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Decision-Making Process and Reasoning of Laparoscopic Entry: A Questionnaire-Based Analysis of Surgical Practice: A Cross-Sectional Study

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Abstract

Objective: Several techniques for initial abdominal entry in laparoscopy have been introduced in the literature. Various guidelines and recommendations are available on this subject; however, compliance with these findings is controversial. The purpose of this study is to evaluate the rationale and the process of decision-making for the first entry technique in laparoscopy.

Methods: A close-ended survey question was formed. The survey was sent to general surgeons by e-mail with the survey's web address included and administered face-to-face in the National Congress of General Surgery. Descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, and maximum) were used to evaluate the study data. Relevance was calculated as $P < .05$ in the 95% CI.

Results: A total of 263 surveys were evaluated. The most common preferred method was the "Veress needle technique" during the residency of the participants. However, fewer surgeons preferred this method ($P < .001$), the open approach/Hasson trocar ($P = .004$) and direct trocar insertion ($P = .003$) were more prevalent after residency. The most common rationale for choosing the laparoscopic entry technique was "learned laparoscopic entry technique during residency" (38.0%) and "ease of applicability" (27.0%). Reasons for changing the laparoscopic entry technique during surgical practice are "easy applicability" in 37% and "advice of competent people on general surgery" in 24.4% of participants.

Conclusion: This study revealed that the decision-making for initial abdominal entry for laparoscopy was influenced mainly by the surgeon's experience during residency, the mentors' effect, and ease of applicability of a technique.

Keywords: Decision-making, laparoscopy, surgery, trocar

The first trocar insertion method in laparoscopic surgery is important in terms of both time and complication probability. At this point, it is possible to identify different trends among surgeons. Several methods, the Veress needle, open approach using the Hasson trocar, and direct trocar insertion without insufflation, have been described for initial abdominal entry in laparoscopy.[1,2] On the other hand, relatively new approaches, the optical or radially expanding trocars, did not become common yet.[3-5] Despite the advantages of laparoscopic surgery, serious complications can be encountered during the initial entry.[1-3] Development of a complication, for example, major vascular and intestinal injury, would affect the outcome of the operation, and it may result in conversion to the open approach. Because of the low incidence of these complications, it is impossible to show any superiority of one approach to another.[4,6-8] It is thought that thousands of cases are required to show any significant difference between the two approaches.[4,6] Guidelines from professional societies have suggested different entry techniques, usually based on retrospective data.[1,4,9-11] The decision of a surgeon to use a particular entry technique cannot be attributed to the personal experience gained due to a complication.[6] Nevertheless, this decision might depend on the surgeon's mentors' personal preferences, experiences, and effects.[2,12]

In this study, we aimed to analyze the rationale and decision-making process of the general surgeons about the initial abdominal entry technique for laparoscopy.

Methods

The study was based on the data retrieved from a structured questionnaire prepared for general surgeons. Surgical residents were excluded from the study. The institutional review board approved the study (Ümraniye Training and Research Hospital Ethics Committee no. 2014/7265), and the universal principles of the 1964 Declaration of Helsinki and its later amendments were applied. Informed consent was obtained from participants.

Close-ended survey questions were formed and sent to general surgeons by e-mail, containing the survey's web address. It was presented in the National Congress of general surgery as well. An anonymous open-access website application was available at

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www.genelcerrahianket.somee.com, active from March to May 2014.

The survey consisted of 18 questions (Appendix). The first six questions (#1-6) were related to the respondent's demographical and educational data and experiences of surgical and laparoscopic practices. There were five questions to determine the preferred technique for first entry (#7-11), three questions for complications (#12-14), and the remaining four questions for safety maneuvers (#15-18). The study was registered with ClinicalTrials identifier: NCT03084653.

Statistical analysis

Statistical calculations were performed using IBM SPSS Statistics 22 statistical software (NY, USA, 2014). Descriptive statistical methods (mean, standard deviation (SD), median, frequency, ratio, minimum, and maximum) were used to evaluate the study data. Normally distributed continuous variables were expressed as mean ± SD, non-normally distributed continuous variables as median, and interquartile range. Categorical variables were expressed as frequencies and percentages. The Chi-square test and Continuity (Yates) correction tests were used. The differences were considered statistically significant if the *P*-value was ≤.05. The Cronbach alpha coefficient of the questionnaire used in this study was calculated as 0.71.

