
ROBOT-ASSISTED MINIMALLY INVASIVE TRANSTHORACIC FUNDOPLICATION FOR HIATAL HERNIA - A NOVEL APPROACH

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Abstract: Robotic-assisted surgery allows surgeons to achieve great results with the benefits provided by the robot, mainly the enhanced vision and precise movements of instruments. This changed the concept of some of the operating techniques already established in the field. We present two cases of hiatal hernia repair with the da Vinci X system using the Belsey-Mark IV technique. The literature review shows that the robotic system is being used mainly for other types of hiatal hernia surgery and that for the Belsey technique a modified transabdominal approach is popular. Our patients underwent robot-assisted transthoracic operations with good postoperative results. Although challenging the robot-assisted minimally invasive transthoracic fundoplication for type 1 hiatal hernia proved to be applicable with good short-term results, no early complications, fast recovery, and minimal postoperative stay. Further studies and randomized controlled trials are necessary to test the non-inferiority of the method to transabdominal laparoscopic and robot-assisted approaches.

Keywords: RATS, fundoplication, Belsey-Mark IV, hiatal hernia

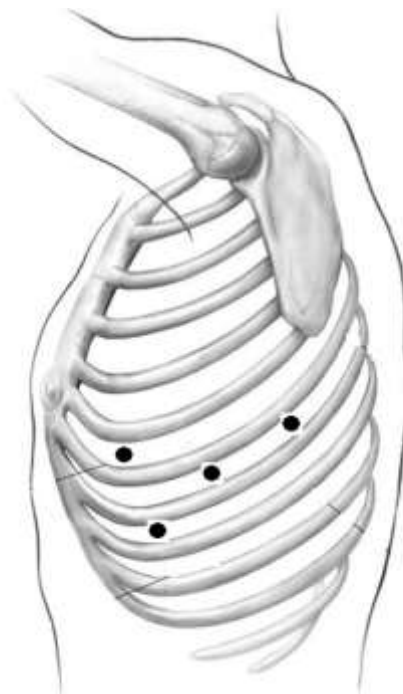
1. INTRODUCTION

Anti-reflux surgery has undergone many modifications over the years, and one of the most widely applied techniques until the beginning of the period of endoscopic surgery after the 1990s was the transthoracic Belsey-Mark IV fundoplication, described in 1961 by surgeons David Skinner and Ronald Belsey. In recent decades, the method has been forgotten and finds its application only in selected cases with a compromised abdomen. The advancement of laparoscopy led to the widespread implementation of Nissen fundoplication with its successful reproducible results. In the era of robotic-assisted surgery, new opportunities are opening up for the surgical treatment of gastro-oesophageal reflux disease and hiatal hernia, which gives surgeons reasons to study and search for even more effective methods. In the literature, there are currently not enough reports on robot-assisted surgery for hiatal hernia, and no data can be found on a transthoracic robotic approach. This provokes new research for treatment of hiatal hernia and the possible positive results of combining established techniques with the assist of the robotic system and its benefits.

2. MATERIALS AND METHODS

We present the cases of two patients with symptomatic gastro-esophageal reflux, non-responding to conservative treatment. The patients are females aged 56 and 62 years. The conducted diagnostic and endoscopic studies verified a hiatal hernia type 1. The two patients were referred for surgical repair of the diaphragmatic defect and fundoplication. The procedure was performed with the Da Vinci X robotic system. After induction of general anesthesia and split endotracheal intubation, patients are positioned in the right lateral decubital position. The Da Vinci X robot is situated to the left of the patient table. A nasogastric tube is placed for gastric decompression during the intervention and it is removed immediately after surgery. Four ports are placed - three 8mm trocars for the robotic system instruments and one utility port. The positioning is described in Figure. 1.

Fig 1: Port placement: utility port in 6th intercostal space anterior axillary line; endoscope 8mm port in 7th intercostal space mid axillary line; two instrument ports in 7th and 8th intercostal spaces 6cm apart from the endoscope port.

