Traditional 4-Port *Versus* Reduced Port Laparoscopic Cholecystectomy

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ABSTRACT

Introduction: Laparoscopic cholecystectomy is one of the most commonly performed surgeries worldwide by general surgeons. Improvisations, also in terms of reduction in the number and size of ports have been attempted for the same, seeking advantages of the same above the conventional four-port laparoscopic cholecystectomy.

Objective: To evaluate the advantages & efficacy of reduction in the number of ports for laparoscopic cholecystectomy.

Methods: A descriptive study of 100 cases from the Dept of General Surgery, Silchar Medical College & Hospital, Silchar, Assam, over a period of one year were analyzed.

Results.: A study of 100 patients with a female: male ratio of (18:7), of which 9 underwent 1-port LC, 52 underwent 2-port LC, 39 underwent 3-port LC. The mean operating time for 1, 2 & 3-port LC were 57.88, 42.2 & 35.68 minutes, respectively (p = 0.883) for conversion of reduced ports to conventional 4-port LC or open cholecystectomy, indicating no positive association between the number of ports & conversion. The mean number of doses of analgesia required in 3, 2 & 1-port LC were 2.23, 2.03 & 1.44 doses, respectively (p = 0.018). The mean number of post-operative days stay was 1.16, 1.04 & 1.11 days, respectively (p = 0.170), and the number of days taken for return to daily was 1.16, 1.04 and 1, respectively.

Conclusion: It was observed that the age for the prevalence of gallstone disease was most common between (21–30) years, the duration of surgery increased with the decrease in the number of ports, and the conversions were not associated with the number of ports used & so were the complications. The number of doses of analgesics required was lesser with a lesser number of ports. There was no significant difference in the duration of hospital stay. The number of days required to return to routine activities was earlier, with a lesser number of ports. The was excellent cosmesis in all the 3 types of reduced ports.

Our study showed similar results of Cassera *et al.*, in terms of post-op complications, & pain were similar in with a decrease in the number of ports; Chow *et al.* showed shorter post-operative stay, which is not so in our study, which showed no significant duration of post-operative stay; Podolsky *et al.* expired technical difficulty with a reduction in a number of ports, which is similar to our study, where the duration of surgery increases with reduction of ports. There were certain limitations to this study including sample size being small and being from a single region is not representative of the entire community around the world. All the surgeries were performed keeping in mind the benefits that could be incurred for the patients at no added cost. There is a possibility of bias.

Keywords: Cholecystitis, conventional 4-port LC, reduced port LC, post-operative pain, return to normal function, cosmesis

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INTRODUCTION

Gallstones, perhaps are the most common gastrointestinal pathology, presenting to a general surgeon. Laparoscopic cholecystectomy has become the gold standard for cholelithiasis.[1-5] Over a period of time, there has been a shift from the standard/ conventional four ports to the reduction in the number and size of ports, to minimize the surgical trauma to patients and thereby reducing the post-operative pain and scarring. This study aims to minimize the surgical trauma, to study the advantages of the decreasing number of ports in terms of the duration of surgery, the need to convert to conventional laparoscopic cholecystectomy (LC) or open cholecystectomy, early post-operative complications, the duration of post-operative stay in the hospital, the duration required to return to normal routine activities post-operatively & the cosmetic advantages associated with it.

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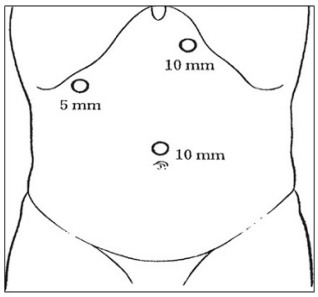


Figure 1: 3-port LC

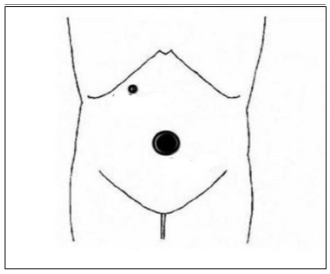


Figure 2: 2-port LC

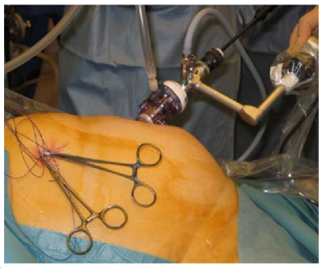


Figure 3: 1-port LC

Incision attribute	Score if absent	Score if present
Step-off borders	0	1
Contour Irregularities	0	1
Margin Separation	0	1
Edge inversion	0	1
Excessive Distortion	0	1
Overall appearance	0 (satisfactory)	1 (unsatisfactory)
Total Hollander score	**0 (best)**	**6 (worse)**

Figure 4: Post-operative period

METHODOLOGY

Patient Selection

Ultrasonographically confirmed patients of cholecystitis were taken from the Department of General Surgery, Silchar Medical College and Hospital, Silchar, Assam, age group 10 to 70 years, who consented for the study. Those with ASA score >/=2, obstructive jaundice, liver cirrhosis**,** common bile duct (CBD) diseases**,** carcinoma gall bladder (GB)**, c**holedocholithiasis, benign GB diseases other than cholelithiasis, and previous upper gastrointestinal surgery were excluded.

