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VIDEO FORUM

Closure of the retroperitoneal space in laparoscopic anterior resection with FLEXDEX™

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Internal herniation of the small bowel under the left colon and mesocolon remnant following laparoscopic anterior resection is an uncommon but potentially devastating complication [1–5]. More common following laparoscopic versus open surgery (perhaps, because of earlier postoperative mobilization and lesser tendency for ileus and adhesions) and in cases where the splenic flexure is truly, fully mobilized (and so the distal transverse colon and descending colon occupy a midline position over the duodenojejunal (DJ) flexure), the problem may only be diagnosed and reacted to quite late when venous congestion and even gangrene have supervened. Authors describing the problem all advocate routine closure of the retroperitoneal space, although the best means of doing so is unclear with suturing, clips and even glue being proposed. While intracorporeal suturing is commonplace in many laparoscopic visceral operations, colorectal surgeons often do not often use this skill set given that many of their procedures are performed with energy and stapling devices alone. Overall, the relative rarity of clinical consequences from the complication, the lack of an easy, reliable method of closure and the fact the step comes late in what can be a tiring, long procedure mitigate against routine closure in common practice.

Surgical instrumentation is becoming increasingly advanced with the purpose of improving or augmenting human performance. The Da Vinci robotic system is one example of such a tool; although well engineered to ease suturing, it is not widely available and indeed is often de-docked from the patient to allow anastomotic construction and so not in situ at the time of retroperitoneal address. The FLEXDEX system is intended to fill this absence by providing single-use, machine assistance for intracorporeal suturing through a mechanically articulated, arm-mounted device that converts rotational movements of the wrist and forearm into unrestricted, precise movements of the end effector inside the patient [6]. By this means, needle and suture management is proposed to be improved easing the effort otherwise inherent to "straight stick" laparoscopy with some early experience in bariatric surgical operations now published.

To examine this, we performed retroperitoneal closure at the end of the procedure in seven unselected, consecutive patients (body mass index 27–38 kg/m^2) needing laparoscopic high or low anterior resection. Device training on bench and biomedical models was performed to ensure the best use of the device in the theater [6]. For optimum ergonomic performance, the device was operated via the lower right port (the 12 mm port used also for colorectal staple transection) with additional assistance possible via the remaining 5 mm ports. As per the associated video, the suture was best commenced distally fixing the distal mesocolon to the incised edge of the retroperitoneum near the sacral promontory and continued proximally to near the clipped, cut end of the inferior mesenteric artery stump. Then a second suture was placed cephalad between the proximal mesocolon and the retroperitoneal edge near the DJ flexure, tied and run caudad to meet the first suture to which it was then tied. Retroperitoneal closure was securely achieved in every patient taking an average of 10 (range 8–15) min. In one case, a hematoma developed in the mesocolon secondary to its suture, but this was readily controlled by a figure of eight suture placement (again by FLEXDEX) to compress the pranged venous tributary. All patients recovered without specific inpatient complications.

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In summary, the FLEXDEX proved capable in ensuring retroperitoneal closure by suture fixation in a manner that was straightforward and kept overall case momentum. It provides a means of achieving "robotic" instrument tip performance without a robot and enables augmented surgical performance at a cost equivalent to standard laparoscopic instrumentation.

Compliance with ethical standards

Conflict of interest Prof Cahill receives speaker fees from Stryker and holds educational and surgical development grant funding from Intuitive and with IBM. The other authors declare that they have no conflict of interest.

Ethical approval FLEXDEX is a CE marked device and was used here with Full Departmental Approval.

Informed consent Patients undergoing surgery for fully consented for the operative steps in their entirety.

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