ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Three port versus four port Laparoscopic Cholecystectomy: A Comparative study.

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Manuscript Info

Manuscript History:

Received: 22 October 2015
Final Accepted: 26 September 2015
Published Online: October 2015

Key words:

Biliary Diseases, Gall bladder, Laparoscopic cholecystectomy, Three port, Four port, cosmesis

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Abstract

Four port laparoscopic cholecystectomy has been a standard procedure for removal of gall bladder. Each additional port gives more morbidity to the patient. Research continues to devise procedures which are more patient friendly. Reducing the number and size of ports has been postulated to be superior in terms of requirement of analgesics, hospital stay, cosmesis and cost.

AIM: Our aim was to compare the three- port and four- port laparoscopic cholecystectomy in terms of Operating time, Safety of the procedure, Need for the additional ports, Postoperative pain, Hospital stay and Cosmesis.

MATERIALS AND METHODS: 200 patients with symptomatic gall stone disease were managed by laparoscopic cholecystectomy (LC) from August2010 to September2014. 100 patients were subjected to three port and 100 patients to four port LC. In three port laparoscopic cholecystectomy 5mm port along anterior axillary line was omitted which is usually used for retracting the fundus of gall bladder so as to expose calot's traingle.

RESULTS: There was no statistical difference between the two groups in terms of complications, conversion to open procedure ($p=1$) operative time ($p=0.096$), and hospital stay ($p=0.730$). However patients who undergone three-port laparoscopic cholecystectomy had less pain and required less analgesia than those who undergone four port LC ($p<0.05$), also three-port LC is less expensive and is cosmetically better than four port laparoscopic cholecystectomy.

Conclusion: Three-port LC is a safe procedure in expert hands and resulted in less port site pain ,required less analgesia ,is cosmetically better and cost effective.

INTRODUCTION

The biliary diseases constitute major portion of digestive tract disorders. Among these cholelithiasis being the fore runner causing general ill health, thereby requiring surgical intervention for total cure [1]. Since its foundation in1987 by Philip Mouret of Lyon, Laparoscopic cholecystectomy (LC) has been the procedure of choice for symptomatic gall bladder disease [2]. Traditionally LC is performed using four port techniques [3, 4]. Reducing the size and number of ports did not affect the safety of the procedure [5]. These modifications actually reduced the pain and analgesia requirement [6]. It has been shown that three port LC, two port LC, Needlescope cholecystectomy with micro-instrument and even single incision LC have shown to be feasible. These new techniques took similar

time to perform operation and caused less post operative pain reducing analgesic requirement, had cosmetic benefits and at the same time reduce the cost of one port ,thus being cost effective than standard LC.

MATERIALS AND METHODS:-

This prospective comparative study was performed on ultrasound proved cases of cholelithiasis admitted in the Department of Surgery SMHS Hospital Srinagar Kashmir for elective surgeries from August 20010 to September 2014. The study comprised of 200 cases. 100 were subjected to three port laparoscopic cholecystectomy and 100 were subjected to four port laparoscopic cholecystectomy. All patients with jaundice, USG proved choledocholithiasis, Malignancy, Previous upper abdominal surgery, Acute cholecystitis and Acute gallstone induced pancreatitis, and patients who were not fit for laparoscopic surgery on anaesthetic grounds, were excluded from the study.

METHODOLOGY:

Preoperative assessment included a detailed history, thorough general physical examination and systemic examination in every patient. Relevant investigations like complete blood counts, liver function tests and Ultrasonography were done in all patients. Before the procedure, fully informed consent was taken. Additionally patient's consent for conversion to an open procedure in case of difficulty was obtained. The patients were asked to void urine just before operation to avoid the injury to urinary bladder. The patients were operated using general anesthesia.

OPERATIVE TECHNIQUE:

Four port laparoscopic cholecystectomy

In group 1 four ports were placed, 10mm infra-umbilical (1^{st})port for camera, 10mm epigastric port(2^{nd} port) for dissection and two 5mm ports right laterally for retraction(one 5mm port(3^{rd}) in the midclavicular line and another 5mm port (4^{th} port) in the anterior axillary line just below costal margin. Clot's triangle anatomy identified. Cystic duct and cystic artery were separated clipped and divided. The gall bladder was separated from the liver by hook electro-cautry and haemostasis secured. Using irrigation and suction the liver bed was closely scrutinized and dealt with as necessary. After removal of gall bladder from epigastric port, bed was inspected once again. The ports were removed under vision and ports sites were closed and cosmopore dressing were applied of all the four ports.

