

DOMENICO RUSSELLO
Editor

WHAT'S NEW *in* **LAPAROSCOPIC** **SURGERY?**



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Preface

This work aims to close the range of didactic activities related to the International Master in *Mininvasive Surgery and New Technologies*, organised by the Superior School of the University of Catania for the academic year 2008-2009.

“What’s new in Laparoscopic Surgery” collects the medical scientific essays written by national and international teachers whose advanced experience and competence have significantly contributed to promote this post-graduated course.

As Director of this Master, I am deeply proud to present this work which is the direct evidence of the profitable collaboration with colleagues of great relevance and huge experience.

It is a privilege for me to conclude the third edition of the International Master in Mininvasive surgery with this volume where experience, technique and competence merge together.

As we know, today, there is very little in the field of medicine that has not been affected by new technology. We strongly feel the necessity to enhance professional skills and qualities. That’s why our University offers this high-quality learning course to the Mediterranean basin countries. A strong relationship with the Universities of these areas has been created in order to develop a scientific and cultural link between different nations for program-based approaches to work together.

During the last twenty years, the surgical science has been affected by a technological revolution without precedents. These changes have been very considerable for the development and for the spread of mininvasive techniques. These, following a first experimental period, have strongly risen in order to reach today very high application levels.

Laparoscopic surgery has been really influenced by the improvement of medical products. The possibility to expand the surgical field and the new surgical instruments have contributed to the wide diffusion of mininvasive techniques. A so quick evolution has requested a revision of well established procedures and methods. But, above all, it has required a specific knowledge related to the different technical supports.

Nowadays, the high-quality technical approach of mininvasive surgery necessarily leads to more sophisticated solutions in order to overcome some possible problems due to human limits. A specific innovative equipment allows to simplify different surgical tricks as well as repeating the same surgical procedures.

Mininvasive surgery requires an accurate use of hands: surgeons have to follow formative training, in order to acquire specific abilities and strengthen previous competences.

Both theoretical and practical training can be achieved in specialised structures equipped with suitable technological supports and above all, provided with advantageous competences. Thank to this concept, we could reach the well known learning curve that is essential in every country in order to fulfill these procedures.

Therefore, a correct education is fundamental to reach high qualitative standard. This is absolutely necessary in our surgical field where the comparison between the manual experience and the technological evolution is a current theme.

As we enter the 21st century, the development of new medical products leads directly into a new era of robotic innovations.

At the same time, the digital technology allows to transfer pictures and interactive video sessions from one surgical center to another in order to promote and facilitate equiped data exchange as well as the surgical research.

Technology won't improve surgery with the discovery of new procedures but it will improve surgical technique. In fact, robotic techniques increase the surgeon's ability to repeat accurate and efficient procedures.

Minimally invasive technologies as well as robotics are fundamental to support the surgeon's own skills, that's why our University firmly believe in this project.

Lastly, I would like to thank to the staff of the Superior School of Catania for their efforts devoted to promoting and preparing the organizational activities, the General Direction of the Cannizzaro Hospital for giving us their support.

Finally, I would like to express my sincere gratitude towards Dr. Valentina Randazzo and Dr. Valeria Alescio for their valuable contribution to this project which promotes the cultural significance of human relationships.

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LAPAROSCOPIC HELLER-DOR FOR PRIMARY ESOPHAGEAL ACHALASIA: OUTCOMES IN 158 PATIENTS

R. Rosati, S. Massaron, U. Fumagalli

1

INTRODUCTION

Laparoscopic Heller myotomy combined with the Dor anterior antireflux fundoplication is widely used to treat stage I-III achalasia¹⁻³. The laparoscopic approach has been shown to be safe and effective, offering the same functional results as laparotomy⁴⁻⁸ but with all the advantages of minimally-invasive surgery. This paper presents long-term outcomes of Heller-Dor in a consecutive series of patients with achalasia treated in our centre from 1992. Based on this experience, we discuss details of the operation which contribute decisively to long-term resolution of dysphagia with minimum or no gastroesophageal reflux.