Surgical Technique

3-port LC

An umbilical incision, subxiphoid supra-umbilical incision for the introduction of a laparoscope. The other two trocars, working ports are placed for a 10 and a 5 mm,. Per-cutaneously placed sutures provide the fundal cranio-lateral traction through the anterior abdominal wall at the right subcostal region at the anterior axillary line (Figure 1). The remaining steps of the LC remained same as that of the conventional 4-port LC.[6,7]

Port LC

Following the placement of a 10 mm umbilical port, two nylon sutures grasp the fundus and the Hartmann's pouch passed percutaneously for traction and counter-traction respectively (Figure 2). The standard dissection as in the conventional LC is followed. For the clipping and dividing. In the case of a wide An alternative is changing & application. Specimen retrieval is either through the umbilical port by railroading or by using 5 mm 30° scope through the epigastric port and 10-mm jaw forceps from the umbilical port.[8,9]

1-port LC

An approximately, 10 mm trocar is used to implant a 30-degree laparoscope on the left side of the incision, and a 5 mm trocar is used on the right side for electrocautery. An alternative to this is the use of a hand glove and the insertion of trocars through this (Figure 3). Just below the right subcostal margin in the mid-clavicular line, and the gallbladder fundus is punctured and retracted superior-laterally.[10-12]

Another suture is used to puncture and retract the Hartmann's pouch inferior-laterally to expose the Calot's triangle. The L-hook diathermy is used to dissect Calot's triangle, clipping of cystic artery & duct is done & GB is dissected from the GB fossa. After that, a 5 mm trocar is switched for a 10 mm trochar, and through the 10 mm port, a specimen bag is inserted, the GB is extracted, and the ports are closed.[13]

Table 1: Representation of the distribution of females & males in different age groups

*AGE * sex cross-tabulation*			
Age in years	*Sex*		*Total*
	Female	*Male*	
<=20	10	3	13
21–30	27	11	38
31–40	16	6	22
41–50	14	7	21
51–60	4	0	4
>60	1	1	2
Total	72	28	100

Table 2: Relation between number of ports & mean operative time

*Ports * Operating time cross-tabulation*					
	Operating time				*Total*
	<=30 minutes	*31–45 minutes*	*46–60 minutes*	*>60 minutes*	
1 port Ports	0	0	6	3	9
2 port	1	32	18	1	52
3 port	7	31	1	0	39
Total	8	63	25	4	100

Table 3: Relation between the number of ports & conversion rates

*Ports * Conversion cross-tabulation*			
	Conversion		*Total*
	Yes	*No*	
1 port	0	9	9
2 port	1	51	52
3 port	1	38	39
Total	2	98	100

Table 4: Relation between the number of ports & complications

*Ports * complications cross-tabulation count*			
	Complications		*Total*
	Yes	*No*	
1 port	1	8	9
2 port	0	52	52
3 port	1	38	39
Total	2	98	100

Table 5: Chi-square test

	Value	*df*	*Asymp. Sig. (two-sided)*
chi-square P	4.936[a]	2	0.085
Ratio (Likelihood)	4.028	2	0.133
LL association	.466	1	0.495
Total valid cases	100		

Table 6: Relationship between number of ports & post-operative analgesia

	Post-op analgesics			*Total*
	1 dose	*2 doses*	*3 doses*	
1 Port	4	4	1	9
2 Port	6	38	8	52
3 Port	4	22	13	39
Total	14	64	22	100

Table 7: Chi-square test

	Value	*df*	*Asymptomatic Sig. (two-sided)*
Chi-square P	11.929[a]	4	0.018
Ratio (Likelihood)	9.755	4	0.045
LL association	6.616	1	0.010
Total cases	100		

Post-operative Period

An initial dose of analgesic was given to all of them. Depending on their pain and symptoms like nausea, they were started on oral fluids followed by semi-solid and then solid diet. Most of the patients were discharged on the next day if no immediate complications were observed. Sutures were removed on 7th post-operative day. Wound infections were noted, if any, in the short-term follow-up period. Cosmetic scores were also assigned as per the Hollander scoring system (Figure 4).[14]

Statistical Analysis

The statistical analysis used in our study is of descriptive type. IBM SPSS Statistics viewer software was used.

