638139

6 Khan MF, Dalli J, Cahill RA. Gas aerosol jetstreams from trocars during laparoscopic surgery - a video vignette. Colorectal Dis. 2020. Online ahead of print. PMID: 32579264

7 Dalli J, O’Keefe DA, Khan F, Traynor O, Cahill RA. Powered air purifying respirators (PAPR) for the protection of surgeons during operative tasks: a user perspective assessment. Br J Surg 2020. In press.

Supporting Information

The video may be found in the online version of this article and also on the Colorectal Disease Journal YouTube and Vimeo channels:

Video S1. Video showing gas leaks occurring through instrumentation used at both standard laparoscopy and robotic-assisted laparoscopic operation with assessment by both Schlieren and Thermographic Optical imaging.

A video demonstration of three-dimensional imaging to assess the circumferential resection margin in locally advanced rectal cancer and recurrent rectal cancer – a video vignette
doi:10.1111/codi.15281

Dear Editor,

Surgical treatment of locally advanced primary rectal cancer and locally recurrent rectal cancer often requires extensive approaches to achieve a tumour-free resection margin (R0). MRI is considered the gold standard for preoperative assessment of the circumferential resection margin (CRM), with a 94% negative predictive value for CRM not threatened by the tumour. However, a positive predictive value of 54% for CRM involvement has been observed [1].

A three-dimensional image processing and reconstruction (3D-IPR) model, based on pelvic MRI, has been designed [2] with the aim of assessing tumour location and invasion of surrounding structures. After chemoradiotherapy, the presence of tumour cells, signs of fibrosis or mucin pools are considered to be associated with previous invasion by the tumour.

We looked at two cases:

Case 1: a locally advanced primary rectal cancer. MRI showed infiltration of the posterior vaginal wall and the internal sphincter and dubious external sphincter infiltration. 3D-IPR confirmed infiltration of these structures but suggested no infiltration of the external sphincter. Pathology showed fibrosis and acellular mucin pools in the posterior vaginal wall and internal sphincter. R0 resection was performed.

Case 2: a locally recurrent rectal cancer. MRI showed infiltration of the left obturator muscle without infiltration of pelvic bones. 3D-IPR confirmed infiltration of the obturator muscle and suggested invasion of the left ischial spine. Pathology showed invasion of the obturator muscle and a positive CRM at the bone surface. R1 resection was performed.

Future studies are needed to assess the role of 3D imaging in the preoperative planning of treatment for locally advanced rectal cancer and recurrent rectal cancer.

Conflicts of interest

DG-C works for Cella Medical Solutions. He served as technical adviser for the current manuscript. All

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