Results

Two hundred sixty-three general surgeons filled the questionnaire with a mean age of 42.9 ± 8.3 years. Most of the survey participants were male (88.6%, n = 233). Demographics are summarized in Table 1. Approximately, one-third of the participants (37.3%) were seniors (specialists over 16 years), and nearly one-third (31.6%) were taken into consideration as “experienced surgeons,” as they stated that they had performed more than 750 laparoscopic procedures.

The most preferred incision for initial entry was infra-umbilical (n = 191, 72.6%). The supra-umbilical and intra-umbilical incisions were used by 64 (24.3%) and 8 (3%) participants, respectively. One hundred seventeen (44.5%) respondents pointed out that the previous midline incision is considered for the localization and technique during the initial entry. One hundred three (46.8%) participants stated that they explore the entire abdomen laparoscopically after initial trocar entry. No demographic differences were found among the participants who perform these safety maneuvers (*P*> .05 for all).

The distribution of preferred techniques during and after residency is given in Figure 1. One hundred ninety (72.2%) participants stated that they used the Veress needle as the most preferred technique during their residency. However, its use significantly decreased after residency (*P*< .001), and only 136 (51.7%) participants continued to use this technique. Contrary to this shift, open approach/Hasson trocar and direct insertion techniques were the most popular choices after residency (*P*= .040 and *P*= .003, respectively).

The most popular response for the rationale of choosing entry technique was “learned technique during residency” (38.0%) and “easy applicability” (27.0%). Other parameters’ data are given in Table 1. One hundred twenty seven (48.3%) participants stated that they revised their laparoscopic entry technique during their surgical practice. “Easy applicability” (37%) and “advice of competent people on general surgery” (24.4%) were the commonly encountered rationale for this change (Table 2).

More than half (n = 16, 53.3%) of the female and 33% (n = 77) of male participants stated that they changed their preferred entry technique over time, and this change was seen more common in female participants (*P*= .05). This change was detected significantly less among the participants who stated their rationale as "I am using learned laparoscopic entry technique during residency" (*P*< .01). There was no significant association between the technique during and after residency and the presence of complications or need for a change of the technique (*P*> .05 for all).

Eighty-six (32.7%) participants expressed that they had been encountered at least one type of major complication during the first entry. More than one-third of these complications (38.4%) occurred during their first 100 laparoscopic cases. There was also a significant relationship between year of practice and complications. We have observed that the number of complications increased along with the experience of the surgeon (>16 years vs. 1-5 years) (*P*= .043) (Figure 2). There was no significant association between the currently used technique and the occurrence of complications (*P*= .662). No relation was found between answers about the safety maneuvers and complications (*P*> .05 for all).

No relation was detected between the current laparoscopic entry technique and demographic variables (gender, type of the hospital in which surgical residency was completed, and current surgical practice had been performed, number of years in practice, and number of performed laparoscopic operations) (*P*> .05 for all).

Gender was the only significant factor in determining the rationale for the technique. Male participants expressed "the learned laparoscopic entry technique during residency" as the most critical factor in choosing a technique in current practice. In contrast, female participants indicated their rationale mainly as "results of randomized controlled studies and meta-analyses" (*P*< .04) (Figure 3).

Discussion

This study has shown that the rationale of surgeons' laparoscopic entry technique choice is commonly influenced by mentors and institutions where they were trained. In the last several decades, laparoscopy has gained popularity for all types of surgical procedures.[13] However, the first trocar insertion remains a dangerous step.[3,13] Although there have been several methods for laparoscopic entry such as insertion of the first trocar after insufflation via the Veress needle, open approach with a small peri-umbilical incision using the Hasson trocar, and direct trocar insertion without any insufflations. This choice depends on the country, preference, and specialty of the surgeon. Therefore, the ratio of each preferred method differs significantly worldwide.[13] Compeau et al.[14] study reports that 80.3% of the Canadian general surgeons preferred the open Hasson entry technique. Ahmad et al.[1] reported that closed entry techniques, either by disposable or reusable Veress needles, were used by 93.8% of surgeons who worked as gynecologists in the United Kingdom. In the Netherlands, the rate of closed entry technique was reported as 57% among gynecologists.[2] Visiport (optic trocar) technique has also been a preference with shorter trocar entry time but with higher complication.[15,16] Also, an international survey considers multiple surgical experiences from over 65.636 procedures; optical trocars seem safer even if it is the less adopted technique despite blind trocar entry, which is the more commonly used.[17]

