

## Trocar-related abdominal wall bleeding in 200 patients after laparoscopic cholecistectomy: Personal experience

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### Abstract

**AIM:** To determine the complications and incidence of the first and second access-related vascular injuries induced by videolaparoscopic cholecistectomy.

**METHODS:** We retrospectively reviewed vascular injuries in 200 consecutive patients who underwent videolaparoscopic cholecistectomy from 2003 to 2005. One hundred and one patients with placement of radial expanding trocars were assigned into group A and 99 patients with placement of pyramidal tipped trocars into group B. All the patients were submitted to open access according to Hasson for the first trocar.

**RESULTS:** Bleeding did not occur at the intraoperative cannula-site in group A. However, it occurred at the intraoperative cannula-site of 7 patients (7.1%) in group B, with a statistically significant difference ( $P < 0.01$ ). No mortality was registered. More vascular lesions were found in group B.

**CONCLUSION:** The advantage of Hasson technique is that peritoneal cavity access is gained under direct vision, preventing most severe injuries. The open technique with radial expanding trocars is recommended for secure access to the abdominal cavity in videolaparoscopy. Great care should be taken to avoid major complications and understanding the abdominal wall anatomy is important for reducing bleeding during or after s placement of trocars.

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**Key words:** Videolaparoscopy; Minor vascular complications; Trocars; Prevention

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### INTRODUCTION

As minimally invasive techniques become more popular in modern surgery, laparoscope is now an instrument used by almost all surgical disciplines<sup>[1]</sup>.

Primary and secondary accesses to the peritoneal cavity are the most crucial phases of laparoscopy. In fact vascular and visceral injuries (0.003%-6%) have been reported secondary to incisions made for positioning the laparoscopic cannulae or ports<sup>[1-3]</sup>.

These injuries usually occur during the initial phase of operation or during placement of secondary cannulae, which should be placed under direct vision and with prior transillumination of the abdominal wall<sup>[4]</sup>. The technique of open laparoscopy developed by Harrith M. Hasson in 1970<sup>[4]</sup> combines safety of minilaparotomy with versatility of laparoscopy. This open access technique has also been introduced with the aim of reducing such injuries<sup>[3]</sup>.

The aim of this study was to evaluate our laparoscopic experience with a focus on access-related vascular injuries and compare the effectiveness of two different types of trocar.

### MATERIALS AND METHODS

We retrospectively reviewed the vascular injuries in 200 consecutive patients who underwent videolaparoscopic cholecystectomy in our university hospital from 2003 to 2005, with the approval of the ethics committee of our hospital.

One hundred and one patients with placement of radial expanding trocars (Ethicon Endo-Path Excel Endo-Surgery<sup>®</sup>) were assigned into group A and 99 patients with placement of pyramidal tipped trocars (Ethicon Endo-Path Tristar Endo-Surgery<sup>®</sup>) into group B. All the patients were submitted to open access according to Hasson for the first trocar, and then the following trocars were introduced under direct vision, after abdominal wall puncture and transillumination. We even used "open access" as previously described<sup>[4]</sup>.

Carbon dioxide was insufflated into the intra-abdominal cavity with a pressure of 10-12 mmHg. We did not formally evaluate the time needed to achieve

abdominal entry and distension during open laparoscopy, but we noted that it generally varied from 3 to 10 min. Time variations depended on patient weight, abdominal wall strength, a well-developed Richet's fascia and post-operative fibrosis.

The diameter of Hasson, subxyphoid, and hypocondriac trocars was 10, 5, and 10 mm, respectively. The "primary access-related complications" were defined as those caused by the introduction of the first trocar and the "secondary access-related complications" as those caused by the introduction of the second or following trocars in the open access using Hasson's technique.

## RESULTS

The age, gender, clinical history, comorbidity and American Society of Anesthesiology (ASA) classification of the patients were similar in both groups (Table 1).

Primary access-related complications occurred in 7 cases (3.5%), all in group B. No first-trocar lesions (Hasson-related) were registered in the two groups. Secondary access-related complications occurred in 6 cases of epigastric vessels injuries, all of which were treated with direct suture by the end of general anaesthesia (in all cases the bleeding started at the disinflation of pneumoperitoneum). One case (0.5%) of large abdominal wall haematomas was managed conservatively. No bleeding occurred at the intraoperative cannula-site in group A. However, bleeding occurred in 7 patients (7.1%) of group B, with a statistically significant difference ( $P < 0.01$ ). Statistical analysis was performed by  $\chi^2$  test and  $P < 0.01$  was considered statistically significant. No intraoperative morbidity or mortality was registered in our study.

## DISCUSSION

Between 1997 and mid-2002, FDA received more than 1300 trocar-associated injury reports, including 30 deaths. Hemorrhage due to vessel injury and infection secondary to bowel injury, especially when diagnosis is delayed, are the most serious complications which most likely result in death. Most data suggest that the rate of trocar-related complications is about 0.003%-6% and the average incidence of trocar-related vascular injuries is approximately 0.1%<sup>[5,6]</sup>.

Minor vascular injuries are referred to the injuries to vessels of lesser importance than the aorta, inferior vena cava and iliac vessels. By far, the most common minor vascular injury of the inferior epigastric vessels occurs in up to 2.5% of laparoscopic cholecystectomies<sup>[3,7]</sup>.

The major advantage of the open access technique using a step-by-step entrance to all layers of the abdominal wall is that peritoneal cavity access is gained under direct vision, preventing severe injuries<sup>[5]</sup>.