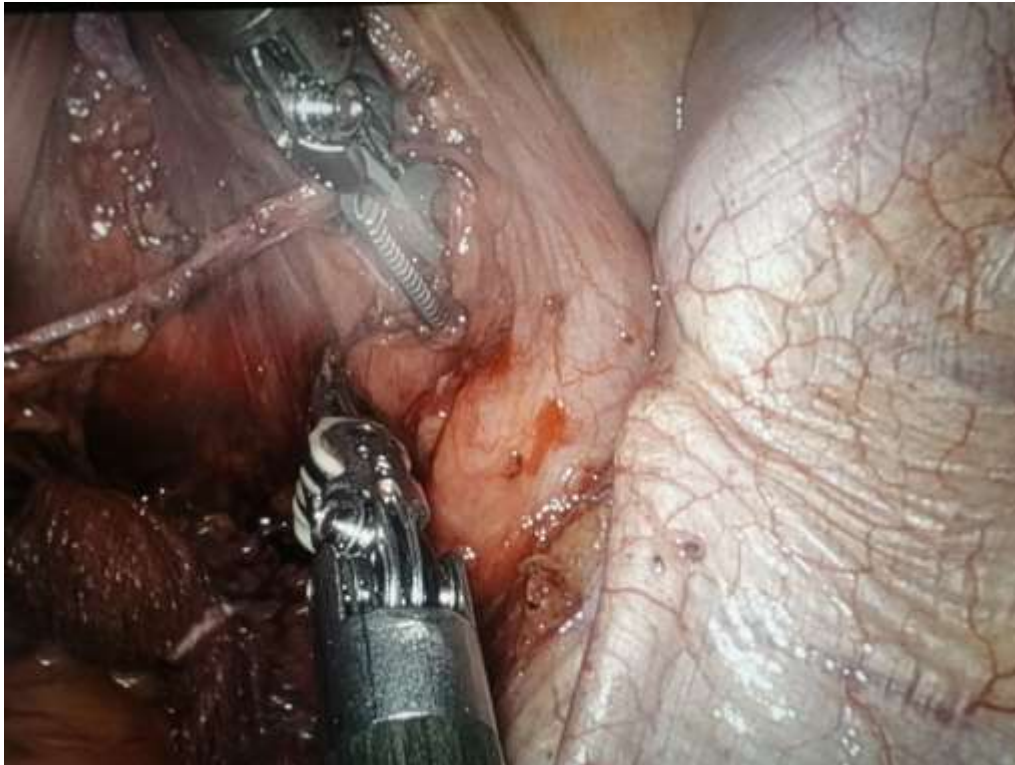


The robotic equipment for the procedure includes a 30-degree endoscope and 3 instruments – Maryland bipolar forceps, Cadieere forceps, and a needle holder. After port placement, the operation continues with an incision of the mediastinal pleura and mobilization of the distal esophagus up to the aortic arch and the proximal third of the stomach above the hiatus (Fig. 2A, B). The reconstruction includes crurorrhaphy and fundoplication according to the Belsey-Mark IV method using the described two-level intussusception technique including the hiatal legs in the second line of suturing. The suture material used is a 2/0 polyfilament non-absorbable polyester suture. The operation ends with the placement of a pleural contact drain.

Fig 2A: Gastro-esophageal junction dissected and retracted anteriorly



Fig 2B: Mobilisation of the gastric fundus



3. RESULTS

The average operating time is 140 minutes (130`-150`). The procedure is performed completely minimally invasive. Patients recovered without intraoperative and early postoperative complications. Oral fluids are taken at first hours after the procedure. Feeding started at first post-operative day and patients are discharged on the 3rd postoperative day without complaints of persistent reflux. Immediately before discharge, an X-ray of the upper gastrointestinal tract was performed with water-soluble peroral contrast, showing the intraabdominal position of the gastroesophageal junction and no reflux was established. Patients are followed up for 2 months with no recurrences.

4. DISCUSSION

Robotic surgery has gained a lot of popularity in recent years. It enables the treatment of various complex cases in thoracic and abdominal pathology. Its benefits are mainly the minimally invasive approach with minimal trauma to the patient, leading to faster recovery and shorter hospital stay. Over the past decade, numerous studies have been conducted regarding the effect of both fundoplication and hiatal hernia repair. They are focused on the safety and the advantages of robot-assisted surgery over conventional and laparoscopic surgery. Regardless of the type of fundoplication, a thorough preoperative evaluation of the patient is critical to subsequent outcomes. This evaluation includes preoperative esophagogastroduodenoscopy, radioscopic contrast examination of the esophagus and stomach, and CT of the abdomen and chest. The robotic approach helps to achieve excellent long-term results in the treatment of hiatal hernias. The two performed interventions have short follow-up period and are insufficient in number to conclude the non-inferiority or benefits of the transthoracic robotic-assisted approach. Prospective randomized trials are needed to obtain more data for the effectiveness of the method.

5. CONCLUSIONS

The transthoracic robotic approach for type 1 hiatal hernias is a technically challenging, but applicable technique, with rapid postoperative recovery and low risk of intra- and postoperative complications observed in the studied patients. Robotic surgery is an accepted method for the treatment of this type of disease. but more studies with longer follow-up periods regarding the transthoracic approach are needed to confirm its advantages and disadvantages in terms of recurrence rates and postoperative complications.

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