Although it was reported that the reason behind these differences between surgical disciplines was challenging to explain, it appears to be related to the teachings during residency and clinical experience.[14] Although the Veress needle has the most popular demand overall, the use of open approaches, including Hasson trocar, has

Table 1. Demographic and Other Features of Participants

	N	%
Age		
≤34	49	18.6
35-39	55	20.9
40-44	44	16.7
45-49	54	20.5
≥50	61	23.2
Gender		
Female	30	11.4
Male	233	88.6
Type of hospital in which surgical residency had been completed		
University hospital	94	35.7
Government teaching hospital	168	63.9
Other	1	0.4
Type of hospital in which surgical practice has been currently performed		
University hospital	34	12.9
Government teaching hospital	158	60.1
Government non-teaching hospital	38	14.4
Private hospital-doctor' office	28	10.6
Others	5	1.9
Number of years in practice		
<1	14	5.3
1-5	52	19.8
6-10	47	17.9
11-15	52	19.8
≥16	98	37.3
Number of laparoscopic procedures*		
≤100	23	8.7
101-250	44	16.7
251-500	68	25.9
501-750	45	17.1
≥751	83	31.6

*Excluding bariatric, inguinal, and adrenal procedures.

increased due to the specific complications of the Veress needle in the last several years. Contrarily, direct trocar insertion has gained popularity among some surgeons, probably because of its ease of use and fast utilization. Our study found that the Veress needle was the most preferred method during and after surgical residency, although its use decreases significantly afterward.

This study has shown that "the learned technique during residency" and "easy applicability" were the most common rationales for decision-making. Regarding the impact of surgical education during residency, there may be some explanations based on the training models. The apprenticeship model of one-on-one training used for surgical training for almost 400 years changed in 1890 after Halsted introduced the concept of surgical residency.[18,19] This system consists of five or more years of teaching human anatomy, clinical skills, surgical skills, and research under the guidance of a tutor along with other teachers. The change from the Socratic dialectical method to the Halstedian apprenticeship model of training has forced the assignment of a resident to an attending surgeon for his/her entire rotation. Therefore, the clinical knowledge and range of technical skills of the resident depend on the attending surgeon. However, changes in surgical residencies, including shortened periods of in-hospital time for residents due to duty-hour restrictions, subspecialty and diversified training programs, and technological and surgical innovations, have led to a demand for surgical training outside the operating theatre.[19] All these factors altered the impact of the traditional and Halstedian mentoring of the residents. In this study, almost 60% of the participants were experienced surgeons with more than 10 years of practice and 15-25 years with their residency counted. Surgical training in our country was a typical Halstedian apprenticeship model for that period. Therefore, this finding may be regarded as the clue for the impact of a clinical mentor inspiring their residents with clinical experience. We also found that almost half of the surgeons (48.3%) expressed that they changed their technique over time. The main reason for this change was the ease of applicability and advice of competent people. Female surgeons were found to be more prone to this change.

The impact of gender of the physician on the variability of chosen treatments has been investigated previously.[20-22] Baumhäkel et al.[20] study showed that guideline-recommended drug use and achieved target doses tended to be higher in patients treated by female physicians. Additionally, the female gender of the physicians was shown to be an independent predictor of the use of beta-blockers for heart failure. Sammer et al.[21] showed that female physicians were more likely to practice guidelines on their practice. It is also known that female physicians tended to adhere better to guidelines than their male colleagues, although no attitudinal differences could be detected.[22] The underlying factors for female physicians to be more receptive to evidence-based applications than their male counterparts have not been clarified yet. Our randomized controlled studies and meta-analyses showed significant factors for female physicians in the rationale of their decisions and reasons to change their techniques. Guidelines were practical to revise the methods used by almost 60% of the gynecologists in Ahmad et al.[1] study. Only 28.5% of the surgeons were unwilling to change their practice methods. Thus, it is clear that most surgeons can change or modify their techniques in appropriate circumstances.