Three port laparoscopic cholecystectomy:-The three-port technique involved inserting a 10 mm trocar just above the umbilicus through which the zero viewing videoscope were introduced. Another 10 mm trocar was inserted 3cm below the xiphisternum and finally, a 5 mm trocar at the right hypochondrium midclavicular line 3cm below the costal margin. The procedure was conducted from the left side of the patient together with the assistant holding the camera while the TV monitor was located on the upper left side of the patient and the nurse on the lower left side of the patient. The operating surgeon held the dissecting instruments with his right hand through the 10 mm trocar while gall bladder held at the infundibulum with a grasper through the 5 mm trocar; moving the infundibulum right and left or back and forth to display the calot's triangle, blunt dissection was used for adequate display of the cystic duct and cystic artery. The duct and artery was cut between clips and the gall bladder was then dissected from its bed and extracted through the epigastric port. The ports were removed under camera vision. The ports sites were then closed and cosmopore dressing were applied of all the three ports.

Postoperatively, Patients were monitored for following:

Pulse, blood Pressure, temperature and respiratory rate, Appearance of bowel sounds, Biliary peritonitis, Ileus, Jaundice,Colour and quantity of discharge from drain,if any,Number of days after which drain (if any) was removed. Discharge of patient from hospital was based on clinical grounds. After discharge all patients were seen at surgical outpatient department at one week and then every four weeks for three months. Patient's satisfaction on scar was reviewed 1 week after surgery.

The results were tabulated and subjected to appropriate statistical analysis to calculate the p value using fisher's exact test or unpaired t test as and when needed. A p value of less than 0.05 was taken as significant.

RESULTS:-

A total of 200 patients were included in this prospective study and were randomly distributed into two groups.Table-I shows comparison of demographic data between two groups ($p>0.05$).

Table-I. Demographic data of the patients

Demographic data	Three port	Four port	P valve

No of patients(n)	100	100	
Age (years) Mean age ± SD (Min, Max)	 38.74±13.38 (20, 70)	 39.04±9.12 (20, 65)	 >0.05
Sex Females Males Female/Male ratio	 82(82%) 18 (18%) 4.5/1	 82(82%) 18(18%) 4.5/1	 1

Table-II shows presentation of the patients and their USG parameters in the two groups.

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Presentation		Three port	Four port	p- value
N		100	100	
Pain right hypochondrium		88	86	1
Epigastric discomfort		12	14	1
Pain radiating to back		24	28	1
USG parameters	Single stone	20	22	1
	Multiple stones	80	78	1
	Wall thickness>4mm	4	6	0.603

Table-III shows Comparison of intra-operative parameters and conversion rate and post-operative complications between two groups.

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1. Intra-operative parameter	Three port	Four port	p- value
Need of additional port	4	0	0.495
Conversion to open	4	2	1
Use of drains	8	6	1
Bleeding from liver bed	4	4	1
Major bile duct injury	0	0	-
Other visceral injury	0	0	-
2.Post-operative complications			
Fever	2	2	1
Jaundice	0	0	-
Port site bleeding	0	0	-
Port site hematom	0	0	-
Port site seroma	2	2	1
Port site infection	2	0	1
Port site hernia	0	0	-
Bile leak	0	0	-
Intra-abdominal collection	0	0	-

Table- IV shows comparison of Operative time, VAS score, Analgesia required, Hospital stay between two groups Operative time.

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Variable	Three port n=50	Four port n-50	P- value
Operative time	50.18±7.53	47.58±8.93	0.096
VAS score(time in hours) 1 hour 12 hour 24 hour	 1.72 ± 0 .671 4.58 ± 0.971 1.94 ± 0 .867	 2.16 ± 1.057 5.26 ± 1.259 2.50 ± 0 .707	 0.015 0.003 0.001
Analgesia required(no of doses)	0.73	1.36	<0.05

Hospital stay	1.68 ± 0.776	2.09±0.28	<0.0001

DISCUSSION:

Good results in LC depends on many factors and most important one is experience of the surgeon in laparoscop[7]. LC using three ports mandate good experience in LC for not to threaten the benefits of this procedure. The standard four port approach is followed by the majority of surgeons [8, 3]. The use of the fourth trocar which is generally used for fundus retraction in the American technique seemed unnecessary by some surgeon [5, 9]. In our study the mean age was38.7±13.84 years in three port group and 39.07±9.12 years in four port group ($p > 0.05$), which is almost similar to Manoj Kumar et al[12]. Female to male ratio in our study was 4.5:1 in both the groups, which is almost similar to Dhafir Al-Azawi et al [10].In our study pain RHC (on/off) was present in 88(88%) patients in three port groups and 86(86%) patients in four port group. This was more after fatty meals. Epigastric discomfort was present in 12 (12%) patients in three port group and 7 (14%) patients in four port group. Pain radiating to back was present in 24(24%) patients in three port group and 28(28%) patients in four port group($p > 0.05$).Our results were comparable with the study of Manoj Kumar et al[11].

