Original Article

A Study on Gallbladder Retrieval via Epigastria V/S Supraumbilical port in Laparoscopic Cholecystectomy

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Abstract: The operation of laparoscopic cholecystectomy is still evolving with time as the size and number of ports are reducing day by day. This comparative study was done to compare the extraction of gallbladder through epigastria/subxiphoid port versus supraumbilical port in laparoscopic cholecystectomy in terms of postoperative pain on first day, gallbladder retrieval time, extendibility of the incision and port-site infection. This is an observational comparative study for duration of one and half year at NMCTH. Total 148 patients were included in the study. Patients underwent standard four port laparoscopic cholecystectomy and were followed for one week after discharge. Postoperative pain at interval of 0, 6, 12 and 24 hours were recorded by Visual Analogue Scale (VAS). Performa were filled for all participants and collected data was analyzed in SPSS 16. For the analysis, paired t-test, independent t-test and chi-square test were used. Ethical approval was taken from Institutional Review Committee (IRC) of NMCTH. The mean VAS scores for pain were higher at the exit port from which the GB was retrieved as compared to non-exit port at all hours of assessment and was statistically significant (P = 0.001). Higher VAS scores were observed for the epigastria port as compared to the umbilical port group at all measured time intervals which was statistically significant (P = 0.001). Mean time taken for retrieval of GB from epigastria port was longer as compared to the umbilical port (7.31±1.87 vs. 6.93±2.25 minutes) but was statistically insignificant (P = 0.270). Port site infection (PSI) were seen in 5 (3.38%) patients. PSI and bile spillage were statistically insignificant (P = 0.139). The chances of port site extension for GB retrieval increased with stones measuring greater than 10 mm (P = 0.0001). The retrieval of the GB from the umbilical port is superior to that from the epigastria port in terms of decreased postoperative pain. The chances of port extension increased with stones larger than 10mm. The mean time taken for GB retrieval and PSI are comparable in both ports.

Keywords: Epigastria port, laparoscopic cholecystectomy, port-site pain, retrieval time, umbilical port

1. INTRODUCTION

The diseases of gallbladder are known since antiquity. Cholelithiasis has plagued mankind for over 2000 years. Langenbuch's open cholecystectomy remained the gold standard for symptomatic cholelithiasis for over a century [1]. In 1987, Philip Moure performed the first LC in France. LC has introduced a new era in general surgery. This procedure has been widely accepted and adopted by the surgical community and has become the "gold standard procedure for managing patients with symptomatic gall stone diseases "There are many advantages of LC over open cholecystectomy like shorter hospital stay, cosmoses and reduced pain. LC is evolving with time like reduction in port numbers and sizes [2]. A National Institutes of Health (NIH) consensus statement in 1992 stated that LC provides a safe and effective treatment for most patients

with symptomatic gallstones and has become the treatment of choice for many patients. Many centers have special “short-stay” units or “23-hour admissions” for postoperative observation following this procedure. Pain is the main reason for the overnight hospital stay and the predominant complaint and primary reason for prolonged convalescence in 26 to 41% of patients after LC [3]. Pain is most intense on the day of surgery and the day after which subsequently declines to low levels within 3 to 4 days. In LC, overall pain is a conglomerate of three different and clinically separate components: incisional pain (somatic pain), visceral pain (deep intra-abdominal pain) and shoulder pain (presumably referred visceral pain). Characteristically, overall pain after LC carries a high inter-individual variability in intensity and duration and is largely unpredictable. Retrieval of GB is an important terminal event of LC and is reported as one of the factors affecting post-operative port site pain. Pain is the most frequent complaint after LC which can prolong the length of hospital stay [4]. Several factors contribute to postoperative pain including rupture of blood vessels due to rapid distension of peritoneum, traumatic nerve traction, and abdominal wall trauma during port insertion, pneumoperitoneum and GB retrieval. It has been shown that incisional pain is more dominant than visceral pain during the first 48 hours after LC [5]. During the extraction of GB, perforation of the wall of GB and spillage of bile in wound are all messy things which may spoil a straight forward cholecystectomy. Conventionally, the retrieval of GB is done via the umbilical port after dissection of the GB from its bed. At this point, the telescope is moved from the umbilical port to the epigastria port, the GB is grasped with a 10 mm grasper introduced through the umbilicus, and the GB and port removed.GB is extracted either from the epigastria or umbilical port and both ports have been encouraged for extraction of GB [6]. Very few studies are available on retrieval of GB via epigastria port. Abbas et al. preferred subxiphoid port as compared to umbilical port due to the surgeon’s ease and also there was no need to change the position of telescope. Siddiqui. However showed superiority of umbilical port in terms of postoperative port site pain. Carpet. Have done a study on abdominal wall abscess and sinus tracts, which are increasingly recognized as complications of LC. They found that most cases were associated with spilled gallstones when GB is extracted through epigastria port [7]. To date, there is no level 1 evidence or meta-analysis to support the superiority of one port over the other for GB [8]. This study is done to compare in terms of retrieval time, postoperative pain, complications, extensibility of incision, hospital stay, ease of use by surgeon as well as acceptability by patient. This new study was done to find evidence for a better port for GB retrieval in LC [9].