MATERIALS AND METHODS

Between November 1992 and January 2009, 158 patients (84 men, 74 women) of median age of 47 years (range 9-86) underwent laparoscopic Heller-Dor for esophageal achalasia. Dysphagia was mild in 8 (5.1%) patients, moderate in 65 (41.1%) and severe in 85 (53.8%). Based on X-ray findings, 9 patients had stage I achalasia (esophageal diameter <4 cm), 120 had stage II (esophageal diameter ≤4 <6 cm), 17 had stage III (≤6 cm) and 12 had stage IV (dolichomegasophagus). The stage IV patients underwent Heller-Dor as a conservative alternative to esophagectomy. Preoperative work-up included barium swallow, esophagoscopy, and esophageal manometry in all patients. Mean esophageal diameter, as measured on barium swallow study, was 50 mm (range 20-90). Median basal and residual

lower esophageal sphincter (LES) pressure, respectively, at manometry were 32 mmHg (range 10-93) and 12 mmHg (range 3-30). Twenty-one patients (13.3%) had undergone a median of 1 (range 1-4) endoscopic dilations before surgery, 7 (4.4%) had received a median of 1 (range 1-4) endoscopic injections of Botox, and 2 (1.3%) had Botox injection and subsequent endoscopic dilatation.

All laparoscopic procedures were performed under general anesthesia and concurrent flexible esophagoscopy control as described elsewhere¹. On the first day post surgery, all patients received a liquid contrast esophagogram.

Follow-up was clinical examination and barium swallow a month after surgery, clinical examination, endoscopy, and manometry within a year, clinical examination or telephone interview after one year. Twenty-four-hour pH monitoring (impedance monitoring after September 2004) was offered to all patients at the same time as the endoscopy and manometry, but only 43 patients consented.

Statistical analysis

The statistical analysis was carried out using Stat Software for Windows (StatSoft, Inc., Tulsa, USA). Descriptive statistics are presented as median with ranges and means with standard deviations. The Mann-Whitney U test was used to compare two independent groups of data.

RESULTS

Intraoperative complications were one (0.6%) splenic lesion treated by electrocautery

and 25 (15.8%) cases of mucosal perforation. In one case the tear was in the mediastinal esophagus, and in the other 24 cases was at the gastro-esophageal junction. Two gastro-esophageal perforations occurred when the anesthesiologist exerted inappropriate force on the nasogastric tube. The first two cases of mucosal perforation were converted to open surgery for repair, all others were sutured laparoscopically. Laparotomy was also required in another case to overcome difficult exposure due to a hypertrophic left liver lobe. All three (1.9%) conversions occurred in first 10 operations. For the 155 procedures completed laparoscopically, median operating time was 90 min (range 59-200 min).

There was no perioperative mortality. All sutured mucosal perforations healed without requiring the nasogastric aspirator to be left in place for longer than usual (i.e. first 24 hrs).

Postoperative complications occurred in five (3.2%) patients: minimal leak at gastrographin swallow in two (1.3%) (in whom gross intraoperative mucosal perforation was not evident), bleeding from acute gastric ulcer in one, trocar-related hemoperitoneum in one, and displacement of abdominal drainage in another. The first three postoperative complications were treated conservatively, the other two required a repeat laparoscopy. Liquid intake in uncomplicated patients was possible on the first post surgical day. A soft diet was resumed a median of two days (range 2-16) after the operation. Median postoperative hospital stay was 3 days (range 3-14).

After a median follow-up of 23 months (range 1-156), clinical evaluation showed complete symptoms relief in 126 patients (79.7%), whereas 30 (19%) reported occasional mild dysphagia; thus 156/158 (98.7%) patients had satisfactory outcomes.

Two patients (1.3%) had severe persistent dysphagia. One had an incomplete myotomy and was dilated while the other had a huge dolichomegacosophagus (we proposed esophagectomy but he refused).

