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Case Report

Robot-assisted Nissen fundoplication with the new Cambridge medical robotics - robotic assisted system

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ABSTRACT

Over the last decade, robotic surgery has become increasingly prominent as a minimally invasive approach, with numerous studies validating its safety and clinical utility. This case report outlines a robotic-assisted nissen fundoplication procedure for hiatal hernia utilizing the CMR™ versius system. One of the distinguishing features of the system is its open console paired with a high-definition 3d display, along with lightweight robotic arms configured as four independent units. The procedure was completed successfully without requiring conversion to open surgery. No intraoperative complications or technical issues occurred. The surgical duration was approximately 150 minutes, with docking taking around 10 minutes. The patient's hospital stays lasted three days. This case highlights the clinical utility, enhanced dexterity and technical feasibility of using the cmr™ versius system for performing Nissen fundoplication. The report also provides preliminary data that may help assess the benefits and limitations of this robotic platform in similar general surgical procedures.

Keywords: CMR, Versius, Fundoplication, Robotic, Nissen

INTRODUCTION

Minimally invasive surgery continues to evolve across various domains of general surgery.[1-3] Robotic platforms, such as the da vinci® system, have significantly advanced these techniques.[4] However, emerging systems, including the recently introduced versius by Cambridge medical robotics (CMR), offer novel solutions that enhance surgeon ergonomics and flexibility. Versius allows the surgeon to operate in a seated or standing position using an open console and high-definition 3d view (Figure 1). The system incorporates up to five light robotic arms, each functioning independently to enhance port placement flexibility. These arms provide 360-degree articulation and seven degrees of freedom, with haptic feedback to increase precision.one key advantage, as noted by puntambekar and colleagues, is the system's ability to replicate laparoscopic port configurations.[5] This feature enables the surgeon to transition smoothly between robotic and traditional laparoscopic steps.

This report presents our experience with the CMR™ versius robotic system in the setting of Nissen fundoplication for hiatal hernia, and details our observations regarding system setup, docking, and surgical workflow.

All surgical team members completed certified training on the use of CMR™ versius technology. The system's modular structure allowed for tailored configuration based on patient-specific anatomical needs. It includes a 3d-HD open console and one main system tower, along with four individual arm carts that provide high maneuverability and flexibility during surgery.

The CMR™ system allows the surgeon to interact through the surgical console (Figure 1), which includes manual controllers and a head-up display (HUD). The HUD projects a real-time, three-dimensional view from the endoscopic camera, overlaid with essential surgical data. One of the key ergonomic features of the console is its adjustable height, enabling the surgeon to operate either while seated or standing for improved comfort during lengthy procedures.

The console also serves as the primary interface for system operation. It connects to the robotic arms and bedside units through dedicated data and power links, ensuring uninterrupted performance. Each robotic arm operates independently and can be adjusted in height and positioning according to surgical requirements. By using the open console outside the sterile field, the surgeon can comfortably control both the camera and the robotic arms. Live 3D video, combined with the HUD, offers high-resolution visualization of the surgical field, enhancing depth perception and anatomical accuracy.

A standout feature of the CMR™ system is its modular architecture, which allows surgeons to select the optimal arm positioning based on each patient's anatomy (Figure 2). This modular docking capability offers substantial flexibility during setup, accommodating various procedural needs.

Each robotic arm, guided by the surgeon via dual hand controllers, can carry out complex tasks with precision. The system includes robotic arms comprising 11 moving joints, allowing for a wide range of motion and fine-tuned movements. Before beginning the operation, a laser alignment system is used to establish a spatial reference by aligning the instrument with the patient's body orientation. Once alignment is verified, the arms automatically calculate the angle of approach relative to the operating table within the system's digital interface.

The CMR™ system utilizes a standardized setup protocol tailored for each surgical procedure to ensure optimal outcomes. A critical part of this process is the docking of the robotic arms, which must be performed with precision.

