Author response to: solving the problems of gas leakage at laparoscopy

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Dear Editor

Dr.’s Matsuzaki and Botchorishvili raise a great point and rightly seek to add further light on a potential contributory mechanism of gas leak through trocars during laparoscopy 1– it would be lovely to see some of their clinical data in this regard accrued during trials regarding low pressure pneumoperitoneum. We’d be delighted to collaborate in any way with them and others in this area.

We are ourselves specifically evaluating the pneumoperitoneum pressure effect on trocar valve apposition after instrument insertion with work (both mechanical and computational modelling) ongoing to understand the relative importance of ‘use fatigue’ versus insufficiency of ‘gas pressure reseal’. In counterbalance, while passive leaks may be more likely and more prolonged with lower pneumoperitoneal pressures, higher pressures induce leaks of greater velocity and turbulence at the moment of instrument withdrawal and indeed insertion too (see Fig. 1). The latter so may be more relevant re particle dispersal trajectory (rather than gas leak volume) in considerations regarding surgical team pathogen/pollutant (e.g., surgical smoke constituents) hazard. While lower pressure is also likely beneficial re leakage occurring at the level of the abdominal wall although, these leaks tend to contour the

![Fig. 1 Photographs showing gas leaks as seen using High speed Schlieren Imaging with varying pressure pneumoperitoneum](https://academic.oup.com/bjs/advance-article/doi/10.1093/bjs/znab062/6161214)

(a) Leak around camera at 8mmHg (b) abdominal wall leakage at point of trocar insertion into abdominal wall at 12mmHg versus (c) 25 mmHg (d), (e) and (f) increasing mean velocity at trocar valve at the moment of instrument removal with pneumoperitoneal pressure of 8 (d), 12 (e) and 25 (f) mmHg.
curvature of the abdomen (‘the Coanda Effect’) and so are not as vertically directed as those emitting directly via trocar valves (gas stream turbulence again increasing with pressure).

Although complex theoretically, the mechanics of gas leaks at laparoscopy are determinable. While this is ongoing, we caution against overly reductive ‘one size fits all’ guidance as there are several governing factors of variable weighting that have yet to be fully understood. For better surgery, reliable engineering solutions are needed so surgeons can focus on the performance of the operation in toto rather than invest disproportionate concentration on access. Yes indeed evolved, next generation trocars with assured performance would be great!

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Reference