Four (2.5%) patients had reflux symptoms and three (1.9%) required chronic proton

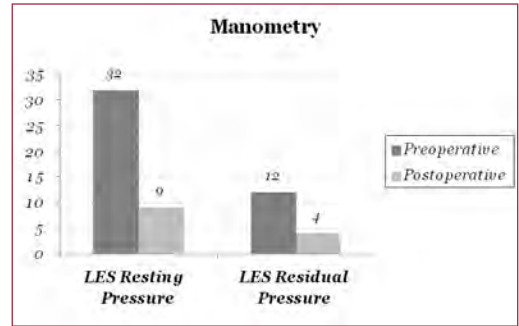


Fig. 1.1 Resting and residual LES pressure before and after surgery (one year follow up) in 70 patients who received laparoscopic Heller-Dor for esophageal achalasia.

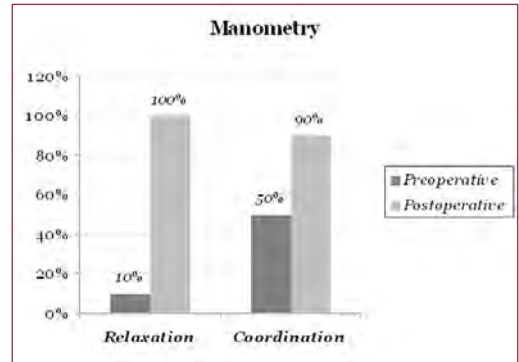


Fig. 1.2 Relaxation and coordination of LES pressure before and after surgery in 70 patients who received laparoscopic Heller-Dor for esophageal achalasia.

pump inhibitor therapy. Esophageal diameter reduced from a mean of 50 mm (range 20-90) to a mean of 25 mm (range 15-80). Manometry was performed in 70 patients at one year follow up (other patients refused to perform the examination). In all cases LES pressure reduced in comparison to preoperative levels (Figs. 1.1 and 1.2). Basal LES pressure reduced from a median of 32 mmHg (range 10-93) to 11 mmHg (range 5-21) ($p < 0.01$, Mann-Whitney U test) and residual pressure reduced from 12 mmHg (3-30) to 4 mmHg (1-8) ($p < 0.01$, Mann-Whitney U test).

Twenty-four hour pH monitoring showed abnormal pH ($\text{pH} < 4 > 5\%$ of time) in 2/41 (4.9%) patients. Twenty-four hour impedance monitoring showed episodes of non-acid reflux in six patients, due to reduced esophageal clearance.

DISCUSSION

We performed open surgery Heller-Dor during the 1970s and 1980s, showing that it was a safe and durably effective procedure for esophageal achalasia⁸ and were among the early adopters the laparoscopic operation at the beginning of the 1990s¹. To increase the safety and reduce the difficulty of the laparoscopic procedure we soon introduced intraoperative endoscopy¹ and Peracchia-Rosati myotomy scissors (Microfrance Medtronic, Sr. Aubin Le Monial, France)⁹. Peracchia-Rosati scissors are modified Sugarbaker pericardiotomy scissors and are characterized by the presence of a smooth and rigid electrically insulating sleeve encasing the lower scissor blade⁹. By gently introducing the scissor-tip (encased in its rounded sleeve) into the plane between the circular muscle and underlying submucosa, the muscle is isolated and cut without damaging the mucosa. At the same time electrocautery can be used liberally to control bleeding. Use of these scissors ensures that the muscle layer is cut cleanly with undamaged borders, which is important for secure suture of the cut borders to the gastric fundus during fundoplication¹⁰.

The success of the operation also depends on careful adherence to a number of technical procedures during the operation. Thus, the anatomic attachments of the area gastroesophageal area must be preserved: only the phrenogastric ligament on occasion may need to be divided to attain a floppy anterior wrap. The short gastric vessels should almost never be sectioned (in only two cases of the present series were these vessels divided)^{5,11}. Esophagoscopy transillumination is used to facilitate identification of the plane between the submucosa and circular muscle and makes it easier to detect inadvertent mucosal perforation.