Although the rates of major complications of laparoscopic entries are low, it is reported that up to one-half of the surgeons encountered at least one type of major complication. Compeau et al.[14] reported that 57.3% of surgeons experienced or witnessed a severe laparoscopic entry complication. In Ahmad et al.[1] questionnaire, 57% of the gynecologists reported a major bowel or vascular complication. In our study, one-third of the

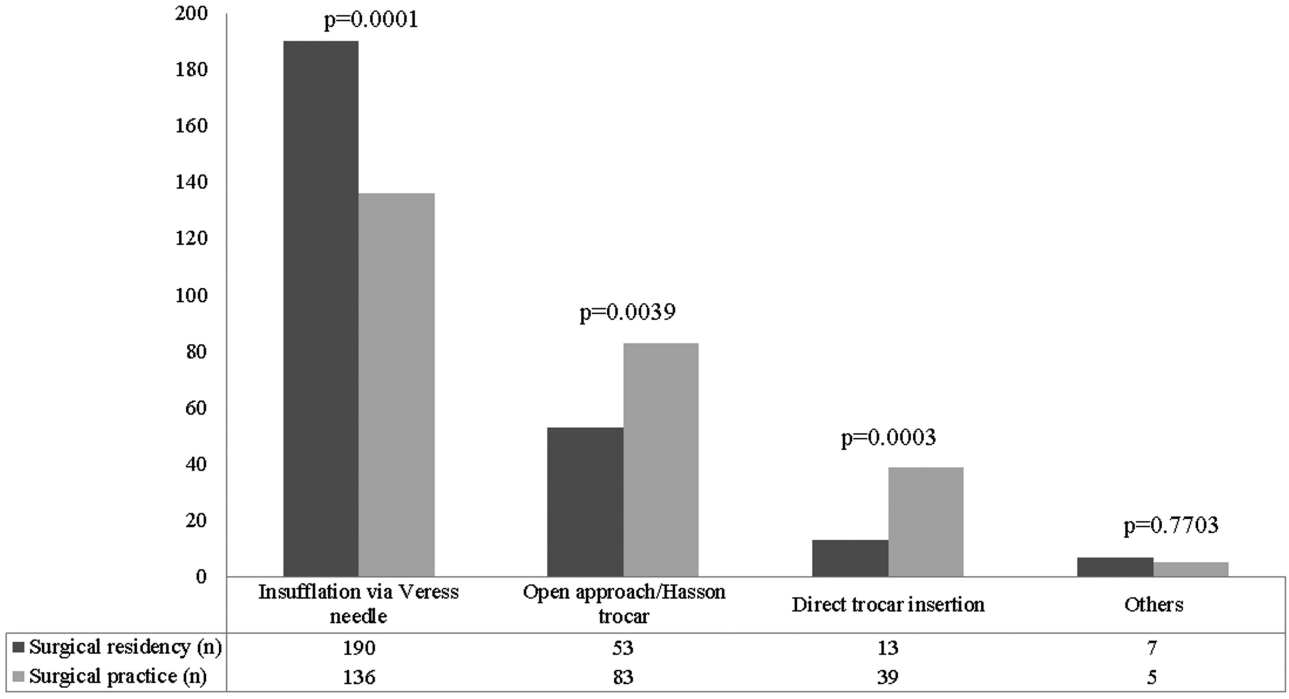


Figure 1. Distribution of laparoscopic entry techniques used during surgical residency and surgical practice.

surgeons reported at least one type of major complication during laparoscopic entry.

We did not detect any significant association between types of preferred technique and complications. Cochrane reviews also failed to reveal any significant differences among the contemporary techniques.[7] The limited statistical power of these reviews was criticized for their failure to demonstrate any differences between these techniques due to the low incidence of complications. Pooled results of meta-analyses also failed to show statistically significant differences in risk of major complications between direct trocar insertion and Veress needle.[8,23,24] Therefore, we can accept that there is no evidence of the superiority of a technique to another.

