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LAPAROSCOPIC CHOLECYSTECTOMY: DIRECT TROCAR INSERTION VERSUS VERESS NEEDLE TECHNIQUE FOR LAPAROSCOPIC ENTRY

Dr. Hassan Khalil Melek* MD

AL-Zahra' Teaching Hospital, College of Medicine, Wasit University, Iraq.

Corresponding Author: Dr. Hassan Khalil Melek

AL-Zahra' Teaching Hospital, College of Medicine, Wasit University, Iraq.

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ABSTRACT

Background: In laparoscopic surgey, Laparoscopic Entry (LE) and establishment of pneumoperitoneum is very important step because 50% of visceral and vascular injuries occur during this step. There are several techniques for laparoscopic entry. The classical technique is use of Veress Needle (VN) which has many disadvantages such as slow insufflation rate, visceral and vascular injuries. Direct Trocar Insertion (DTI) technique without prior pneumoperitoneum is regarded as safe and fast procedure. ***Objectives***: The aim of this study was to compare VN technique and DTI technique for LE and establishment of pneumoperitoneum regarding time and safety. ***Patients and Methods:*** This was a prospective study performed during period from May 2012 to April 2016. A total of 446 patients (395 females and 51 males) with symptomatic cholelithiasis underwent Laparoscopic Cholecystectomy (LC) were included in this study. VN was used in 210 patients and DTI was used in 236 patients. All operations were performed by single laparoscopic surgeon. The Mean±SD of patient's age was 39.6±12 years (range, 16 to 75). ***Results:*** The Mean±SD of time of DTI (1.9±0.9 minutes) was shorter than that of VN (5.37±1.6 minutes.), P-value =< 0.001. There were no major complications nor mortality in both techniques. There were no significant differences in the incidence rates of minor complications in both techniques except subcutaneous emphysemas which occurred more in VN technique. ***Conclusions:*** DTI technique for Laparoscopic entry is safer and faster alternative than VN technique

INTRODUCTION

The first step in laparoscopic surgery is LE and creation of pneumoperitoneum. This is a very important step because it allows easy and safe insertion of the other ports under direct vision through the telescope. The laparoscopic intraperitoneal access is associated with injuries to the gastrointestinal tract and major blood vessels. At least 50% of these injuries occur before starting the operation.[1] Inspite of significant advances in endoscopic techniques and instrumentation, inadvertent and potentially avoidable complications related to abdominal entry continue to occur.[2], including life-threatening complications such as damages of major abdominal vessels, bowel injuries, bladder injuries, extraperitoneal emphysemas and postoperative infections.[3,4]

Therefore, the safest technique of LE and creation of pneumoperitoneum is very important. Several techniques have been introduced over the past 50 years to decrease incidence of laparoscopic related injuries. The standard techniques of insufflations are: Veress needle, open laparoscopy where the peritoneum opened under direct vision (Hasson's method), optical trocar insertion and direct trocar insertion (DTI) in addition to variants of these techniques.[5] There are many significant complications occur with VN insufflation such as gas embolism, extraperitoneal emphysema, failed pneumoperitoneum with resultant failed laparoscopy and visceral insufflations.[6, 7]

Open access, as described by Hasson in 1971, has shown to minimize vascular injuries but does not reduce bowel injury.[8] Also open access may be complicated by gas leak and port instability.[9] The use of VN was introduced in 1938 by Hungarian surgeon, Janos Veress. It is a spring loaded needle with an inner stylet that automatically convertes the sharp cutting edge to a rounded end by incorporating a side hole for creation of pneumoperitoneum.[1,10,11]

DTI without prior pneumoperitoneum was first described by Dingfelder JR. in 1978.[12] It has many benefits as ; a shorter operation time, immediate recognition of vascular and visceral injuries, decrease incidence of entry failure.[13] and less insufflation-related complications such as gas embolism.[14]

The aim of this study was to compare the time, safety and complications of DTI technique without prior pneumoperitoneum versus VN technique in laparoscopic cholecystectomy (LC).

PATIENTS AND METHODS

This was a prospective observational (cross-sectional) study conducted in the surgical departments, AL-Karama and AL-Zahraa teaching Hospitals / College of Medicine / Wasit Uuniversity, Iraq from May 12, 2012 to April 20, 2016. A total of 446 consecutive patients, 51males 11.5%, 395 females 88.5%, with symptomatic cholelithiasis underwent LC, were included in this study. Each patient was evaluated by detailed history, physical examination and investigations. Investigations included: complete blood picture, urine examination, blood urea and creatinine, fasting blood sugar, liver function tests, hepatitis viral screening and ultrasound of the abdomen.

Exclusion criteria included:gallbladder and bile duct cancers, liver cirrhosis, obstructive jaundice, patients unfit for general anesthesia and patients had associated umbilical hernias.