The "11 secured steps" for the safe insertion of trocars using conical disposable trocars are recommended<sup>[8]</sup>. A randomized study comparing the conventional cutting with radial expanding trocars at all port sites reported that there is a significant difference in cannula-site bleeding and post-operative wound complications, which is in favour of using radial expanding trocars<sup>[9]</sup>.

Table 1 Personal experience

	Group A	Group B	P
Equipe position	French	French	-
ASA class I / II / III	10/64/27	8/72/19	NS
Bleeding comorbidities	4%	1%	NS
Type of trocar	Conical	Pyramidal	-
Patients	101	99	NS
M:F ratio	0.6:1	0.6:1	NS
Age (mean)	62	64	NS
Body weight (mean, Kg)	72.7	70.8	NS
Bleeding (7 cases = 3.5%)	0	7 (7.1%)	< 0.01
Relaparotomy	0	0	0
Mortality	0	0	-

In a rabbit model, the relative risk of vessel injury induced by pyramidal tipped trocars is significantly increased compared with that induced by conical tipped trocars, especially if larger diameter trocars are used. The smooth contour of the conical tip stretches and separates the tissue layers with little damage, whereas the sharp-edged pyramidal tip lacerates any tissue it encounters, including vessels, even if the trocar is inserted directly over (in 88% of cases, partial interruption of vessel) or at 1-2 mm from the vessel (no injuries)<sup>[10,11]</sup>.

In 1999, Balzer KM *et al*<sup>[11]</sup> dissected the abdominal walls of 21 cadavers transversally and measured the morphometric distances as well as determined the distances of the epigastric arteries and the ascending branch of the deep circumflex iliac artery from the midline and lateral edge of rectus muscle. The results showed that in order to minimize the danger of lesions of abdominal vessels, trocars should be placed in the ventral midline or in a 5 cm wide zone to the lateral border of the rectus sheath.

If prevention fails, it is possible to try to tamponade by applying pressure to the abdominal wall with a balloon trocar or a Foley catheter pulled against the abdominal wall and attached to a clamp (the temporary pressure usually stops bleeding from small vessels or veins), which should not be used to stop the bleeding at the trocar site.

If significant bleeding occurs, ligation is needed using Keith or Reverdin needle and large suture that can be removed in the recovery room when the patient awakens. Occasionally, in catastrophic bleeding from the abdominal wall, an incision should be made to dissect down the bleeding vessels and control the bleeding by ligation<sup>[12]</sup>.

In conclusion, the risk of vessel injury varies markedly with the different trocars used. The open technique with radial expanding trocars is recommended for access to the abdominal cavity during videolaparoscopy. However, open laparoscopy cannot prevent small bowel injury or post-operative herniation, but can eliminate failed laparoscopy attempts, inappropriate insufflation, gas embolism, peritoneal, stomach, colon and vessel injury.

## REFERENCES

- 1 Tarnay CM, Glass KB, Munro MG. Incision characteristics associated with six laparoscopic trocar-cannula systems: a randomized, observer-blinded comparison. *Obstet Gynecol* 1999; **94**: 89-93
- 2 Moberg AC, Montgomery A. Primary access-related compli-

- cations with laparoscopy: comparison of blind and open techniques. *Surg Endosc* 2005; **19**: 1196-1199
- 3 **Merlin TL**, Hiller JE, Maddern GJ, Jamieson GG, Brown AR, Kolbe A. Systematic review of the safety and effectiveness of methods used to establish pneumoperitoneum in laparoscopic surgery. *Br J Surg* 2003; **90**: 668-679
- 4 **Hasson HM**, Rotman C, Rana N, Kumari NA. Open laparoscopy: 29-year experience. *Obstet Gynecol* 2000; **96**: 763-766
- 5 **Fuller J**, Scott W, Ashar B, Corrado J. Laparoscopic Trocar Injuries: A report from a US Food and Drug Administration Center for Devices and Radiological Health Systematic Technology Assessment of Medical Products Committee. FDA, 2003
- 6 **Jansen FW**, Kolkman W, Bakkum EA, de Kroon CD, Trimbos-Kemper TC, Trimbos JB. Complications of laparoscopy: an inquiry about closed- versus open-entry technique. *Am J Obstet Gynecol* 2004; **190**: 634-638
- 7 **Geers J**, Holden C. Major vascular injury as a complication of laparoscopic surgery: A report of three cases and review of the literature. *Am Surg* 1996; **62**: 377-379
- 8 **Semm K**, Semm I. Safe insertion of trocars and the Verres needle using standard equipment and the 11 security steps. *Gynaecol Endosc* 1999; **8**: 339-347
- 9 **Bhojru S**, Payne J, Steffes B, Swanstrom L, Way LW. A randomized prospective study of radially expanding trocars in laparoscopic surgery. *J Gastrointestinal Surg* 2000; **4**: 392-397
- 10 **Hurd WW**, Wang L, Schemmel MT. A comparison of the relative risk of vessel injury with conical versus pyramidal laparoscopic trocars in a rabbit model. *Am J Obstet Gynecol* 1995; **173**: 1731-1733
- 11 **Balzer KM**, Witte H, Recknagel S, Koziarka J, Waleczek H. Anatomic guidelines for the prevention of abdominal wall hematoma induced by trocar placement. *Surg Radiol Anat* 1999; **21**: 87-89
- 12 **Champault G**, Cazacu F, Taffinder N. Serious trocar accidents in laparoscopic surgery: a French survey of 103,852 operations. *Surg Laparosc Endosc* 1996; **6**: 367-370

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