To begin the procedure, a 12 mm trocar is inserted through an incision just above the umbilicus using a Veress needle. A 30° laparoscope is then introduced through this port to allow for abdominal inspection. Additional trocars are placed to complete the setup, typically totaling four, with placement guided by a configuration as illustrated in Figure 4.

The laparoscope and the primary instrument ports for the surgeon's right hand are positioned in the left upper quadrant of the abdomen, about 18–20 cm below the xiphoid process. The ports for the surgeon's left hand and for auxiliary instruments are located on the right side, with the left-hand port positioned approximately 5 cm above and lateral to the camera port. A minimum distance of 8 cm is maintained between all robotic ports to avoid instrument collision.

A primary assistant port is placed at least 5 cm from the camera port and the surgeon's right-hand ports. In more involved procedures, an additional assistant port can be added, maintaining at least a 2 cm gap from existing ports and anatomical landmarks.

The patient is positioned in a modified French position (legs apart) with a reverse Trendelenburg tilt exceeding 15°, and the operating table may be tilted to the right by 5–15° to optimize access. Figures 3 and 4 demonstrate the positioning and port configuration used in this setup.

The surgical steps themselves follow conventional Nissen fundoplication techniques as described in established literature.

CASE REPORT

A 57-year-old female presented to the emergency department with upper abdominal discomfort, retrosternal burning, nausea, and episodes of vomiting. Her medical history included type 2 diabetes mellitus and bronchial asthma, with no additional comorbidities. She reported longstanding symptoms suggestive of gastroesophageal reflux, and a known diagnosis of hiatal hernia.

An upper gastrointestinal endoscopy was performed, which revealed findings consistent with hill grade ii lax les, and signs of mild antral gastritis. Based on these clinical and endoscopic findings, she was scheduled for a robotic-assisted laparoscopic Nissen fundoplication. The procedure was conducted under general anesthesia using low-flow sevoflurane. Pneumoperitoneum was created using carbon dioxide, maintaining intra-abdominal pressures between 12 and 14 mmHg. The total operative duration, including docking time, was 150 minutes.

The patient had an uneventful postoperative recovery. The surgical duration, including a 10-minute docking phase, was 150 minutes in total. No blood transfusions were required. A liquid diet was initiated on postoperative day two, and the patient was discharged after a three-day hospital stay. No surgical drains were placed, and her recovery was smooth, with good tolerance to the procedure. She returned for outpatient follow-up one week later and continues to participate in routine postoperative monitoring.

Figure 1: The open surgical console.

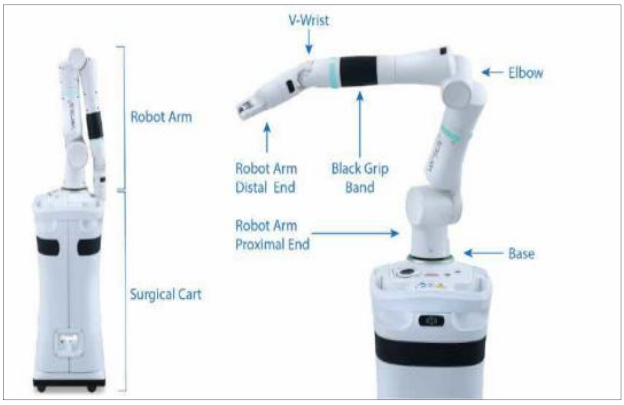

Figure 2: The bed side unit.

Figure 3: The positioning and port configuration.

