

Three cases of robotic funduplication for gastro-esophageal reflux in children

**Mario Lima Sara Ugolini Giovanni
Parente Michele Libri Giovanni Ruggeri**

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Abstract. In the last decade the use of robot Surgical System has been largely reported to be a safe and effective approach for fundoplication in children, which is up to date the most commonly offered application of this technology in pediatric gastrointestinal surgery. The aim of this report is to describe three cases of our early clinical experience in performing robot-assisted hemifundoplication for gastro-esophageal reflux. No complications were recorded in the immediate postoperative time as well as at a one month follow-up. All treated children experienced a complete release of the symptoms. In our opinion, robotically assisted hemifundoplication in children is safe and feasible.

Keywords. Robotic surgery, robot, fundoplication, gastro-esophageal reflux, Minimal Invasive Surgery, children

Corresponding author:

Professor Mario Lima, MD

Department of Pediatric Surgery

University of Bologna

Policlinico Sant'Orsola-Malpighi

Via Massarenti 11, 40138 Bologna, ITALY

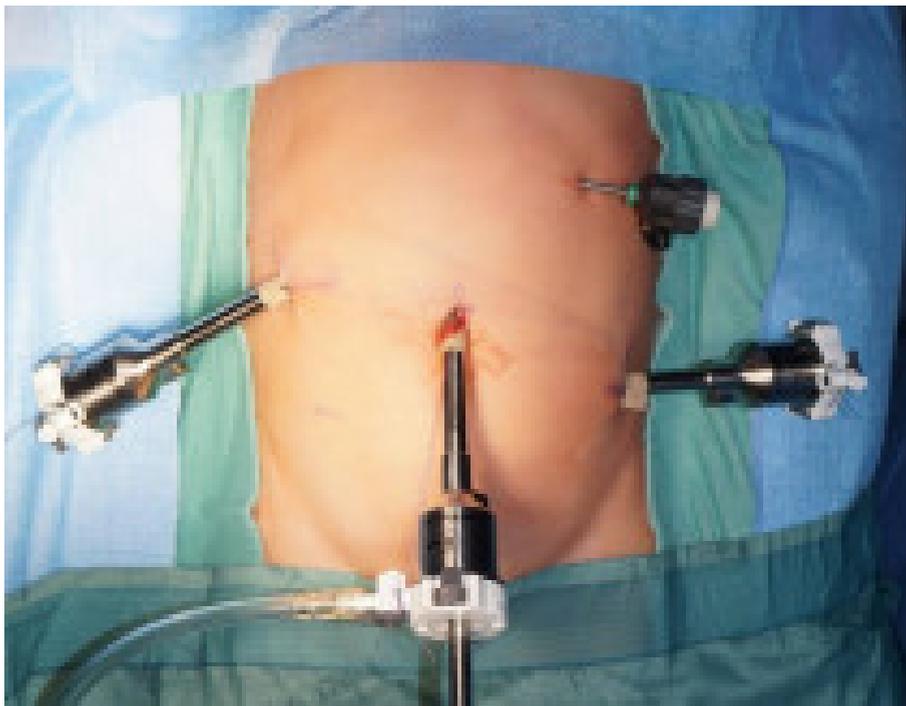
mario.lima@unibo.it

1. Introduction

Gastro-Esophageal Reflux (GER) in children is frequently an indication for fundoplication [1]. Even though the open and laparoscopic techniques provides comparable quality of life, the minimal-access approach has been associated with reduced incidence of retching at long-term follow-up [2]. Described intraoperative and postoperative complications range between damage to the vagus nerve, perforation of the oesophagus/stomach and dysphagia, ileus, wound infection, wrap breakdown respectively. Robot-assisted surgery offers great advantages over the conventional laparoscopic technology such as the natural movement of the surgeon's hand, wrist and fingers which is best seen in complex procedures [3,4]. On the other hand, disadvantages are still long operative time, high costs and limited instrument selection and the fact that long-term clinical outcome has to be estimated yet [5]. In the last decade the use of robot Surgical System has been largely reported to be a safe and effective approach for fundoplication in children [6], which is up to date the most commonly offered application of this technology in pediatric gastrointestinal surgery [7]. In fact, conventional and Robot-assisted Minimal-Invasive Surgery (MIS) have been suggested to present similar clinical outcome [1,8,9]. Despite many studies have been published concerning the safety and feasibility of the robotic approach, none randomized trial is available regarding evidence of a real benefit over conventional laparoscopy [1,4,5,10-12]. We report our early experience in robotic fundoplication performed in children.