2. MATERIALS & METHOD

A Hospital based observational comparative study was conducted to evaluate gallbladder retrieval from epigastria versus supraumbilical port in laparoscopic cholecystectomy. The study was conducted in the Department of General Surgery in Nepal Medical College and Teaching Hospital, Dorati, Kathmandu (NMCTH) all patients who were planned for elective laparoscopic cholecystectomy for symptomatic gallbladder disease confirmed by ultrasonography in Department of Surgery at NMCTH were included in the study. Patients below the age 16 years, with gall bladder malignancies, empyema, musicale, obstructive jaundice and bleeding diathesis were excluded in this study. All eligible patients within time of study were included in the study. Sample size was calculated by following formula Therefore, approximately 148 patients were included in this study an open and close ended preform was used for data collection. VAS was used to assess the pain in both umbilical and epigastria ports for each participant at 0,6,12, and 24 hrs. The preform was developed based on the objectives of the study and study variables. Diagnosis was based on clinical suspicions and USG findings. Detail parameters as mentioned in preform was taken. All patients underwent classical 4 port laparoscopic cholecystectomy performed by experienced surgeon of concerned department. GB was retrieved from umbilical or epigastria port according to the operating surgeon’s preference. Intraoperative findings such as port site extension, bile leakage, bleeding and time taken for GB retrieval were noted. Time taken for GB retrieval was the time after completion of Cabot’s triangle dissection, cystic artery and cystic duct clipping, dissection of GB from liver bed, hemostasis, and irrigation till its removal from one of the two ports .Standard IV paracetamol 15mg/kg was given every 8 hours.

Measurement of postoperative pain for epigastria and umbilical port was done using Visual Analogue Scale (VAS). VAS was divided from the score of 0 to 10. (0 being no pain and 10 being the worst possible pain patient had ever thought of). Postoperative pain in both epigastria and umbilical ports at 0, 6, 12 and 24 hours after surgery was measured in VAS. Performa were filled by attending duty resident in department of General Surgery. VAS was explained by the duty resident one day prior to surgery. Pain was managed by top-up analgesics Patients were called for follow-up in Surgery OPD in one week after discharge postoperatively. Post-operative complications like length of hospital stay, SSI were noted as per CDC guidelines every completed preform along with information of VAS was checked regularly to ensure its consistency and completeness. All recorded data was coded to facilitate data entry process. Classification and tabulation of data were done to make analysis further easier. Data was entered and analyzed in IBM Statistical package for the Social Sciences (SPSS) 16.Descriptive statistics was used to describe the patient's characteristics. Pearson chi-square test was used for comparison of categorical data and student's t-test was used for continuous data. The P-value less than 0.05 was taken as statistically significant. For the reliability of the study extensive literature review and consultation with supervisors were done and standard tools (preform and VAS) were adopted. Medical history of the respondents was reviewed to ensure the validity of the information obtained. The researcher himself was actively involved in data collection and intervention. Regular assessment was carried out by the investigator and the on-duty doctors by observation, patient's complaints and direct questionnaire. Assessment was done at 0 hours, 6 hours, 12 hours and 24 hours after surgery. Patients' complaints in between the time of assessment were also recorded. Ethical approval was obtained from the Institutional Review Committee (IRC) of NMCTH. The reference number is 30-076/077. A written informed consent was obtained from each patient included in this study. All precautions were taken not to harm the patient and confidentiality was maintained. Participants were explained about the research detail, its significance, benefits, and harm in the language they understand and were allowed to withdraw from the study at any time of the study. Pain was assessed timely using VAS and analgesics were prescribed with reference to WHO pain ladder.

