

Evaluating the Risk Factors of Closed Laparoscopic Surgery in Patients with Previous Gynecologic Surgery

Zahra Asgari¹, Zahra Fakherdanesh¹, Hayede Samiee¹, Ahmad Ghoochani¹, Somaye Sadate, Shervin Taslimi¹, Leili Hafizi^{2,*}

¹Obstetrics and Gynecology Department, Research Development Center, Arash Hospital, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, IR Iran

²Obstetrics and Gynecology Department, Imam Reza Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, IR Iran

*Corresponding author: Leili Hafizi, Obstetrics and Gynecology Department, Imam Reza Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, IR Iran. Tel: +98-2177883284, Fax: +98-2177883196, E-mail: hafizil@mums.ac.ir.

Received: August 07, 2013; Revised: July 27, 2013

Background: Development of complications during gynecologic laparoscopic surgery depends on many factors such as history of previous laparotomies. This factor usually increases the veres and first trocar complications.

Objectives: In this study, we compared all operative complications between the patients with and without previous abdominal surgery.

Patients and Methods: All operative complications due to the first trocar insertion complications were recorded for 100 women who had laparoscopic surgery history during 2005-2010, and were compared with 100 age range in control groups. Influence of different parameters on the risk of adverse complications after surgery was also taken into account.

Results: In both case and control groups, there is no major complication due to the insertion of the first trocar or other procedures of laparoscopy. Adhesion bands were identified in 69 of cases and 24% of them were lysed during laparoscopic surgery; but abdominal wall adhesions were not observed in any patients of control group. Moreover, minor complications did not differ between cases and controls. seven percent of cases and 6% of controls required blood transfusion. There is a significant direct association between the number of previous surgery and increasing NPO days ($r = 0.28$, $P = 0.004$). Duration of postoperative hospital admission showed a significant difference between four types of surgery ($P < 0.001$).

Conclusions: Closed approach gynecological laparoscopy with careful method and preoperatively perdition of complication can be applied in patients having previous laparotomy history with inconsiderable complication increase.

Keywords: Risk Assessment; Laparoscopy; Reoperation; Gynecology

1. Background

By increasing the adoption of laparoscopic surgery in gynecology, there has been a corresponding rise in types and rates of complications reported (1). But, the advantages and feasibility of laparoscopic techniques on complication increase in gynecologic surgery has been documented today (2-4). These advantages included cost effectiveness; better cosmetic effect, shorter convalescence period or post-operation hospital stay, and decreased use of analgesics. These are the most important benefits of laparoscopy in comparison with conventional laparotomy methods. However, laparoscopic complications are still remarkable, despite increasing improvements in accumulated surgical experience and laparoscopic instruments (5-8), it is estimated that the rate of laparoscopic complication is variant from 0.2% to 10.3% (5, 9-11). This variation may be due to the complexity level of surgical procedures, experience of surgeons and pre-

vious history of abdominal surgery especially in gynecological operation (4, 12-14). Although Laparoscopic management of complications in gynecologic laparoscopic surgery is feasible and efficient (2), finding exact impacts of different parameters on increasing complications of laparoscopy is essential to decrease mortal injuries (4, 5, 14). The most prevalent complication in laparoscopy is related to the entrance to abdominal wall via the Verres needle or first trocar. It can result in vascular injury (the most acutely life threatening complication) or intestinal injury (the most lethal injury). In patients with the history of previous abdominal surgery, the risk of entrance complication will be increased significantly. In these situations, we may decide to enter the abdomen via umbilicus or other alternate sites (12).

2. Objectives

We designed this study to recognize definite impact of

Implication for health policy/practice/research/medical education:

Although the risk of minor complication in gynecologic laparoscopic surgery might be increased in patients with multiple number and severe surgery by preoperatively consultation on characteristics of previous surgery, laparoscopy can be performed under acceptable conditions.

Copyright © 2013, Minimally Invasive Surgery Research Center and Mediterranean. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

previous abdominal surgery on the later complications during laparoscopy procedures especially after the first trocar insertion. We also conducted evaluation risk factors on closed laparoscopic surgeries in these patients. We could verify the Influence of incision type, number of previous laparotomies and type of surgery on further complication.