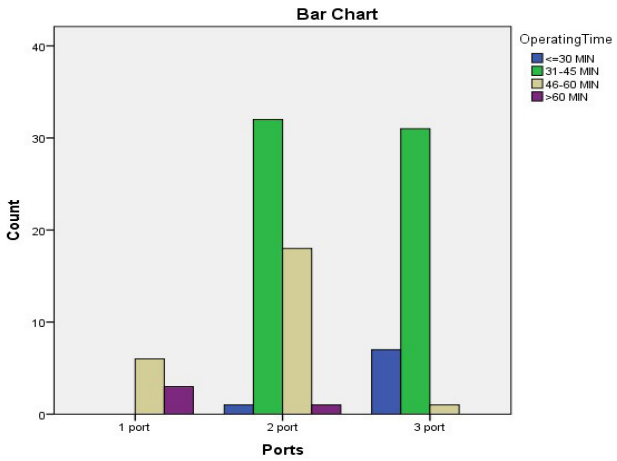
RESULTS

Age-sex-frequency distribution

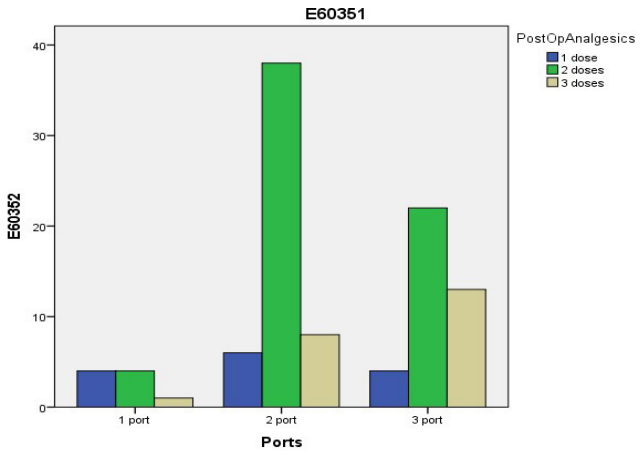
There were 100 cases in the study, of which 9 cases underwent 1-port LC, 52 cases underwent 2-port LC and 39 cases underwent 3-port LC, which were randomly assigned (Table 1).

Ports* operative time

In 1-port LC, the mean operative time was in the range of (46–60) minutes in 6 cases and was more than 60 minutes in 3 cases. In the 2-port LC, the mean operative time was <30 minutes in 1 case, (31–45) minutes in 32 cases, (46–60) minutes in 18 cases and >60 minutes in 1 case. In the 3-port LC, of the mean operative time was <30 minutes in 7 cases, (31–45) minutes in 31 cases & (46–60) minutes in 1 case. The mean operating time for 1, 2 & 3 port LC were 57.88, 42.2 & 35.68 minutes, respectively (Graph 1 and Table 2).



Graph 1: Relationship between the number of cases of each type of LC & mean operative time



Graph 2: Association between number of ports & post-operative analgesia

Table 8: Relationship between number of ports & post-operative stay

Number of ports & days of post-operative stay	*Post-op stay*			*Total*
	1 day	*2 days*	*4 days*	
	8	1	0	9
Number of ports & days of post-operative stay	50	1	1	52
	33	6	0	39
Number of ports & days of post-operative stay	91	8	1	100

Table 9: Chi-square tests

	Value	*df*	*Asymp. Signature (two-sided)*
Chi-square P	6.422[a]	4	.170
Ratio (Likelihood)	7.293	4	.121
LL association	.465	1	.495
Total cases	100		

Table 10: Relationship between number of ports & return to routine activity

*Ports * Return to routine activity A cross-tabulation*				
Ports	*Return to routine activity*			*Total*
	<=2 days	*3-4 days*	*>4 days*	
port	7	2	0	9
2 port	33	18	1	52
3 port	22	14	3	39
Total	62	34	4	100

Table 11: Chi-square tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson chi-square	3.240[a]	4	.518
Likelihood ratio	3.479	4	.481
Linear-by-linear association	2.287	1	.130
No. of valid cases	100		

Number of Ports & Conversion Rates

Among the cases of 1-port LC, there were zero conversions to 4-port LC. Among the 2-port LC, there was a conversion of 1 case to 4-port LC. Among the 3-port LC, there was a conversion of 1 case to a conventional 4-port LC. The (p = 0.883) for number of ports & conversion to conventional LC implies no significant relationship between the number of ports & conversion rate in our study (Table 3).

Number of ports & Complications

Among the 1-port LC, the complication was noted in 1 case. Among the 2-port LC, none had complications & in 3-port LC, complications were noted in 1 case. The p = 0.085 implies no significant relationship between the number of ports & complications (Tables 4 and 5).

Number of Ports & Post-operative Analgesia

Association between number of ports & post-operative analgesia as shown in Graph 2 and Table 6.