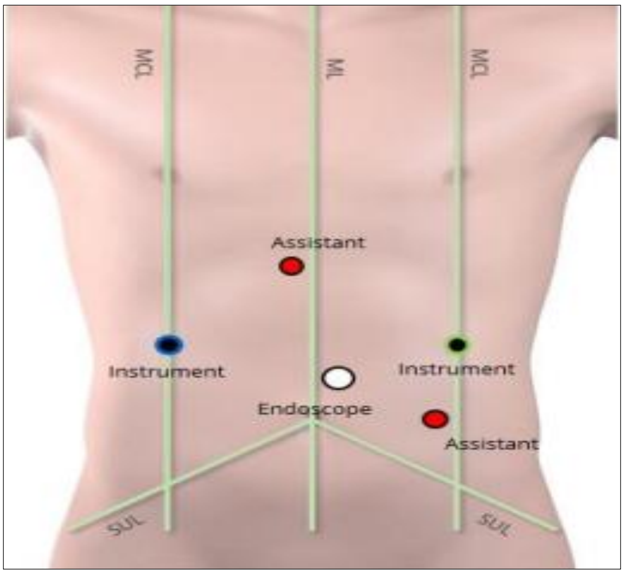

Figure 4: The positioning and port configuration. Colour of the ports correspond to the BSUs shown in this procedure card

DISCUSSION

Over the last several years, robotic-assisted surgical techniques have seen significant growth, offering notable advantages over conventional laparoscopic surgery.[6,7] Various studies have highlighted the evolving role of robotic systems in multiple domains of general surgery.[8] The versius system, a recent innovation in robotic platforms, was developed specifically to address some of the key challenges faced in traditional laparoscopy.

Robotic technology is increasingly being adopted in general surgical practice due to its precision, versatility, and ability to streamline complex procedures. One persistent concern, however, is the high cost associated with robotic systems. This barrier is gradually being addressed through the emergence of modular platforms like bedside unit (BSU), which enhance flexibility and ease of deployment in the operating room.

Compared to earlier robotic platforms such as the da vinci system, versius offers a more open console design and separate robotic arms, allowing greater freedom of movement and improved ergonomics for the surgeon. These features help enhance surgical performance, especially in delicate and complex tasks, by offering refined control and accuracy. The dexterity of robotic surgery helps the surgeon add precision in every task related to this very difficult functional gastrointestinal disorder, compared with the laparoscopic approach.[9]

Nonetheless, effective utilization of these advanced systems requires specific technical knowledge and training. Familiarity with the robotic interface, docking protocols, and system mechanics is crucial to minimize workflow disruptions and avoid potential complications

The CMR™ versius system introduces unique design elements that enhance versatility and precision, greater mobility primarily due to the configuration of its robotic arms and the BSU concept. One of the major advantages of this system is its open console, which allows the surgeon to operate while seated comfortably and maintain direct visual contact with the screen. The console's compatibility with 3D glasses enhances depth perception and spatial awareness, enabling multi-directional control of instruments via 3D vision. The open console allows better team communication and participation, also the open console enables multiple observers to see operative procedure using 3D vision.

Despite these benefits, there are certain challenges. For example, the docking process for multiple arms can be time-consuming and complex, however the docking time would be reduced as learning curve reduces, the procedure, lasted around 150 minutes, largely because of the learning curve associated with the system. At the conclusion of the operation, the system was undocked using a dedicated set. Procedure was uneventful and at the end of procedure surgeon was comfortable without tired eyes. The modularity of the CMR™ design demands tailored adjustments for optimal use of the operating space—requiring equipment such as towers and surgical consoles to be carefully positioned. This setup often involves reconfiguring the layout of the operating room and accounting for factors like the table position, anesthesiologist access, and the location of nursing staff.

Critical elements such as arm placement and trocar positioning must be carefully considered to prevent collisions and avoid restricted movement. The system's modular design allows for better flexibility in placement and enhances safety during setup.[10] Early user training is essential to familiarize the surgical team with both the system and the docking procedures. Instrumentation includes advanced tools such as bipolar maryland dissectors, monopolar scissors. Another major disadvantage of cmr robotic system is the unavailability of harmonic and ligasure energy device

One notable feature of the CMR™ system is the independence of its robotic arms, which can be positioned in various configurations to suit specific surgical tasks. This independence means surgeons can change working angles without altering port placement—offering significant ergonomic benefits. Manual control with the thumb and index finger provides precise manipulation.

