

## **Experimental evaluation of a novel handheld articulating laparoscopic instrument driven by robotic technology**

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**Objectives:** This work evaluates the feasibility and therapeutic safety of digestive and urological laparoscopic procedures combining a single-site approach and a new system handheld articulating laparoscopic instruments (Kymerax™, Terumo Europe NV, Germany) in a porcine model.

**Material and Methods:** This system consists of a generator, handles and interchangeable instruments (scissors, dissector and needle-holder). Three healthy female pigs underwent laparoscopic cholecystectomy and Nissen fundoplication using a laparoscopic single site approach (SILS, Covidien) placed in the upper abdominal midline through a 3cm incision. Three female pigs were used to create a surgical model of kidney pseudotumor. A single-site laparoscopic partial nephrectomy was performed in these animals. In all cases the surgeons handled conventional laparoscopic instruments with the left hand and articulated laparoscopic instruments with the right hand. During surgery, the operative time and the presence of complications were recorded. The validation of the new device includes a questionnaire. Animals were euthanized after surgery, performing postmortem examinations. The quality of dissection and intracorporeal suturing and knotting were evaluated using a scoring system.

**Results:** No complications were registered during the surgical procedures. In the subjective assessment of this device the surgeons indicate that the rotation of the tip facilitates the suture maneuvers in single-site approach. The importance of visualizing the end of the instruments and the need for previous training to get used to handling were also registered in the questionnaires. During the necropsy it was found that the quality of the suture was lower than that obtained by conventional laparoscopic approach of previous studies.

**Conclusions:** Single-site laparoscopic gastrointestinal and urological surgeries are feasible and safe techniques using a novel handheld articulating laparoscopic instrument. This device allows functional results similar to traditional instruments but requires previous training and does not provide advantages in surgical time compared with conventional laparoscopy. More studies are needed to determine the exact scope of this new technology in the field of minimally invasive surgery.