UIJ UroToday International Journal®

www.urotodayinternationaljournal.com
Volume 2 - December 2009

Direct Trocar Insertion Compared With Open Laparoscopy (Hasson Technique) in Patients Undergoing Urolaparoscopic Surgery

Siavash Falahatkar, Mohammad Nadjafi Semnani, Zahra Panahandeh, Aliakbar Allahkhah, Seyedeh Atefeh Emadi, Sanaz Sadat Motevali, Negin Khaki, Roya Behboudi

Urology Research Center, Guilan University of Medical Sciences, Rasht, I.R. Iran

Submitted August 17, 2009 - Accepted for Publication October 6, 2009

ABSTRACT

INTRODUCTION: The purpose of the study was to compare the ease of use, safety, and efficacy of direct trocar insertion (DTI) and open access (Hasson technique) in laparoscopic surgery. This is the first known report of DTI used in urolaparoscopy.

METHODS: The study was a retrospective evaluation of patients referred for laparoscopic procedures between December, 2005 and June, 2008. A total of 148 patients were studied; 62 patients (41.9%) received DTI and 86 patients (58.1%) received open laparoscopy. Patients were not randomly assigned to treatment groups. For the DTI, the abdominal wall was lifted and the trocar was pushed through the fascia and muscle layer. The surgeon felt when the trocar had pierced the peritoneum and entered the abdominal cavity. For the open technique, the peritoneal cavity was opened under direct vision and the trocar was inserted. The variables measured were access time, minor and major complications, visceral and vascular injury and bleeding, conversion to open surgery, length of hospitalization, failed entry, and abdominal pressure for creation of the pneumoperitoneum. Chi-square and *t* tests were used to compare categorical and continuous variables, respectively.

RESULTS: The mean length of hospitalization was 26.95 hours (SD = 7.78) for patients receiving DTI and 30.44 hours (SD = 13.98) for patients receiving open laparoscopy, but the difference was not statistically significant ($P > .05$). The mean access time for DTI was 91.75 seconds (SD = 79.77), which was significantly shorter than the mean access time of 263.97 seconds (SD = 119.28) for patients receiving open laparoscopy ($P < .0001$). The mean abdominal pressure for creation of the pneumoperitoneum with DTI was 16.17 mmHg (SD = 1.46), which was significantly higher than the mean abdominal pressure of 15 mmHg (SD = 0) with open laparoscopy ($P < .0001$). There were very few complications in either study group. Although 11 patients (17.74%) in the DTI group and 7 patients (8.14%) in the open laparoscopy group had previous open abdominal or groin surgery, the previous surgeries did not negatively impact the laparoscopic procedures ($P = .01$). There were no entry failures in either group.

CONCLUSIONS: DTI is faster and appears to be more efficacious for some aspects of surgery than the open laparoscopy technique, although the safety of the two techniques is equivalent. The authors suggest that direct trocar insertion can be used in urolaparoscopic surgeries. Future prospective studies with larger numbers of patients randomly assigned to treatment groups are needed to confirm the results.

KEYWORDS: Laparoscopic surgery; Direct trocar insertion; DTI; Laparoscopic access; Pneumoperitoneum; Emphysema; Urolaparoscopy; Endopth Xcel trocar

CORRESPONDENCE: Siavash Falahatkar M.D., Guilan University of Medical Sciences, Urology Research Center, Razi Hospital, Sardare Jangal Street, Rasht, Guilan 41448, Iran (falahatkar_s@yahoo.com).

CITATION: *UroToday Int J*. 2009 Dec;2(6). doi:10.3834/uij.1944-5784.2009.12.03

UroToday International Journal®

original study

Direct Trocar Insertion Compared With Open Laparoscopy (Hasson Technique) in Patients Undergoing Urolaparoscopic Surgery

INTRODUCTION

The goal of laparoscopy is to minimize patient morbidity while maintaining successful outcomes [1]. The laparoscope is as an essential diagnostic and therapeutic operative tool [1,2,3]. With the expanded incorporation of laparoscopy into surgery over the last 15 years, there have been studies assessing complications related to its use [4-7]. Most of the complications are associated with the blind entry of needles and trocars into the abdominal cavity [1,8]. Significant complications from laparoscopy are primarily visceral and vascular injury [9-11].