In our initial experience with the versius system, operative time was approximately 150 minutes, including docking, and the average hospital stay was three days. These results are comparable to those seen with the da vinci system.[9] While the duration of robotic procedures is still debated, our early observations suggest that with experience, time efficiency improves significantly after the learning curve.[1] Nevertheless, challenges such as instrument collisions and docking duration remain limiting factors, contributing to increased surgical time and surgeon fatigue.

This paper is among the first to discuss the application of the CMR™ versius robotic system in general surgery. Further research and larger studies are needed to validate and expand upon our initial findings.

CONCLUSION

Robot-assisted Nissen fundoplication using the CMR™ versius system is a safe and viable option for treating patients with hiatal hernia. This platform can be effectively utilized and may serve as an alternative to other established robotic systems.

Robotic technology enhances surgical precision, increases dexterity, improves ergonomics for the operating surgeon, and helps reduce fatigue. It facilitates meticulous dissection. However, challenges such as instrument collision and docking complexity persist. With increased surgical experience and standardization, these issues are likely to diminish as the learning curve improves.

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REFERENCES

1. Caruso R, Vicente E, Quijano Y, Duran H, Diaz E, Fabra I, et al. Case-matched analysis of robotic versus open surgical enucleation for pancreatic tumours: A comparative cost-effectiveness study. Int J Med Robot. 2022;18(5):e2425.
2. Ferri V, Quijano Y, Nuñez J, Caruso R, Duran H, Diaz E, et al. Robotic-assisted right colectomy versus laparoscopic approach: case-matched study and cost-effectiveness analysis. J Robot Surg. 2021;15(1):115-23.
3. Di Martino M, Caruso R, D'Ovidio A, Núñez-Alfonsel J, Burdió Pinilla F, Quijano Collazo Y, et al. Robotic versus laparoscopic distal pancreatectomies: A systematic review and meta-analysis on costs and perioperative outcome. Int J Med Robot. 2021;17(5):e2295.
4. Giulianotti PC, Coratti A, Angelini M, Sbrana F, Cecconi S, Balestracci T, et al. Robotics in general surgery: personal experience in a large community hospital. Arch Surg. 2003;138(7):777-84.
5. Alkatout I, Salehiniya H, Allahqoli L. Assessment of the versius robotic surgical system in minimal access surgery: a systematic review. J Clin Med. 2022;11(13):3754.
6. Ielpo B, Caruso R, Quijano Y, Duran H, Diaz E, Fabra I, et al. Robotic versus laparoscopic rectal resection: is there any real difference? A comparative single center study. Int J Med Robot. 2014;10(3):300-5.
7. Prete FP, Pezzolla A, Prete F, Testini M, Marzaioli R, Patriti A, et al. Robotic Versus Laparoscopic Minimally Invasive Surgery for Rectal Cancer: A Systematic Review and Meta-analysis of Randomized Controlled Trials. Ann Surg. 2018;267(6):1034-46.
8. Ielpo B, Duran H, Diaz E, Fabra I, Caruso R, Malavé L, et al. Robotic versus laparoscopic distal pancreatectomy: A comparative study of clinical outcomes and costs analysis. Int J Surg. 2017;48:300-4.
9. Arcerito M, Perez MG, Kaur H, Annoreno KM, Moon JT. Robotic Fundoplication for Large Paraesophageal Hiatal Hernias. JSLS. 2020;24(1):e2019.00054.
10. Gueli Alletti S, Chiantera V, Arcuri G, Gioè A, Oliva R, Monterossi G, et al. Introducing the New Surgical Robot HUGO™ RAS: System Description and Docking Settings for Gynecological Surgery. Front Oncol. 2022;12:898060.

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