3. Patients and Methods

3.1. Patients

After general approval on the utility and ensuring the safeness of methods in ethics review board of Tehran University of Medical Sciences and Health Services, 100 patients with history of previous abdominal surgery (case group) and 100 patients without the mentioned history (control group) with the same age range and surgical type undergoing the laparoscopic surgery were included in this study. The inclusion criteria for selection of these patients were as follows: Scars of previous surgery in the abdominal wall below umbilicus (vertical or horizontal) and nonexistence of definite known contraindication of laparoscopic surgery. The exclusion criteria were as follows: the history of more than three abdominal surgeries with midline incisions, scar of previous surgery on the umbilicus, history of bowel perforation or peritonitis, history of frozen pelvis or extensive severe adhesions in abdominal cavity. Demographic data such as age, body mass index (BMI), number of previous abdominal surgery, cause of previous abdominal surgery and indications for current laparoscopic surgery were collected in a questionnaire designed for this purpose. Moreover, kind and number of complications after trocar insertion was documented and reported in all patients. Intestinal and solid organ injury, vascular damage, visceral damage, immediately conversion to laparotomy, blood transfusion during surgery and post-operative hospital admission were defined.

3.2. Laparoscopic Surgical Method

For all patients, same methods of laparoscopic surgery were used via primary conventional umbilical closed approach via Verres needle with the aim of towel clips. Therefore, selection of the primary approach was independent of the location of previous abdominal wound. With regard to the type and level of the surgery, we used 2, 3 or 4 trocars. To decreased the surgical complications, innocent adhesions which had not influence on pelvic procedures were not lysed. Before verres needle insertion procedures, required repair equipment for complication or conventional condition to laparotomy were prepared. The primary laparoscopic approach of this study in both case and control groups was based on previous described surgical procedure (5, 15). It should be emphasized that

insertion site of trocar has been changed occasionally, mostly in cases if adhesions were detected. The primary trocar in all patients was interred via umbilicus, and the secondary ones via LLQ, RLQ or both and midline lower the umbilicus. If we detected adhesions, we would enter the secondary trocars in only one of these sites or in these situations but in case of upper or lower places, it depends on the site of adhesions. Furthermore, adhesions were lysed if it is considered essential to enable laparoscopic surgery continuation (16, 17).

3.3. Follow up

We followed both groups after operation in case of different parameters and possible complications (Table 2); and compared them with each other. Intestinal gas passing was our criteria for changing NPO to PO situation.

3.4. Statistical Analysis

The analysis of complication was performed on inter and intra groups between cases and controls using SPSS version 17.0 software. T-student test and the Mann Whitney test were conducted for comparing continuous variables. Linear regression was applied to find out the relationship between two continuous variables. The calculations of $P < 0.05$ and odds ratios (ORs) with 95% confidence intervals (CIs) were estimated as a significant difference.

4. Results

One hundred patients of all patients candidate for laparoscopic procedure at Arash Hospital in Tehran University of Medical Sciences and Health Services from 2005 to 2010 had history of previous laparotomy and complete inclusion criteria. The age mean of studied patients and control group was 36.7 ± 7.9 and 37.4 ± 9.0 years., respectively. Comparison of body mass index between cases and controls did not show any significant difference (21.9 ± 3.7 vs. 20.5 ± 4.2 ; $P = 0.46$). Indications of laparoscopic surgery were also matched between cases and controls based on the modified classification of the laparoscopic procedures (18, 19). Fifteen patients were categorized in type 1 (diagnostic laparoscopy and tubal patency test), 29 patients had type 2 indications of laparoscopy (minor surgery, minimal adhesiolysis, early endometriosis management, and ovarian drilling for polycystic ovary syndrome). Among the remaining patients, 25 cases had history of major surgeries; moderate to severe adhesiolysis, tubal neostomies, management of ectopic pregnancy, ovarian cysts, endometriosis, and treatment of pelvic inflammatory disease which were named type 3; and type 4 with advanced laparoscopy; total laparoscopic hysterectomy, myomectomy, severe endometriosis, suspension of uterus and cuff of uterus, and prolapsed uterus were recorded in another 31 patients.

Table 1. Comparison of Major and Minor Complications during Laparoscopy between Case and Control Groups

Variable	Patients	Controls	P value
Vascular damage	0	0	-
Visceral damage	0	0	-
Conversion to laparotomy	0	0	-
Chronic abdominal pain	1	0	-
Umbilical hernia	1	0	-
Abdominal wall adhesion (total/ required analysis)	69/24	0	-
Required blood transfusion	7	6	0.93
Mean postoperative NPO-hours	12.3 ± 4.5 ^a	10.9 ± 4.4	0.06
Mean postoperative hemoglobin level	10.9 ± 1.5	11.2 ± 1.6	0.24
Mean absolute decrease of hemoglobin count	1.18 ± 0.6	1.08 ± 1.5	0.77
Mean time of hospital admission	1.75 ± 0.8	1.60 ± 0.9	0.17