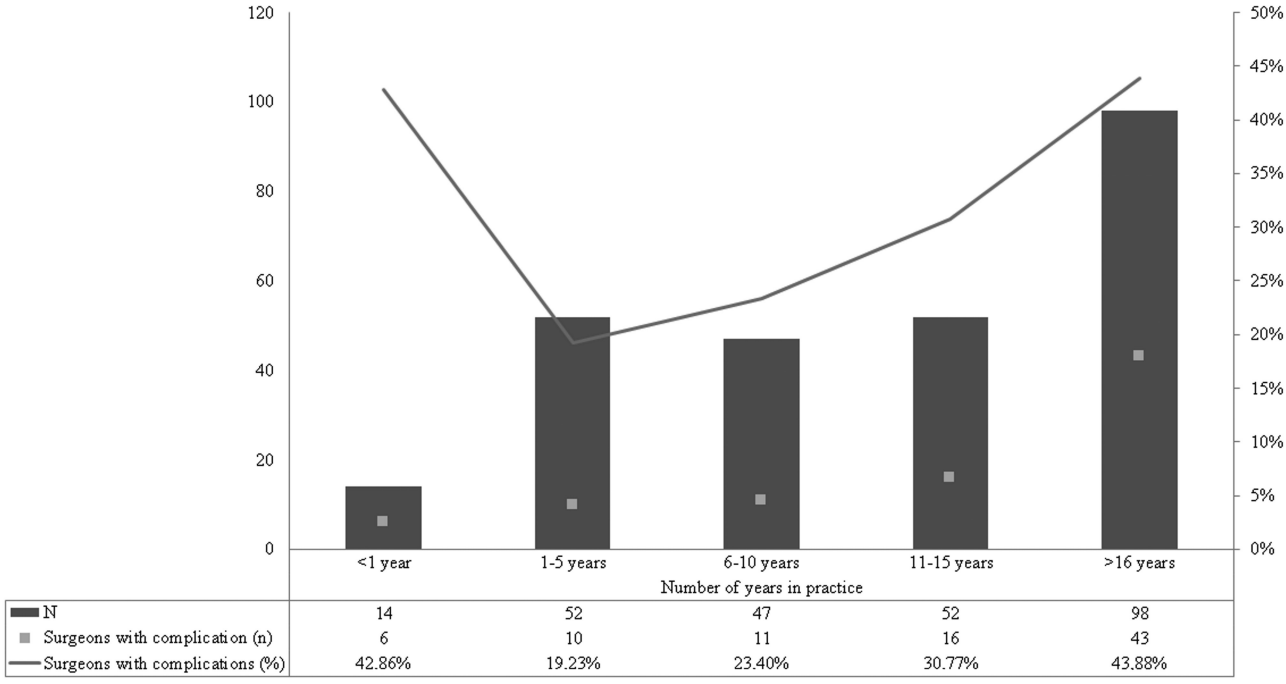
Major strength of this study is that there is no similar study examining surgeons in our country and that it emphasizes reliable teaching in surgical training as a result. The small number of surgeons and inadequacy of reflected distribution of surgeons throughout the hospitals (e.g., training hospitals, private hospitals, university hospitals, and state hospitals) are the major limitations of our study. Future prospective studies on psychological reasoning of the decision process, the interaction of the training models and evidence-based practice, the impact of the opinion leaders or mentors on the quality of surgical training, and assessment of clinical reasoning skills are needed.

In conclusion, the rationale of surgeons' laparoscopic entry technique choice is mainly influenced by their mentors, training

Table 2. Rationale on Determining and for the Change of Laparoscopic Entry Technique