3. RESULTS & DISCUSSION

Out of 148 patients enrolled in this study, 77 patients had their GB retrieved from epigastria port while 71 patients had their GB retrieved from umbilical port.

3.1 Demographic Characteristics of the Participants

A total of 148 patients aged above 16 years who underwent LC were enrolled in this study. The mean ages of the participants was 40.67±12.59 years. Patients in both groups were comparably distributed in terms of age. Majority of the patient belonged to age group of 30-39 i.e., 46 (31.1%) followed by 40-49 i.e., 45 (30.4%) as shown in table.

Table 01: Age ddistribution (total sample = 148)

Age	Umbilical	Epigastria	Total
<20	3 (42.9%)	4 (57.1%)	7
20-29	8 (47.1%)	9 (52.9%)	17
30-39	21 (45.7%)	25 (54.3%)	46
40-49	24 (53.3%)	21 (46.7%)	45
50-59	7 (41.2%)	10 (58.8%)	17
>60	8 (50%)	8 (50%)	16
	71	77	148
Mean Age ± SD	41.04±12.83	40.32±12.44	40.67±12.59

Majority of the patients undergoing LC were female 118 (79.7%) as shown in table. Among them, 52.54% underwent GB retrieval via epigastria port. Equal percentage of male underwent GB retrieval via epigastria and umbilical port.

Table 02: Gender ddistribution (total sample = 148)

Gender	Umbilical	Epigastria	Total
Male	15 (50%)	15 (50%)	30
Female	56 (47.46%)	62 (62%)	118

3.2 Clinical Characteristics of the Participants

Majority of the patient who underwent LC had biliary colic (n=130) followed by acute calculus cholecystitis (n=14) and gallbladder polyp (n=4). Most of the patient underwent GB retrieval via epigastria port (53.1%) among the patient with diagnosis of biliary colic while among the patient with acute calculus cholecystitis 71.4% of the patients underwent GB retrieval vial umbilical port. Similarly, all the patients with gallbladder polyp underwent GB retrieval via epigastria port.

Table 03:Distribution according to Diagnosis (total sample = 148)

Diagnosis	Umbilical	Epigastria	Total
Acute calculus cholecystitis	10 (71.4%)	4 (28.6%)	14
Gallbladder polyp	0 (0%)	4 (100%)	4
Biliary colic	61 (46.9%)	69 53.1%)	130
Total	71	77	148

3.3 Comparisons between Mean Retrieval Times

The time taken for the GB retrieval from epigastria port took slightly longer than the via umbilical port which was 7.31±1.87 minutes and 6.93±2.25 minutes respectively. This difference was not statistically significant at P = 0.270 and CI = -1.053 – 0.296.

Table 04: Comparison of mean retrieval time (total sample = 148)

Port site	Number	Mean Retrieval Times	MD±SD	P-value*
Umbilical	71 (48%)	6.93±2.25	-0.378±0.341	0.270
Epigastria	77 (52%)	7.31±1.87		
MD = mean difference; SD = standard deviation; *P-value from independent sample t-test				

3.4 Comparisons between VAS in Patients With Epigastria Port As Exit Port

The average VAS for epigastria port was higher than umbilical port at each hour of assessment for the participants when epigastria port was used for retrieval of GB and was statistically significant (P < 0.0001). The mean VAS was negatively correlated with time.

Table 05: Mean value (±SD) of VAS in patients with epigastria as exit port (total sample = 148)

Time (hr.)	Epigastria	Umbilical	MD	P-value*
0	6.49±0.927	4.74±1.005	1.75±0.83	<0.0001
6	5.97±1.013	4.01±0.925	1.96±0.86	<0.0001

12	5.27±1.008	3.25±1.002	2.03±0.78	<0.0001
24	4.74±0.938	2.30±1.040	2.44±0.75	<0.0001
MD = mean difference; SD = standard deviation; Time = Assessment time; *P-value from paired sample t-test				

3.5 Comparisons between VAS in Patients with Umbilical Port as Exit Port

Similarly, when umbilical port was used as exit port for GB retrieval, the average VAS of umbilical port was observed to be higher than that of epigastria port at each hour of assessment and was statistically significant (P < 0.0001). The mean VAS was negatively correlated with time.