^a the data are shown with Mean ± SD

Table 2. Inter- group Comparison of Minor Complications during Laparoscopy Based on the Types of Operations among 100 Patients in Case Group

Variable	Type 1 ^b	Type 2 ^c	Type 3 ^d	Type 4 ^e	P value
Number of patients, No.	15	29	25	31	-
Mean postoperative NPO time, h	11.9 ± 3.7 ^f	12.0 ± 4.5	11.8 ± 7.3	12.8 ± 1.0	0.121
Mean absolute decrease of hemoglobin, mg/dl	1.00 ± 1.2	1.03 ± 0.9	1.22 ± 0.4	1.16 ± 0.6	0.80
Mean postoperative hospitalization duration, h	1.05 ± 0.3	1.14 ± 0.7	1.89 ± 1.2	1.92 ± 0.9	< 0.001
POHC^a analysis on NPO-hours					
Type1	-	0.458	0.759	0.145	
Type2	0.458	-	0.951	0.860	
Type3	0.759	0.951	-	0.564	
Type4	0.145	0.860	0.564	-	
POHC analysis on absolute decrease of hemoglobin count					
Type1	-	0.959	0.837	0.990	
Type2	0.959	-	0.974	0.995	
Type3	0.837	0.974	-	0.907	
Type4	0.990	0.995	0.907	-	
POHC analysis on the duration of hospitalization					
Type1	-	0.789	< 0.001	< 0.001	
Type2	0.789	-	< 0.001	< 0.001	
Type3	< 0.001	< 0.001	-	0.970	
Type4	< 0.001	< 0.001	0.970	-	

^a post-operative hospital conditions

^b Type 1, Diagnostic laparoscopy and tubal patency test

^c Type 2, Minor surgery, minimal adhesiolysis, early endometriosis management, and ovarian drilling for polycystic ovary syndrome

^d Type 3, Major surgery; moderate to severe adhesiolysis, tubal neostomies, management of ectopic pregnancy, ovarian cysts, endometriosis, and treatment of pelvic inflammatory disease

^e Type 4, Advanced laparoscopy; total laparoscopic hysterectomy, myomectomy, adenomyomectomy, and prolapsed uterus

^f data are shown with Mean ± SD

4.1. Intra-group Comparison of Complications during Laparoscopy

In both case and control groups, there was no major complication reported including intestinal and solid organ injury, vascular damage, visceral damage and immediate conversion to laparotomy due to insertion of the first trocar or other procedures of laparoscopy. There were only some cases we found in long term follow-up of case group, one with chronic abdominal pain and another with umbilical hernia. Predictably, adhesion band was identified in 69 of cases and 24% of them were lysed during laparoscopic surgery; and this is while abdominal wall adhesions were not observed in control group patients. Moreover, minor complications were compared between cases and controls (Table 1). During the time of surgery, 7% of cases and 6% of controls required blood transfusion. The mean postoperative NPO-hours were 12.3 ± 4.5 and 10.9 ± 4.4 in case and control groups, respectively ($P = 0.06$). Postoperative hemoglobin level (10.9 ± 1.5 in cases vs. 11.2 ± 1.6 in controls; $P = 0.24$) and absolute decrease of hemoglobin count during laparoscopic surgery (1.18 ± 0.6 in cases vs. 1.08 ± 1.5 in controls; $P = 0.77$) did not differ considerably between two groups. Hospital admission mean time after surgery was 1.75 ± 0.8 day in cases and 1.60 ± 0.9 day in controls ($P = 0.17$).

4.2. Inter- group Comparison of Complications during Laparoscopy

The minor complications of cases were analyzed based on the number of previous surgeries and indication of current laparoscopic surgery. The statistical analysis shows a remarkable direct association between the number of previous surgeries and increasing NPO hours ($r = 0.28$, $P = 0.004$), but there is not a notable correlation between the number of previous surgeries and absolute decrease in hemoglobin count or time ($r = 0.78$, $P = 0.44$) of hospital admission after surgery ($r = 0.05$, $P = 0.964$). Among parameters of post-operative hospital condition (Pohc) analysis, duration of postoperative hospital admission showed significant difference between 4 types of laparoscopic surgery ($P < 0.001$). It is illustrated in Table 2.