The extension of the myotomy to the cardia has to be minimal and basically limited to just beyond the esophagogastric junction. Failure to section all the muscle fibers of the cardia wall is frequently responsible for persistent or recurrent dysphagia¹¹. We use a hook as the

instrument of choice for dividing the muscle fibers here. The changing direction of the fibers – circular in the esophagus to oblique in the cardia – is best visualized by esophagoscopy transillumination and mild distension of the cardia with smooth insufflation. The cardia is more richly endowed with blood vessels than the esophagus and bleeding can be pronounced: it must be controlled effectively but with great care since coagulation can cause immediate or delayed mucosal perforation. In previously treated patients, fibrosis is often prominent in this region, making it difficult to dissect between muscle and submucosa. After Botox treatment, in particular, the muscle layers become strongly attached to a whitish fibrotic tissue that is particularly difficult to dissect. Seven out of 25 mucosal perforations occurred at this level.

All 25 mucosal perforations were recognized and repaired intraoperatively, in 23 with laparoscopic suture, without clinical consequences, in 2 after conversion to open surgery. Two gastroesophageal perforations occurred when the anesthesiologist pushed on the nasogastric tube without waiting for the go-ahead from the surgeon. We emphasize that maneuvers by the endoscopist or anesthesiologist should always be authorized by the surgeon and performed under visual control. When the mucosa is perforated, one to two 5-0 absorbable sutures tied intracorporeally are sufficient to effective repair.

Addition of a Dor fundoplication to the myotomy provides additional protection to the esophageal mucosa, allowing early resumption of oral feeding, and also helping to prevent scarring of the cut edges of the myotomy. In particular, the practice of fixing the cranial suture of the wrap on each side not only to the myotomy edges but also to the diaphragmatic crura helps to keep the edges of the myotomy apart and discourage the formation of scar tissue on the muscle.

The main reason for fundoplication after myotomy is prevent reflux of gastric fluids into the esophagus¹². However there is no consensus regarding the need for fundoplication after myotomy for achalasia. There is also contro-

versy regarding the type of fundoplication that should be performed¹². In a previous paper on 79 patients referred to us after failed esophagomyotomy performed elsewhere, the problem was reflux esophagitis in 22.8%, and persistent dysphagia following incomplete myotomy after Heller-Nissen in the remaining cases¹¹. Even with a single episode of reflux, defective esophageal clearance in persons with achalasia means that gastric juice is in prolonged contact with the esophageal mucosa. To prevent reflux and the resulting esophagitis, some authors advocate Nissen fundoplication^{13,14}. However a balance must be struck between addressing the dysphagia and preventing subsequent reflux: this boils down to constructing a non-obstructive but effective fundoplication. We believe that the only situation where fundoplication should be not necessary is when thoracoscopic myotomy is performed¹⁵. With the thoracoscopic approach, hiatal attachments are only minimally damaged and iatrogenic reflux is rare. However, the myotomy is more difficult and more often incomplete at the level of the lower part of the lower esophageal sphincter, so that dysphagia is more common¹². When a trans-abdominal Heller is performed, either laparoscopically or in by open surgery, using optimal technique (minimal dissection of anterior esophagus, no circumferential dissection), a partial anterior wrap – such as the Dor fundoplication – is more than sufficient to prevent reflux in the great majority of cases¹⁶. Partial posterior fundoplications, such as the Toupet¹⁷ or Nissen, require greater mobilization of the esophagogastric junction with circumferential dissection.

Even a floppy Nissen, which has been reported to produce good results¹⁴, should, in our opinion be reserved for patients with effective esophageal motility, and not for those with a primary motor disorder like achalasia¹⁸.

An important result of the present series is that functional outcomes in terms of basal and resting pressures in the lower esophageal sphincter were similar to those of Dor *et al.* in their open series published in 1962⁵.

To conclude, the excellent long-term clinical and functional results presented in this

paper demonstrate the effectiveness, feasibility and safety of laparoscopic Heller myotomy combined with Dor fundoplication as a treatment for achalasia; careful attention is paid to the technical details discussed above. The main advantages of the laparoscopic approach over the open procedure are reduced trauma and pain with shorter post-operative hospitalization. Laparoscopic Heller-Dor should be considered the first choice surgical option for the treatment of esophageal achalasia.

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