Table 06: Mean value (±SD) of VAS in patients with umbilical as exit port (total sample = 148)

Time (hr.)	Epigastria	Umbilical	MD	P-value*
0	4.39±0.853	5.54±0.954	-1.14±0.54	<0.0001
6	4.14±0.867	5.13±0.861	-0.98±0.75	<0.0001
12	3.18±0.883	4.38±0.834	-1.19±0.62	<0.0001
24	2.18±0.798	4.04±0.853	-1.86±0.62	<0.0001
MD = mean difference; SD = standard deviation; Time = Assessment time; *P-value from paired sample t-test				

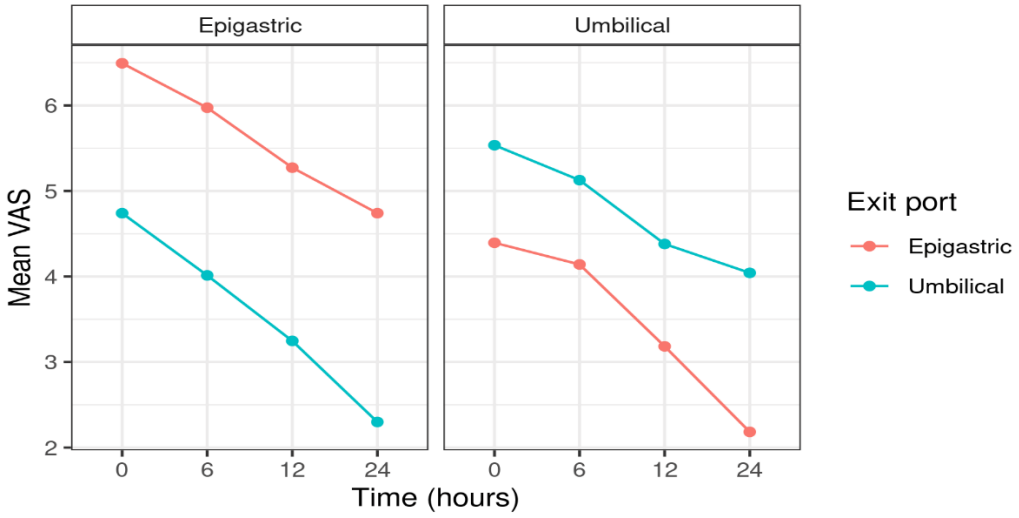

Figure 01: Mean Value of VAS across time at exit vs non-exit port

3.6 Comparisons of VAS between Epigastria and Umbilical Exit Port

When the VAS score at epigastria port with epigastria as exit/retrieval port was compared with the VAS score at umbilical port with umbilical port as exit port, it was found that there was statistically significant difference of pain score (P < 0.001) at all postoperative hours as shown in table. The VAS score at the epigastria port was significantly higher.

Table 07: Mean value (±SD) of VAS between exit ports at different times (total sample = 148)

Time (hr.)	Epigastria	Umbilical	MD	P-value*
0	6.49±0.927	5.54±0.954	0.95±0.15	<0.0001
6	5.97±1.013	5.13±0.861	0.84±0.15	<0.0001

12	5.27±1.008	4.38±0.834	0.89±0.15	<0.0001
24	4.74±0.938	4.04±0.853	0.69±0.14	<0.0001
MD = mean difference; SD = Standard Deviation; Time = Assessment time; *P-value from independent sample t-test				

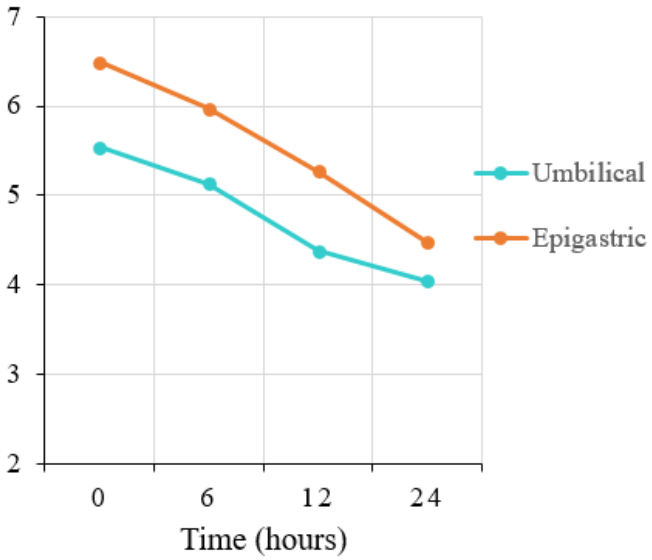

Figure 02*:* Trend of VAS score at epigastria and umbilical ports

3.7 Comparisons of Bile Spillage and SSI

Out of 148 patients, 42 patients had bile spillage intraoperative of which only 3 developed port site infection. Whereas 2 patients who didn't have bile spillage also developed port site infection and wasn't statistically significant at P <0.05 table. All patients with superficial PSI were managed conservatively with oral antibiotics.