Number of ports & days of post-operative stay

In the 3-port LC, the post-operative stay was 1 day in 8 cases & 2 days in 1 case. In 2-port LC, it was 1 day in 50 cases, 2 days

Figure 5: – 3 port vs 2 port vs 1 port post operative port sites

in 1 case, and 4 days in 1 case. In 3-port LC, it was 1 day in 33 cases & 2 days in 6 cases. The mean number of post-operative stay in the hospital in 3-port, 2-port and 1-port LC are 1.16, 1.04 and 1.11 days, respectively. The (p = 0.170), which is not significant (Tables 7 to 9).

Number of Ports & Duration for Return to Normal Activity

The number of days taken for returning to normal activity in 1-port LC was (<= 2) days in 7 cases & (3–4) days in 2 cases. In 2-port LC it was (<= 2) days in 33 cases, (3–4) days in 18 cases & (>4) days in 1 case & in 3-port LC was (<=2) days in 22 cases, (3–4) days in 14 cases & (>=4) days in 3 cases. The *p-value* is 0.518, which indicates there is no significant correlation between the number of ports & duration required to return to normal activities. The mean number of post-operative stay in the hospital in 3-port, 2-port and 1-port LC are 1.16, 1.04 and 1.11 days, respectively (Figure 5 and Tables 10 and 11).

Cosmesis

DISCUSSION

In this study, 100 cases were studied of which 72 were females and 28 were males. After randomly assigning the type of surgery the patients would undergo, they were taken up for reduced port LC & then assessed on the basis of mean duration of surgery, conversion to the conventional 4-port LC or to open cholecystectomy, early post-operative complications (within 10 days) if any, post-operative pain in terms of doses of 75 mg of injection (intra-muscularly) Diclofenac (for age >12 years) & injection paracetamol (intravenous) 15 mL/kg/dose (for cases with <12 years of age) required, number of days of post-operative stay required, number of days taken to resume routine day to day activities and cosmesis on the basis of Hollander score. An experienced surgeon in the field of laparoscopic cholecystectomy performed all the surgeries

A total of 100 patients were taken up for the study, of which there were 28 males and 72 females. These patients were distributed into three groups- 3, 2 and 1-port, respectively. The number of patients who underwent 3, 2 and 1 port LC were 39, 52 and 9, respectively, of which 1 case each from the 3-port and the 1-port group had to be converted to conventional 4-port LC. The mean time taken for 3, 2 and 1-port LC was 35.68, 42.2, and 57.88 minutes, respectively. The mean analgesia requirements in each of the groups were 2.23, 2.03, and 1.44 doses, respectively. The mean post-operative stay was 1.16, 1.04, and 1.11 days, respectively. The mean number of days required to resume routine daily activities were 2.68, 2.33, and 2.22 days, respectively. The Hollander score for cosmesis was 0 in all cases, except the 2 cases that had later presented with port site infections, where the scores were 2 and 1, respectively.

Thus, it was observed from our study that with the reduction in number of ports, even though there was an increase in the mean duration of surgery with the decrease in the number of ports, there was a decrease in the requirement of analgesia and better patient satisfaction with the decrease in number of ports. However, no significant differences were noted in the other parameters with the decrease in number of ports in this study.

Comparison with the existing studies-

Our study showed similar results to Cassera *et al* [11], in terms of post-op complications, & pain was similar in with a decrease in the number of ports; Chow *et al.* showed shorter post-operative stay, which is not so in our study, which showed no significant duration of post-operative stay,; Podolsky *et al* [13] expired technical difficulty with a reduction in number of ports, which is similar to our study, where the duration of surgery increases with reduction of ports.

There were certain limitations to this study, including sample size being small, and being from a single region is not representative of the entire community around the world. All the surgeries were performed keeping in mind the benefits that could be incurred for the patients at no added cost, there is a possibility of bias. Also, as a single surgeon performed all the surgeries, there is a possibility of bias. These could be some of the reasons, for some of our findings not resonating with other similar studies.

CONCLUSION

In our study, it was observed that decreasing the number of ports did not cause any increase in cost of surgery to the patient, but it increased the mean duration of surgery. There were no significant technical difficulties noted during the procedure with the decreasing number of ports and there were no significant differences in conversion rates or complications noted with the different number of ports.

There was significant decrease in the number of doses of analgesia required with the decreasing number of ports. However, there was no significant difference in the duration of post-operative stay or in the return to routine daily activities. The cosmesis was similar in terms of Hollander scale in all three types of reduced port LC studied. However, after the port-site infection the score was better in case of single port LC than in 3-port LC. The patient satisfaction was better with decreasing the number of ports.

Therefore, from our study, we come to a conclusion that, decreasing the number of ports in laparoscopic cholecystectomy, significantly decreases the post-operative pain and provides better cosmesis; the only drawback being, the increase in the duration of the surgery with the decrease in the number of ports.

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