Routine laboratory investigations were done in all the cases. However no statistically significant difference was found between the two groups (p value >0.05).In our study 20 patients in three port group had a single stone in gall bladder while as 80 had multiple stones. In four ports group 22 patients were harboring a single stone in contrast to 78 patients who had multiple stones ($p > 0.05$).

Additional port was required in 4 patients in three port group. In two patients the GB was too long and would often come in the field of surgery and in other two patients because of dense adhesions it was difficult to define callot's triangle, as keeping GB at stretch by clamp holding fundus, the dissection became easier. However there was no need of additional port in any patient in four port group ($p=0.495$). Subhepatic drain was placed in 8(8%) patients in three port group and 6(6%) patients in four port group because of difficult dissection in view of adhesions and gallbladder perforation during surgery leading to spillage of bile and stones. After saline washes and retrieval of stones a drain was left in sub hepatic region in all these patients ($p=1$). 4 patients (4%) were converted to open in three port group and 2 patient in four port group, 2(2%) patient from either group was converted to open because of bleeding from GB bed which was obscuring the operating field so operating surgeon decided to convert to open, two patients from three port group was converted to open because of distorted anatomy of calot's triangle. 8 patients 4 from each group had difficulty in dissection of gall bladder bed, resulting in bleeding from liver bed, the bleeding was controlled by using diathermy and pressure gaze and post-operative period was uneventful. There was no major bile duct injury or any other visceral injury in any of the two groups. Nafeh A I et al [12] and Slim K et al [13] also reported similar results in their studies.

There was no death in either group, and there were a total of 10 minor complications in the study group (6 in 3-port and 4 in 4- port groups) and was statistically insignificant. 4 patients two from each group develops fever $>100^0$ F probably due to thrombophilibitis in both groups.4 patients two from each group developed port site seroma in epigastric port only, because the enlargement of the epigastric port was needed in view of large stone size. 2 patients in three port group develop port site infection (epigastric), which was managed by applying antiseptic dressing twice a day. None of the patient in our study group has jaundice, port site bleeding, port site hematoma, port site hernia, bile leak and intra-abdominal collection.The mean operative time in three port 50.18±7.53 minutes and in four port group 47.58±8.92 minutes ($p > 0.05$). Similar results were reported by Nafeh A I et al [12]. The operative field was quite clear and comparable to that in standard four port cases. In some cases of three port group, the liver and gall bladder hindered the operative field and consumed slightly more time (average 5-10 minutes). The VAS scores were significantly lower in the three port group as compared to the four port group at 1, 12 and 24. The mean visual analogue score for pain on postoperative days was 1.72± 0.67 at 1 hour, 4.58± 0.97 at 12 hours and 1.94± 0.87 at 24 hours in the three port group and 2.16±1.06 at 1 hour, 5.26± 1.26 at 12 hours and 2.50 ± 0.71 at 24 hours in four port group($P < 0.05$). Manoj Kumar et al [11] reported that the VAS score was significantly low in three port group. The average analgesia required was 0.73 doses in three port group and 1.36 doses in four port group (one dose= 75mg of diclofenac sodium), the difference was statistically significant ($P<0.05$). Though it is said that epigastric port is the main contributor to the pain in LC, however in our study we concluded that the two 5mm ports also contribute to pain in LC. Reduction in number of ports does also reduce the pain score as well as the analgesic requirement which is evident in our study.

The hospital stay was 1.68±0.776 days in three port group and 2.09 ±0.28 days ($P> 0.05$). These results were comparable with the results reported by Dion Y M et al[14]. Cosmesis was assessed by the size of the surgical scars and the number of scars. Patients in both the groups were operated laparoscopically, however in three port group there was one less scar than four port group. Average(range) scar size was 4 mm scar (3.5–5.5 mm) at 5 mm port and 11 mm scar (9–11 mm) at the epigastric port area, the umbilical scar was not seen. It was noted that port site

scars were hardly visible after healing. Overall patients in both the groups were highly satisfied over the cosmetic outcomes of their surgery.

The three-port technique is as safe as the standard four-port laparoscopic cholecystectomy.

CONCLUSION:

There was no difference between the two groups with respect to success rate, operative time and hospital stay. However we conclude that three port laparoscopic cholecystectomy group is preferable as there is fewer requirements of analgesics, cosmetically better, cost effective and there is less crowding around the operating table as there is no need of second assistant in three port laparoscopic cholecystectomy, thus reducing the required manpower and hospital cost.

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