In minimal access surgery, the technique of first entry inside the human body with a telescope and instruments is called the *access technique* [9]. Different techniques have been described for the induction of a pneumoperitoneum to start laparoscopy [11].

There are 4 basic techniques used to create a pneumoperitoneum: (1) blind Veress needle (VN), (2) direct trocar insertion (DTI), (3) optical insertion, and (4) open laparoscopy (Hasson technique) [1,9]. Control of the laparoscopic trocar as it penetrates each layer of the anterior abdominal wall is essential [12]. Authors of previous studies have suggested that the initial trocar insertion is the most dangerous aspect of its use [13-17] and possibly the most dangerous step in minimally invasive surgery [9]. The DTI technique without preinsufflation is an alternative to VN insertion and open laparoscopy for accessing the abdominal cavity [8,18,19].

The open laparoscopy (Hasson) technique appears to be a popular choice for many urologists. The present authors did not find any study about the efficacy of direct trocar insertion in urolaparoscopy as an alternative to the Hasson technique. The purpose of the present study was to compare the incidence of complications after open laparoscopy versus direct trocar insertion (DTI) and to assess the efficacy and safety of these procedures.

METHODS

Participants

The study was a retrospective evaluation of all patients referred for laparoscopic procedures between December, 2005 and June, 2008. Patients were not randomized into groups. Exclusion criteria were: pregnant women, children under 5 years old, patients with 2 or more previous extensive abdominal operations, or patients with a history of massive bowel distension, uncorrected coagulopathy, or generalized intraabdominal infection (peritonitis).

A total of 148 patients were included. There were 2 groups of patients, defined by the type of surgical procedure they had received: 62 patients (41.9%) received DTI and 86 patients (58.1%) received open laparoscopy. In the group receiving DTI, the mean age was 41.71 years (SD = 16.81 years); in the group receiving open laparoscopy, the mean age was 30.34 years (SD = 14.39). There were no significant differences in patient age between groups ($P < .0001$). The male to female sex ratio was 38:24 in the group receiving DTI and 68:18 in the group receiving open laparoscopy, with no significant between-group difference ($P = .015$).

Previous abdominal surgery was reported in 11 (17.74%) and 7 (8.14%) of the patients receiving DTI and open laparoscopy, respectively. There was a significant group difference in the number of patients receiving previous surgeries ($P = .02$), presumably due to the small number of patients in the 2 groups.

Procedures

Direct trocar insertion. The DTI technique was performed according to guidelines given elsewhere [18]. All patients were placed in the laparoscopic surgery position. After adequate patient relaxation, a 10 mm skin incision was made at the level of the umbilicus. The abdominal wall was lifted by hand or by grasping with tissue-seizing forceps, moving the skin upward. An Endopth Xcel® trocar (Ethicon Endo-surgery, Inc, Cincinnati, OH) was used. Once the tip of the trocar had been inserted through the skin incision, the trocar was pushed through the fascia and muscle layer by a continuous motion with constant

Figure 1. Tip of Trocar (A) Reaching the Fascia, (B) Piercing Through the Fascia. doi: 10.3834/uij.1944-5784.2009.12.03f1