Table 08: Comparison of bile spillage and SSI (total sample = 148)

		Surgical Site Infection			
		Absent	Present	Total	P-value
Bile Spillage	Present	39	3	42	0.139
	Absent	104	2	106	
Total		143	5	148	

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3.8 Comparisons of Port Site and SSI

In this study, only 5 patients (3.37%) developed superficial port-site infection amongst which 4 were from umbilical and 1 from epigastria group and was statistically insignificant (P = 0.195).

Table 09: Comparison of port site and SSI (total sample = 148)

	Surgical Site Infection		
	Present	Absent	P-value*
Umbilical	4	67	0.195

Epigastric	1	76	

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*Fisher exact test

3.9 Comparisons of Stone Size and Port Site Extension

In this study, it was seen that with increasing stone size, the chance of port site extension for GB retrieval also increased. Stones less than or equal to 10mm did not require any port extension. Among the 58 patients with stone size more than 10mm, 11 patients required port site extension and was statistically significant (P <0.001).

Table 10: Comparison of stone size and port site extension (total sample = 148)

	Port site extension			
Stone Size (mm)	Present	Absent	Total	P-value*
≤10	0	90	90	<0.0001
>10	11	47	58	

*Fisher exact test

3.10 Comparisons of Port Site and Port Site Extension

A total of 11 patients required port site extension. Among them, 6 were of umbilical and 5 of epigastria group. The difference was not statistically significant (P = 0.650).

Table 11: Comparison of port site and port site extension (total sample = 148)

*Pearson Chi-square

		Port extension		
		Present	Absent	P-value*
Port site	Umbilical	6	65	0.650
	Epigastria	5	72	

3.11 Discussion

Laparoscopic cholecystectomy has become a gold standard procedure for gallbladder surgery for benign gallbladder disease. It is one of the most common surgical procedures performed worldwide for gallstone disease [10]. LC being a minimally invasive surgery for gallstone disease is characterized by reduced pain, it is not painless per se. Patients undergoing LC suffer considerable pain on the day of surgery frequently requiring narcotic analgesics Thus, it leads to increased hospital stay. The present study was done to compare the epigastria and umbilical ports in terms of postoperative port-site pain, mean gall bladder retrieval time and SSI rates [11]. The general characteristics of the patients in relation to age were not significantly different between the two study groups. The average age of the patient was evenly distributed in both the groups (41.04 ± 12.83 years in umbilical group vs. 40.32 ± 12.44 in epigastria group) respectively. Age is a well-known risk factor for asymptomatic cholelithiasis and the prevalence of asymptomatic cholelithiasis increased with age in many studies. Increased formation of cholelithiasis with age is suggested to be related to a longer period of exposure to various risk factors for cholelithiasis and gallbladder dysmotility secondary to sedentary activity in old age [12]. There was predominance of female population in this study (79.7%) comparable to the series (75% female), (76%), (60% female), and Hang. Female sex is an important risk factor for cholelithiasis, and most previous studies reported higher prevalence in females