The patients were randomly divided into two groups (VN group and DTI group). In VN group (210 patients)Veress needle technique was used while in DTI group (236 patients), the primary trocar was directly inserted without prior pneumoperitoneum . Data regarding age, gender, technique of LE, laparoscopic entry-related complications , length of hospital stay and mortality were collected and statistically analysed.

All operations were performed by one general surgeon. Operating table was put in supine position at or below the level of surgeon's waist. Under adequate general anesthesia, the patient was prepared and draped. Ten millimeters infra or supraumibilical incision was made. For obese patients, the incision was 3-4cm supraumbilically. For patients with previous upper mid line laparotomy incisions, left sub costal (Palmers point) was the site of insertion. The operating surgeon and his assistant elevated the anterior abdominal wall by pulling up with their left hands and 10- mm trocar was inserted by twisting semicircu lar motion with the surgeon's right index finger positioned 3 cm away from the trocar tip in order to increase safety so preventing sudden uncontrolled entry into the abdomen until a discrete and single pop was heard indicating that the trocar has pierced the fascia and peritoneum. The telescope was then introduced, proper intraperitoneal placement was ensured, and a pneumoperitoneum was established with high flow insufflations. The underlying structures were carefully inspected for any injury. The patients position was then changed to Reverse- Trendeleburg's position. Other trocars were inserted under direct vision. In VN group, in order to make sure VN worked correctly, it was checked before it's use by retracting the sheath which spring back when released. Under general anaesthesia with the patient in supine position, a small sharp transverse incision is made (either supra or infra umbilical), then the subcutaneous tissues bluntly dissected and retractor is used to grasp and elevate the umbilicus.VN was inserted at 45° or 90° angle. A double click was felt, the first when the needle passed through the tissue and the other when it passed the peritoneum and the blunt tip retracted. The correct placement of VN was checked by several methods like needle movement test, irrigation test, aspiration test and hanging drop test**,** then the first trocar was inserted with the continuation of insufflations and the telescope was introduced The results of the study were statistically analysed using SPSS version *22.*

RESULT OF THE STUDY

In this study, 446 patients (aged 16 - 75 years - median 45.5 year) were included (395 females and 51 males) table 1. The Mean±SD of age was 39.6± 12.3. Most patients were complaining of calculous cholecystitis, 424 patients complained of chronic calculous cholecystitis, 15 patients complained of acute cholecystitis and 7 patients complained of empyema of gall bladder.

Table .1. Age / Sex Distribution of The Study Patients.

Sex/LE Technique	No=	%	Age Mean±SD	Age range /year
Male	51	11.5%	45.5±13.4	20 - 75
Female	395	88.5%	38.8±12	16 - 75
Total	446	100 %	39.6±12.3	16 - 75
VN			38.7±11.7	
DTI			40.3±12.8	

Table .2. The Histopathologic Distribution of the Study Patients.

Histopathologic Result.	No. of patients	DTI Technique	VN Technique	Conversion To Laparotomy
Chronic Calculous Cholecystitis	424 (95%)	227	197	10
Acute Caculous Cholecystitis	15 (3.6%)	5	10	3
Empyema of Gall bladder	7(1.4%)	4	3	1
Total	446(100%)	236(52.9%)	210(47.1%)	14(3.13)

The study patients were divided in two groups according to the technique of LE and creation of pneumoperitoneum: VN technique included 210 patients while DTI technique included 236 patients.

Conversion rate to open technique was 14 (3.13%) patients: 11patients due to dense adhesion at Calot's triangle, 2 patients due to Mirrizi's syndrome and one patient due to large gall stone impacted in the cystic duct. Regarding time, there was a significant difference between VN technique (Mean5.37±1.6min) and DTI technique (Mean±SD = 1.9±0.9), P-value=<0.001. There were no major complications in DTI group but it had 3 patients developed subcutaneous emphysemas that improved spontaneously. VN group had 17 patients developed subcutaneous emphysemas, p-value = <0.0001, 4 patients had omental injury conservatively treated, 2 in each group.

Regarding postoperative complications, there were no significant differences. Port site infection occurred in 9 patients VN group and 8 patients of DTI group. Port site hernia occurred in one patient of VN group and two patients of DTI group.

Table 3. Shows Our Study Complications.

The Study complications	VN Technique		DPI Technique	
	No. of cases	Percentage %	No. of cases	Percentage %
Subcutaneous emphysema	17	8.09	3	1.27
Visceral injury	0	0	0	0
Omental injury	2	0.95	2	0.84
Port site hernia	1	0.47	2	0.84
Port site infection	9	4.28	8	3.38

DISCUSSION

In laparoscopic surgery, first trocar entry and induction of pnuemoperitoneum is the critical step because 50% of injuries in laparoscopic surgery occur during this step.[13] To have safe LE, several entry techniques were developed .