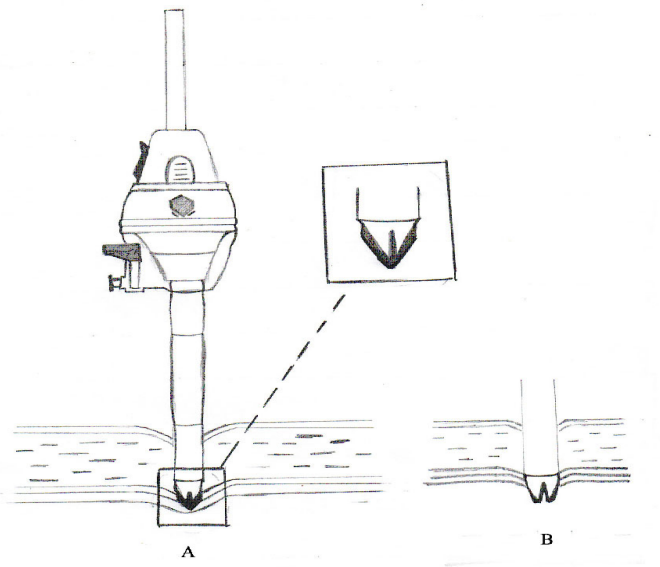


Figure 2a. The Steps of Direct Trocar Insertion, Part 1: Incision of Skin on Umbilicus.
doi: 10.3834/uij.1944-5784.2009.12.03f2a

Figure 2b. The Steps of Direct Trocar Insertion, Part 2: Trocar Pushed Into Abdomen With Elevation of Abdominal Wall.
doi: 10.3834/uij.1944-5784.2009.12.03f2b

pressure, so that the surgeon could easily feel when the trocar had pierced the peritoneum and entered the abdominal cavity (Figure 1, Figure 2a, Figure 2b, Figure 2c). Once visualization of the peritoneal cavity was obtained (for example, see Figure 3), a carbon dioxide pneumoperitoneum was insufflated at a pressure of 15-18 mmHg. For evaluation purposes, the *trocar insertion time* was defined as the interval between skin incision and introduction of the laparoscope. At the end of the procedure, the abdominal wall fascia was sutured along a 10 mm port site.

Open laparoscopy (Hasson technique). Open laparoscopy differed from DTI in that the peritoneal cavity was opened under direct vision and the trocar was then inserted. A Storz nondisposable trocar (Karl Storz GmbH & Co. KG, Tuttlingen, Germany) was used to create the pneumoperitoneum.

Evaluation and Data Analysis

The variables measured were access time, minor and major complications (including subcutaneous emphysema), visceral and vascular injury and bleeding, conversion to open surgery, length of hospitalization, failed entry, and abdominal pressure for creation of the pneumoperitoneum.

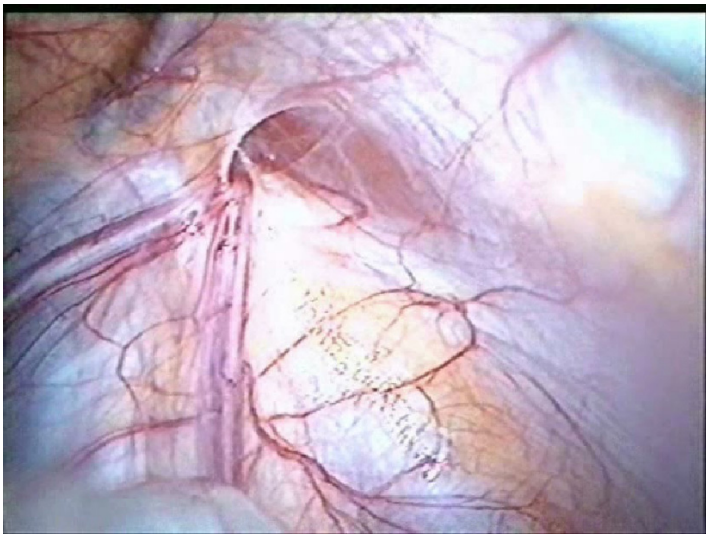
The authors performed the chi-square and *t* tests for comparing categorical and continuous variables, respectively. A test for normal distribution of the variables was not completed. Therefore, there is a possibility that this basic assumption of the *t* test was not met, particularly because of the difference in group sizes.

RESULTS

Table 1 shows the type of surgeries conducted using DTI and open laparoscopy. DTI was used most frequently for ureterolithotomy, pyeloplasty, nephrectomy, and herniorrhaphy. Open laparoscopy was used most frequently for pyeloplasty, diagnostic, nephrectomy, and varicocelectomy.