than males. This increased risk of cholelithiasis in females is related to the estrogen effect, pregnancy, use of oral contraceptives, or hormonal replacement therapy. Three types of pain have been proposed i.e., visceral, parietal and shoulder tip pain, with different intensity and time courses. Visceral and parietal pain is most important during the first 24-48 hours after surgery [13]. The main sources of pain are incision sites within the abdominal wall. The pneumoperitoneum in association with both local (peritoneal and diaphragmatic stretching, acidosis and ischemia) and systemic changes (hypercarbia causing sympathetic nervous system excitation with amplification of local tissue inflammatory response) and the post-cholecystectomy wound within the liver (visceral pain) are the causes of pain. The largest component (50-70%) arises from the incision sites, followed by the pneumoperitoneum (20-30%) and "cholecystectomy wound" (10-20%).This study showed that the mean VAS scores at the exit port from which the GB was retrieved (either epigastria or umbilical) were higher as compared to the non-exit port. This was statistically significant at all hours of assessment (P = 0.001). Similar results were found in the study it is proved that GB retrieval is one of the important factors affecting postoperative pain after LC [14]. The higher pain scores may be attributed to the forced stretching of the sheath and muscle, use of dilators, and sometimes skin tears at the time of the retrieval of the GB. Higher VAS scores were observed at all measured time intervals for the epigastria port group as compared with the umbilical port group which was statistically significant (P = 0.001). It was similar to the results obtained where they concluded that umbilical port was better in terms of postoperative port-site pain in GB retrieval. As compared to epigastria port, umbilical port was opened by open technique which gives wider space for the retrieval of GB, with less traction of the sheath and parietal peritoneum and therefore less pain, whereas epigastria port is inserted by blunt force, injuring the rectus sheath, leading to more chances of hematoma formation and therefore increased pain. Moreover, the retrieval of the GB through the epigastria port will cause excessive traction on the parietal peritoneum and rectus muscle, inciting the nerve fibers, leading to increased pain perception. The results of the present study were inconsistent with that of where post-operative pain score came out 3.70 ± 1.02 in subxiphoid group while 3.37 ± 1.3 in umbilical group [15]. The difference in 24-hr VAS was statistically non-significant (P = 0.28). They recommended both umbilical and subxiphoid ports to be equally effective for GB retrieval in terms of postoperative pain and to be surgeon specific. Similarly, found that postoperative pain in terms of VAS between epigastria and umbilical port was statistically non-significant (P = 0.089) with mean pain at epigastria port and umbilical port being 3.54±1.034 and 3.11±1.368 respectively One of the reasons for such disparity in results could be that pain intensity like other sensations and perceptions is an individual experience that displays considerable variability both between patients and within a patient at different time interval. Assessment of pain experience is built upon the use of patient's self-report. As because pain is subjective, the patients self-report provides the most valid measure of the experience and are considered the gold standard in pain measurement. Currently, there is no single pain measurement instrument that fully satisfies all the properties. Although the difference in VAS was statistically significant in our study, however, this finding needs to be put into clinical context whether the pain difference is clinically significant. The difficulty in retrieval of GB from port site is an important determinant of post-operative pain in LC. In this study, the mean time taken for retrieval of GB was slightly longer in the epigastria port as compared to the umbilical port (7.31±1.87 vs 6.93±2.25 minutes) but which was statistically not significant (P = 0.270). Regarding mean time taken for GB retrieval in our study, our results matches those presented who also observed mean time for GB retrieval was 10.43±4.5 minutes in subxiphoid group while 8.67±3.8 minutes in umbilical group showing no significant difference (P = 0.109). A study by Bashir et al.48 also showed significantly longer GB retrieval time from epigastria port as compared to umbilical port (10.62±4.611 vs 8.64±4.182 minutes) [16].

4. CONCLUSIONS

This study showed statistically significant difference in the mean VAS scores at the exit port from which the GB was retrieved (either epigastria or umbilical) as compared to the non-exit port. Higher VAS scores were

observed at all measured time intervals for the epigastria port group as compared with the umbilical port group. The mean time taken for retrieval of GB was slightly longer in the epigastria port as compared to the umbilical port but which was statistically insignificant. Bile spillage and PSI was found to be statistically insignificant. It was found that with increasing stone size, the probability of port site extension for GB retrieval also increased. Stones measuring less than 10 mm did not require port extension. No significant relationship between port site and port extension was observed. The retrieval of the GB from the umbilical port is superior to that from the epigastria port in terms of decreased postoperative pain. However, there is no significant difference in GB retrieval time, port-site extension and port-site infection. There is increased chance of port extension with increasing stone size.

5. RECOMMENDATIONS

Study will compare the extraction of gallbladder through epigastria/subxiphoid port versus supraumbilical port in laparoscopic cholecystectomy in terms of postoperative pain on first day, gallbladder retrieval time, extendibility of the incision and port-site infection This is an observational comparative study for duration of one and half year at NMCTH. Study should to compare in terms of retrieval time, postoperative pain, complications, extensibility of incision, hospital stay, ease of use by surgeon as well as acceptability by patient. The research should statistically significant difference in the mean VAS scores at the exit port from which the GB was retrieved (either epigastria or umbilical) as compared to the non-exit port. Higher VAS scores were observed at all measured time intervals for the epigastria port group as compared with the umbilical port group. The mean time taken for retrieval of GB was slightly longer in the epigastria port as compared to the umbilical port but which was statistically insignificant. Bile spillage and PSI was found to be statistically insignificant.

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