5. Discussion

In this study, we did not find any major complication in both case and control groups. The rate of complications varies from 0.4-3% during gynecologic laparoscopic surgery (18). This rate could increase to 13.4% in patients with a history of laparotomy (18, 20, 21). Recent advances in laparoscopic equipment technology and techniques have changed (considering improvement in surgeons' skills) many former absolute contraindications to relative contraindication. Therefore, decision making on the

issue of performing laparoscopic surgery in cases with morbid obesity, adhesion bands, abdominal or diaphragmatic hernia, hypovolemic shock, cancers, pregnancy over 16 weeks of gestation, generalized peritonitis and intestinal perforation is dependent on equality of harms and benefits (20, 22). This study is designed to investigate the laparoscopic surgery condition in patients with previous laparotomy in comparison with patients without a surgical history. Despite fewer complications of laparoscopy rather than laparotomy, it seems that vessel injury, intestinal perforation, wound infection, ileus, deep vein thrombosis, urodynamic complications, diarrhea and hernia in laparoscopy are more liable in patients with surgery history (9-11). Although recent studies indicating direct visualization in open methods (22) has much better and desirable final outcomes (23, 24), the results of current study supports the idea that conventional closed umbilical approach with designed primary approach can control complication in patients with previous surgery history as well as level of complication in other patients. Moreover, these results assert the significant difference in both major and minor complications between cases and controls while adhesions after laparotomy were found in 69% of the patients, which completely conformed to reported range 30- 90% (13). Surgery with adhesiolysis did not even increase the rate of minor complications. Whereas, it was reported in a previous study that pelvic adhesiolysis in patients with history of surgery is the most important parameter for complications appearance during laparoscopy, the authors also mentioned that none of the 164 patients developed complications due to the primary entry in abdominal wall adhesions (25). According to results of present study, inter case group analysis of complications during laparoscopy showed that the number of previous surgery and indication of current laparoscopic surgery may influence the frequency of complication. These data conformed to previous studies showed correlations between gynecological laparoscopic complications, and the characteristics of previous laparotomies, especially history of abdominal myomectomy and excisional endometriosis surgery (18, 25). Closed approach gynecological laparoscopy (via Verres needle) with careful patient selection, careful method and preoperatively perdition of complication can be applied in patients having previous laparotomy history with inconsiderable complication increase. Although the risk of minor complication in gynecologic laparoscopic surgery might be increased in patients with multiple number and severe type of surgery, by preoperatively consulting on characteristics of previous surgery, laparoscopy can be performed in those with acceptable conditions.

Acknowledgements

This paper was derived from the thesis of a gynecology

assistant student with registration number 851. We want to acknowledge the Vice Chancellor of research, Tehran university of medical sciences for the Financial and material support. We also thank Dr. Hami Ashraf for his great work in writing assistance. And last but not least, we know it is necessary to appreciate the great works of all the nurses and staffs of Arash hospital central operation room for their close cooperation in this study.

Author's Contributions

Study concept and design was done by Dr. Zahra Asgari and Dr. Leili Hafizi. Interpretation of data was done by Dr. Shervin Taslimi and Ahmad Ghoochani. Drafting of the manuscript was done by Dr. Zahra Asgari and Dr. Zahra Fakherdaneh. Doing the surgery and follow up was done by Dr. Zahra Asgari, Dr. Hayede Samiee and Dr. Leili Hafizi. Critical revision of the manuscript for important intellectual content was done by Dr. Leili Hafizi, Dr. Somaye Sadate Sabet.

Financial Disclosure

Authors declared that they have no conflict of interest.

Funding Support

The source of financial grants of this study was provided by research committee of Tehran University of Medical Sciences.