Figure 2c. The Steps of Direct Trocar Insertion, Part 3: Trocar After Entrance to the Peritoneal Cavity.
doi: 10.3834/uij.1944-5784.2009.12.03f2c

Figure 3. Inserted Trocar Showing Inguinal Hernia.
doi: 10.3834/uij.1944-5784.2009.12.03f3



The mean length of hospitalization was 26.95 hours (SD = 7.78) for patients receiving DTI and 30.44 hours (SD = 13.98) for patients receiving open laparoscopy; the difference was not statistically significant ($P > .05$). The mean access time for DTI was 91.75 seconds (SD = 79.77), which was significantly shorter than the mean access time of 263.97 seconds (SD = 119.28) for patients receiving open laparoscopy ($P < .0001$). The mean abdominal pressure for creation of the pneumoperitoneum with in DTI was 16.17 mmHg (SD = 1.46), which was significantly higher than the mean abdominal pressure of 15 mmHg (SD = 0) with open laparoscopy ($P < .0001$). This may be due to more leakage of gas with open laparoscopy. There were no entry failures in either group.

Table 2 shows the complications resulting from DTI and open laparoscopy. Three patients in the group receiving DTI and 2 patients in the group receiving open laparoscopy had complications. Subcutaneous emphysema, vascular trauma, visceral injury and bleeding occurred in a maximum of 1 patient in either group. One patient receiving DTI had to be converted to open surgery because of massive bleeding during a nephrectomy procedure. Pneumothorax and pneumomediastinum did not occur in any of the patients in either group.

There were 2 cases (3.2%) of intraperitoneal adherence in the group receiving DTI and 5 cases (5.8%) in the group receiving open laparoscopy. These adherences were due to each patient's previous surgeries and not related to the present investigation. Although 11 patients (17.74%) in the DTI group and 7 patients (8.14%) in the open laparoscopy group had previous open abdominal or groin surgery, the previous surgeries did not negatively impact the laparoscopic procedures ($P = .01$).

Table 1. Type of Surgeries for Patients Receiving Direct Trocar Insertion (DTI) and Open Laparoscopy (N = 148). doi: 10.3834/uij.1944-5784.2009.12.03t1

Surgery Type	DTI (n = 62)		Open Laparoscopy (n = 86)	
	n	% n	n	% n
Laparoscopic Orchiopexy	0	0	5	5.81
Ureterolithotomy	13	20.96	2	2.32
Antireflux	0	0	3	3.48
Retroperitoneal Lymph Node Dissection	0	0	1	1.16
Laparoscopic Pyeloplasty	11	17.74	7	8.13
Laparoscopic Diagnostic	5	8.06	14	16.27
Diverticulectomy	0	0	1	1.16
Radical Nephrectomy	3	4.83	1	1.16
Renal Cyst	3	4.83	2	2.32
Pelvic Lymphadenectomy	0	0	1	1.16
Laparoscopic Nephrectomy	12	19.35	10	11.62
Laparoscopic Varicocelectomy	0	0	38	44.18
Nephroureterectomy	0	0	1	1.16
Herniorrhaphy	15	24.19	0	0

Table 2. Surgical Complications for Patients Receiving Direct Trocar Insertion (DTI) and Open Laparoscopy (N = 148). doi: 10.3834/uij.1944-5784.2009.12.03t2

Complication	DTI (n = 62)		Open Laparoscopy (n = 86)	
	n	% n	n	% n
Subcutaneous emphysema	1	1.61	1	1.17
Vascular trauma	0	0	1	1.17
Visceral injury	0	0	0	0
Bleeding	1	1.61	0	0
Conversion to open surgery	1	1.61	0	0

DISCUSSION

Abdominal access and the creation of the pneumoperitoneum carry a risk of visceral and vascular injury [20]. Currently, none of the available modes of entry into the abdominal cavity are free of complications, and solid organs and hollow viscera are prone to trocar injury during the entire course of the laparoscopic procedures [13,19,21-23].

The direct trocar insertion technique was first reported by Dingfelder in 1978 [24] and later described by Copeland et al in 1983 [25], but so far it has been used mainly by gynecologists [19]. According to Copeland et al [25], the keys to a successful DTI are an adequate wall relaxation, proper skin incision, and the use of sharp trocars.