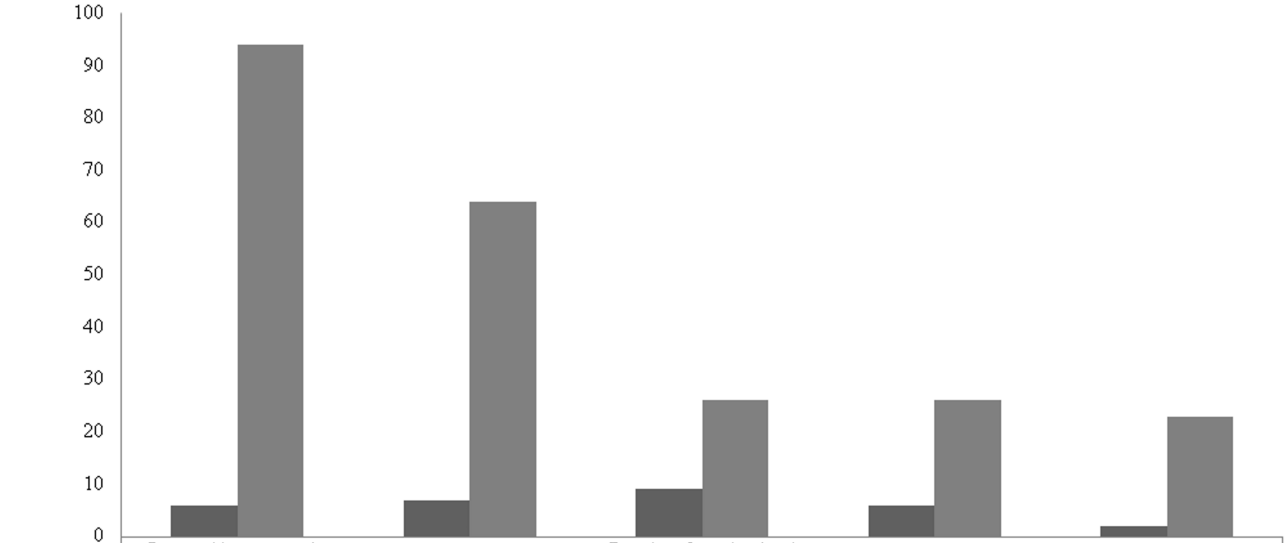
Rationale	Determination of Laparoscopic Entry Technique, n (%)	Change of Laparoscopic Entry Technique, n (%)
Learned laparoscopic entry technique during residency	100 (38)	NA
Easy applicability	71 (27)	47 (37)
Results of randomized controlled studies and meta-analyses	35 (13.3)	17 (13.4)
Advice of competent people on general surgery	25 (9.5)	31 (24.4)
Higher complication rate of other techniques	32 (12.2)	NA
Occurrence of any complication	NA	20 (15.7)
Obligatory current technique used on the hospital	NA	12 (9.5)

NA, not applicable.



	<1 year	1-5 years	6-10 years	11-15 years	>16 years
N	14	52	47	52	98
Surgeons with complication (n)	6	10	11	16	43
Surgeons with complications (%)	42.86%	19.23%	23.40%	30.77%	43.88%

Figure 2. Association of surgical experience in years and complications.



	Learned laparoscopic entry technique during residency	Easy applicability	Results of randomized controlled studies and meta-analyses	Higher complication rate of other techniques	Advice of competent people on general surgery
Female (n)	6	7	9	6	2
Male (n)	94	64	26	26	23

Figure 3. Distribution of rationales for laparoscopic entry techniques among female and male surgeons.

during residency, and ease of applicability. For this reason, we believe that how the first education should be provided is one of the most important issues for future medical education.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Ümraniye Training and Research Hospital University (Date: April 24, 2014, No: 2014/7265).

Informed Consent: Informed consent was obtained from all the participants.

Peer-review: Externally peer-reviewed.

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Appendix. The Questionnaire

1. Age

2. Gender

Female

Male

3. Type of the hospital in which surgical residency has been completed

University hospital

Government teaching hospital

Other

4. Type of the hospital in which surgical practice has been currently performed

University hospital

Government teaching hospital

Government non-teaching hospital

Private hospital-private doctor's office

Other

5. Number of years in practice

<1 year | 1-5 years | 6-10 years | 11-15 years | >16 years

6. Approximate number of laparoscopic procedures (excluding bariatric, inguinal hernia and adrenal gland surgery)

<100 | 101-250 | 251-500 | 501-750 | >751

Preferred techniques for first entry

7. Recognized laparoscopic entry technique at the hospital in which surgical residency has been completed

Insufflation via Veress needle | Direct trocar insertion | Open approach/ Hasson trocar | Optic trocar | Other

8. Currently preferred laparoscopic entry technique

Insufflation via Veress needle | Direct trocar insertion | Open approach/ Hasson trocar | Optic trocar | Other

9. Most prominent rationale on determining laparoscopic entry technique

Most recognized laparoscopic entry technique during residency

Results of randomized controlled studies and meta-analyses

Higher complication rate of other techniques

Advice of competent people on general surgery

Easy applicability

10. Any change of laparoscopic entry technique

Yes | No

11. Most prominent rationale for change of laparoscopic entry technique

No need

Results of randomized controlled studies and meta-analyses

Complication in association with laparoscopic entry technique

Advice of competent people on general surgery

Easy applicability

Obligatory current technique used on the hospital

Complications

12. Occurrence of complication/s during laparoscopic entry

Yes; number of complication/s

No

13. If the answer of the previous question is "Yes," type of complication/s

Intestinal injury

Vascular injury

Both

14. Approximate number of the case in which the first complication encountered during laparoscopic entry

<100	101-250	251-500	501-750	>751