2. Material and Methods

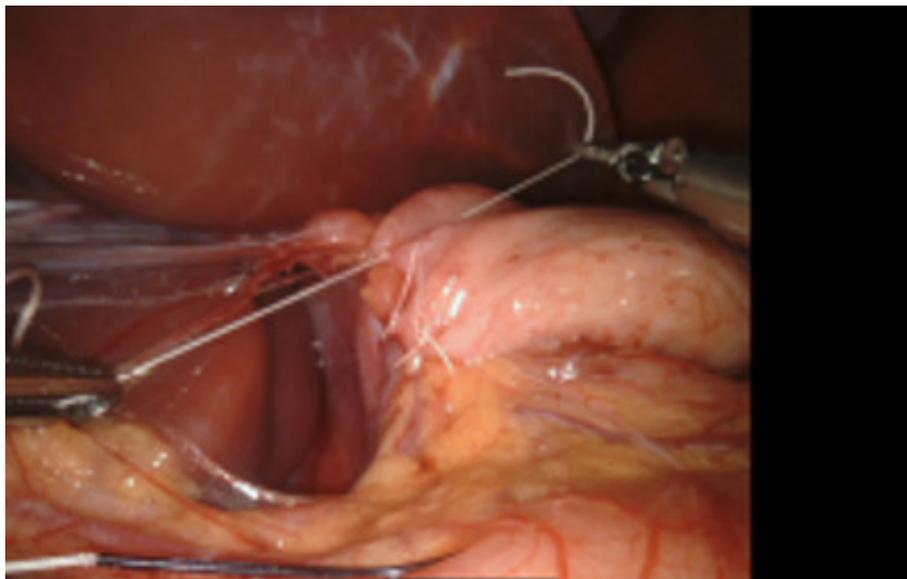
We have used Da Vinci Xi Surgical System (Intuitive Surgical) for almost one year, starting from February 2016 performing a variety of pediatric procedures. Three patients underwent anterior hemifundoplication (Dor): all were female of about 12, 5, and 6 years old, with a diagnosis of Gastro-Esophageal Reflux Disease (GERD) previously documented by barium esophagography and a esofago-gastro-duodenoscopy (EGDS) with positive biopsies; All of them have been treated with PPI with no/poor response. Furthermore, one of them was diagnosed an inlet patch of gastric mucosa in the cervical oesophagus treated successfully by endoscopic diathermy coagulation and clip application. All three patients were considered eligible for robotic-assisted anterior hemifundoplication. The System consists of a console connected to a surgical arm cart with a 3-D endoscope and three instrument arm. Three 8 mm trocars have been employed for the procedure: right hypochondriac region, supraumbilical and left flank. An accessory 3-5 mm trocar in the left hypochondriac region was used for liver retraction (Fig.1). All patients were admitted to the ward with a Naso-Gastric Tube (NGT) and a vesical catheter. Clinical data on post-operative outcome were recorded and a follow-up of one month was observed.

Figure 1. Position of trocars

3. Results

We report three cases of children undergoing robot-assisted pediatric hemifundoplication (Fig.2). Children had a mean age of 7 years old (range: 5-12) and operative times were about 110, 80 and 70 minutes (mean value 87 minutes). Immediately after surgery the patients were admitted to the ward: Patient1 removed the NGT and catheter during the first post-operative day and at the same time was reintroduced the oral feeding; Patients 2 and 3 removed the catheter immediately after surgery and the NGT/started the oral feeding in first post-operative day. No technical failure or perioperative complications were observed and patients have been discharged on the tenth, fifth and fifth post-operative day. All of them at one month follow-up have shown the complete release of symptoms.

Figure 2. Anterior hemifundoplication (Dor) using Da Vinci system



4. Discussion

Minimal Invasive Surgery (MIS) in children is largely adopted for gastrointestinal, thoracic and urological surgery, given the associated reduced postoperative pain and ileus, length of hospital stay and scarring. In the specific, robotic surgery has been applied in the last decade to a wide range of procedures in pediatric general surgery, marking a new era of laparoscopy. Confirming what previously said, our experience with the Da Vinci Robot have demonstrated various additional advantages besides those associated with the minimal-access: 3-dimensional view, depth perception, wristed movements, intuitive eye-hand coordination, elimination of the fulcrum effect [8]. In the present paper, we aim to present our early case series of robot-assisted hemifundoplication in children. We have used the System for almost one year and up to date we have performed three procedures, showing a good clinical outcome, no complications and operating times comparable to those previously reported. Despite the tangible benefit over conventional laparoscopy, is still under debate [12], we feel that the enhanced technique will provide greater advantages especially in difficult cases requiring greater precision and minimize complications. This work highlights feasibility and safety of robotic surgery for hemifundoplication in children and may be the basis for a future for further studies to evaluate best indications.

5. References

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