DTI has been reported as a safe alternative to Veress needle insertion [24-27]. In a randomized prospective study of 200 patients, Nezhat et al [28] reported 22% and 6% rates of minor complications after Veress needle insertion (n=100) and direct trocar insertion (n=50), respectively. The Veress needle has been implicated as the cause of more vascular accidents during laparoscopy than the trocar, and studies using randomized patient groups have confirmed the safety of DTI [26,27].

The authors of the present study could not find a published report assessing the efficacy of DTI versus the open laparoscopy technique in urolaparoscopic surgery, so they conducted the present retrospective investigation. The results showed very few surgical complications in either group. One patient receiving DTI had subcutaneous emphysema between the abdominal wall and peritoneum because of premature insufflation, but the surgery was continued. The premature insufflation occurred prior to visualization of the trocar tip and was theoretically avoidable. The surgeons detected the emphysema because of abdominal asymmetry. One patient receiving open laparoscopy also had subcutaneous emphysema. Vascular trauma and bleeding occurred in 1 patient in each group.

The results of the present investigation showed that the primary advantages of using DTI were a significantly shorter mean access time (91.75 seconds with DTI; 263.97 seconds with open laparoscopy) and a significantly higher mean abdominal pressure for creation of the pneumoperitoneum (16.17 mmHg with DTI; 15 mmHg with open laparoscopy).

The authors believe that DTI has the following advantages:

1. It elevates the rectus sheath, pulling the abdominal wall 6-8 cm away from the abdominal viscera.
2. It is easy to learn and practice.
3. It is easy to control the force used while entering the peritoneal cavity.
4. It is safe for use with very thin and very obese patients.
5. It was reported to be superior to Veress needle insertion because it eliminates time-consuming steps [29].
6. It appears to be safe in patients with a history of previous abdominal surgery, although this conclusion is based on a small number of patients in the present study.

CONCLUSION

The use of direct trocar insertion to establish a pneumoperitoneum is safe, fast, and efficacious. Based on the present study, the authors suggest that it can be used in urolaparoscopic surgeries. Future prospective studies with larger numbers of patients randomly assigned to treatment groups are needed to confirm these results.

Conflict of Interest: None declared

REFERENCES

[1] Kim C, Docimo SG. Use of laparoscopy in pediatric urology. *Rev Urol*. 2005;7(4):215-223.

[2] Schlaerth AC, Abu-Rustum NR. Role of minimally invasive surgery in gynecologic cancers. *Oncologist*. 2006;11(8):895-901.

[3] Fernandez EM, Malagón AM, Arteaga I, Díaz H, Carrillo A. Conservative treatment of a huge abdominal wall hematoma after laparoscopic appendectomy. *J Laparoendosc Adv Surg Tech A*. 2005;15(6):634-637.

[4] Yanke BV, Horowitz M. Safety of the Veress needle in pediatric laparoscopy. *J Endourol*. 2007;21(7):695-697.

[5] Esposito C, Ascione G, Garipoli V, DeBernardo G, Esposito G. Complications of pediatric laparoscopic surgery. *Surg Endosc*. 1997;11(6):655-657.

[6] Esposito C, Mattioli G, Monguzzi GL, et al. Complications and conversions of pediatric videosurgery: The Italian multicentric experience on 1689 procedures. *Surg Endosc*. 2002;16(5):795-798.

[7] Esposito C, Lima M, Mattioli G, et al. Complications of pediatric urologic laproscopy: mistakes and risks. *J Urol*. 2003;169(4):1490-1492.

[8] Chapron C, Querleu D, Bruhat MA, et al. Surgical complications of diagnostic and operative gynaecological laparoscopy: a series of 29,966 cases. *Hum Reprod*. 1998;13(4):867-872.

[9] Mahajan NN, Gaikwad NL. Direct Trocar Insertion: A Safe Laparoscopic Access. *The Internet J of Gynecol and Obstetrics*. 2007;8(2).