References

- Lam A, Kaufman Y, Khong SY, Liew A, Ford S, Condous G. Dealing with complications in laparoscopy. *Best Pract Res Clin Obstet Gynaecol.* 2009;**23**(5):631-46.
- Kyung MS, Choi JS, Lee JH, Jung US, Lee KW. Laparoscopic management of complications in gynecologic laparoscopic surgery: a 5-year experience in a single center. *J Minim Invasive Gynecol.* 2008;**15**(6):689-94.
- Sokol AI, Chuang K, Milad MP. Risk factors for conversion to laparotomy during gynecologic laparoscopy. *J Am Assoc Gynecol Laparosc.* 2003;**10**(4):469-73.
- String A, Berber E, Foroutani A, Macho JR, Pearl JM, Siperstein AE. Use of the optical access trocar for safe and rapid entry in various laparoscopic procedures. *Surg Endosc.* 2001;**15**(6):570-3.
- Kumakiri J, Takeuchi H, Sato Y, Kitade M, Kikuchi I, Shimanuki H, et al. A novel method of ninth-intercostal microlaparoscopic approach for patients with previous laparotomy. *Acta Obstet Gynecol Scand.* 2006;**85**(8):977-81.
- Leng J, Lang J, Huang R. [Complications in laparoscopic gynecologic surgery: analysis of 34 cases]. *Zhonghua Fu Chan Ke Za Zhi.* 2001;**36**(3):146-9.
- Leng J, Lang J, Huang R, Liu Z, Sun D. Complications in laparoscopic gynecologic surgery. *Chin Med Sci J.* 2000;**15**(4):222-6.
- Tulikangas PK, Robinson DS, Falcone T. Left upper quadrant cannula insertion. *Fertil Steril.* 2003;**79**(2):411-2.
- Querleu D, Chapron C. Complications of gynecologic laparoscopic surgery. *Curr Opin Obstet Gynecol.* 1995;**7**(4):257-61.
- Rafii A, Camatte S, Lelievre L, Darai E, Lecuru F. Previous abdominal surgery and closed entry for gynaecological laparoscopy: a prospective study. *BJOG.* 2005;**112**(1):100-2.
- Van Goor H. Consequences and complications of peritoneal adhesions. *Colorectal Dis.* 2007;**9 Suppl 2**:25-34.
- Rock JA, Jones HW. *TeLinde's Operative Gynecology.* 10 ed. Philadelphia: Lippincott Williams & Wilkins; 2012. p. 320-35.
- Szomstein S, Lo Menzo E, Simpfendorfer C, Zundel N, Rosenthal RJ. Laparoscopic lysis of adhesions. *World J Surg.* 2006;**30**(4):535-40.
- Varma R, Gupta JK. Laparoscopic entry techniques: clinical guideline, national survey, and medicolegal ramifications. *Surg Endosc.* 2008;**22**(12):2686-97.
- Kyung MS, Choi JS, Lee JH, Jung US, Lee KW. Laparoscopic management of complications in gynecologic laparoscopic surgery: a 5-year experience in a single center. *J Minim Invasive Gynecol.* 2008;**15**(6):689-94.
- Kumakiri J, Takeuchi H, Kitade M, Kikuchi I, Kumakiri Y, Kuroda K, et al. Safe primary approach using a micro-laparoscope via the posterior vaginal fornix for patients with previous upper laparotomy: a report of five cases. *J Obstet Gynaecol Res.* 2010;**36**(1):195-8.
- Mettler L. Pelvic adhesions: laparoscopic approach. *Ann N Y Acad Sci.* 2003;**997**:255-68.
- Perone N. The incidence of adhesions after prior laparotomy: a laparoscopic appraisal. *Obstet Gynecol.* 1995;**85**(6):1064-5.
- Chapron C, Dubuisson JB. Predicting risk of complications with gynecologic laparoscopic surgery. *Obstet Gynecol.* 1999;**93**(2):318-9.
- Chapron C, Querleu D, Bruhat MA, Madelenat P, Fernandez H, Pierre F, et al. Surgical complications of diagnostic and operative gynaecological laparoscopy: a series of 29,966 cases. *Hum Reprod.* 1998;**13**(4):867-72.
- Johnston K, Rosen D, Cario G, Chou D, Carlton M, Cooper M, et al. Major complications arising from 1265 operative laparoscopic cases: a prospective review from a single center. *J Minim Invasive Gynecol.* 2007;**14**(3):339-44.
- Leonard F, Lecuru F, Rizk E, Chasset S, Robin F, Taurelle R. Perioperative morbidity of gynecological laparoscopy. A prospective monocenter observational study. *Acta Obstet Gynecol Scand.* 2000;**79**(2):129-34.
- Chang FH, Chou HH, Lee CL, Cheng PJ, Wang CW, Soong YK. Extraumbilical insertion of the operative laparoscope in patients with extensive intraabdominal adhesions. *J Am Assoc Gynecol Laparosc.* 1995;**2**(3):335-7.
- Hasson HM. Open laparoscopy: a report of 150 cases. *J Reprod Med.* 1974;**12**(6):234-8.
- Keltz MD, Lang J, Berin I. A 5-mm open-entry technique achieves safe, single-step, cosmetic laparoscopic entry. *JSLs.* 2007;**11**(2):195-7.
- Chi DS, Abu-Rustum NR, Sonoda Y, Awtrey C, Hummer A, Venkatraman ES, et al. Ten-year experience with laparoscopy on a gynecologic oncology service: analysis of risk factors for complications and conversion to laparotomy. *Am J Obstet Gynecol.* 2004;**191**(4):1138-45.