In this study there were no significant differences in the incidence of minor and major complications except the extraperitoneal emphysemas whose incidence rate was more in VNgroup (17 patients 8.09%) than DTI group(3 patients 1.27%). Altun and associates.[15] reported 2.2% major complications in VN group with no such complications in the DTI group. The incidence of minor complications in their study was 6.75% in VN group and 2.05% in DTI group. They concluded that the selection of technique depends on surgeon preference, surgeon experience, skills and anatomical knowledge. An important advantage of DTI technique is the decreased number of blind insertions required to establish pneumoperitoneum, in DTI, there is only one blind insertion while in VN technique 2 blind entries(VN and trocar) and blind insufflations.[16,17] Subcutaneous emphysema is one of the main complications in VN technique, it's incidence rate decreased in DTI technique]. This study had only 3 patients (1.27%) developed subcutaneous emphysemas in DTI group while in VN group 17 patients (8.09%) had subcutaneous emphysemas , P-Value = <0.0001.

In Ahmed and assosciate study, they reported no major differences were found in complications between the two techniques but, extraperitoneal insufflation was avoided in DTI technique in comparison to VN technique.[18] The incidence of complications was more in VN group because of difficulty in placement of trocar due to extraperitoneal emphysema which occured due to inadequate depth achieved with VN. In A.S. Mudholkar et al study.[5] ,there were no subcutaneous emphysemas or vascular injuries but, only 2 patients had omental injuries. Also our study had no vascular injuries.

Complications can be minimized if there are: a proper patient selection, well- relaxed abdomen, sharp instruments, adequate incision, good anatomical knowledge and dynamics and proper elevation of the abdomen.[17,19]. Minor complications were significantly more frequent in VN technique.[10]

Table .4.compares complications of our study with those of some global studies

Complications/ Global Studies		Yerdel MA[20]	Mary T. Jacobson et al[21]	Günenc MZ et al[22]	E. P-Díaz-Chávez et al[23]	K. Theodoropoulou, et al[13]	Mahmood S. Zakhera [24]	F. Agresta, [25]	Jawad K. Dhahiry [26]	This study
No. of patients		1567	1385	?	84	196	?	2091	208	446
Year		1999	2002	2005	2006	2008	2010	2012	2014	2016
V N	***Minor complications %***	14.4	0.7	?	?	Not Used	14	Not Used	Not Used	6.95
	Major Complications %	0	4.7	?	?		0			0
	Total	14.4	5.4	15.7	23.8		14			6.95
D	***Minor***	0.4	2.4	?	?	4.5	0.4	0	4.3	2.91

PI	***complicatin%***									
	Major complications %	0	0.16	?	?	0	0	0	0	0
	Total%	0.4	2.56	3.3	2.3	4.5	0.4	0	4.3	2.91
P- Value		<0.01	?	<0.05	0.009	?	<0.0001	?	0.004	<0.001

Another advantage of DTI technique is that it takes less time to establish pneumoperitonium. Careful access choice, thorough knowledge of abdominal anatomy and careful attention to surgical technique during laparoscopic port entry can significantly decrease inadvertent injury and improve patient safety.[27]

In this study, VN time Mean±SD was 5.37± 1.6 min while DTI time Mean±SD was 1.9±0.9 min, P-Value = <0.001.Mahmood S. Zakhera[24] reported DTI time 2.2±0.7SD minutes and VN time 8.2±1.4SD minutes. Byron et al[28] reported DTI time Mean±SD =2.2 min and VN time Mean±SD =5.9 min. So, this study time result was comparable with either studies results. These differences occur as a result of multiple blind insertion with a low gas flow rate during insufflation in VN technique.

Table 5. Comparison Between This Study And Other Studies Rsgarding Laparoscopic Entry Time.

Time of Laparoscopic Entry/min	F. Argesta *et al*[25]	Byron JW *et al* [28]	Mahmood S. Zakherah [24]	Prieto *et al* [23]	Jawad K Al-Dhahiry [26]	This study
VN	Not used	5.9	8.2±1.4SD	3.0±0.4	Not used	5.37±1.6
DTI	0.55±0.13	2.2	2.2±0.7SD	1.5±0.5	1.8±0.6SD	1.9±0.9

CONCLUSION

DTI technique of laparoscopic entry is a safe and quick alternative to VN technique and other techniques of laparoscopic entry and creation of pneumoperitoneum. It has shorter entry time than that of other laparoscopic entry techniques with low incidence rates of both, major and minor laparoscopic entry complications.

COMPETING INTERESTS

The author declare that he has no any competing interests.

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