[10] Querleu D, Chevallier L, Chapron C, Bruhat MA. Complications of gynaecological laparoscopic surgery. A french multi-centre collaborative study. *Gynaecol Endosc*. 1993;2:3-6.

[11] Harkki-Siren P, Kurki T. A nationwide analysis of laparoscopic complications. *Obstet Gynecol*. 1997;89(1):108-112.

[12] Soderstrom RM, Butler JC. A critical evaluation of complications in laparoscopy. *J Reprod Med*. 1973;10(5):245-248.

[13] Mac Cordick C, Lecuru F, Rizk E, Robin F, Boucaya V, Taurelle R. Morbidity in laparoscopic gynecological surgery: results of a prospective single-center study. *Surg Endosc*. 1999;13(1):57-61.

[14] Champault G, Cazacu F, Taffinder N. Serious trocar accidents in laparoscopic surgery: A French survey of 103,852 operations. *Surg Laparosc Endosc*. 1996;6(5):367-370.

[15] Yuzpe AA. Pneumoperitoneum needle and trocar injuries in laparoscopy. A survey on possible contributing factors and prevention. *J Reprod Med*. 1990;35(5):485-490.

[16] Corson SL, Chandler JG, Way LW. Survey of laparoscopic entry injuries provoking litigation. *J Am Assoc Gynecol Laparosc*. 2001;8(3):341-347.

[17] Chapron CM, Pierre F, Lacroix S, Querleu D, Lansac J, Dubuisson JB. Major vascular injuries during gynecologic laparoscopy. *J Am Coll Surg*. 1997;185(5):461-465.

[18] Gunenc MZ, Yesildaglar N, Bingol B, Onalan G, Tabak S, Gokmen B. The safety and efficacy of direct trocar isertion with elevation of the rectus sheath instead of the skin for pneumoperitoneum. *Surg Laparosc Endosc Percutan Tech.* 2005;15(2):80-81.

[19] Yerdel MA, Karayalcin K, Koyuncu A, et al. Direct trocar versus Veress needle insertion in laparoscopic cholecystectomy. *Am J Surg.* 1999;177(3):247-249.

[20] Philips PA, Amaral FA. Abdominal access complications in laparoscopic surgery. *J Am Coll Surg*. 2001;192(4):525-536.

[21] Catarci M, Carlini M, Gentileschi P, Santoro E. Major and minor injuries during the creation of pneumoperitoneum: a multicenter study on 12919 cases. *Surg Endosc.* 2001;15(6):566-569.

[22] Jacobson MT, Osias J, Bizhang R, et al. The direct trocar technique: an alternative approach to abdominal entery for laparoscopy. *JSLS*. 2002;6(2):169-174.

[23] Molloy D, Kaloo PD, Cooper M, Nguyen TV. Laparoscopic entry: a literature review and analysis of techniques and complications of primary port entry. *Aust N Z J Obstet Gynaecol.* 2002;42(3):246-254.

[24] Dingfelder JR. Direct laparoscope trocar insertion without prior pneumoperitoneum. *J Reprod Med*. 1978;21(1):45-47.

[25] Copeland C, Wing R, Huka JF. Direct trocar insertion at laparoscopy: an evaluation. *Obstet Gynecol.* 1983;62(5):665-669.

[26] Jarrett JC 2nd. Laparoscopy: direct trocar insertion without pneumoperitoneum. *Obstet Gynecol*. 1990;75(4):725-727.

[27] Byron JW, Fujiyoshi CA, Miyazawa K. Evaluation of direct trocar insertion technique at laparoscopy. *Obstet Gynecol.* 1989;74(3 Pt 1):423-425.

[28] Nezhat FR, Silfen SL, Evans D, Nezhat C. Comparison of direct trocar insertion of disposable and standard reusable laparoscopic trocars and previous pneumoperitoneum with Veress needle. *Obstet Gynecol*. 1991;78(1):148-150.

[29] Byron JW, Markenson G, Miyazawa K. A randomized comparison of Veress needle and direct trocar insertion for laparoscopy. *Surg Gynecol Obstet*. 1993;177(3):259-262.