



## Evaluation of Complications of Laparoscopic and Open Cholecystectomy in Elderly Patient with Acute Cholecystitis

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### Abstract

**Background:** *Acute cholecystitis is a serious surgical emergency for elderly patients. Strophe and Dittensbaugh (1953) observed that all gall stones were found twice as often in the age group of over 70 years as compared to all groups. Several studies have also found that laparoscopic cholecystectomy (LC) is a safe and efficient treatment approach for acute cholecystitis compared with open cholecystectomy (OC). The role of LC in acute cholecystitis in elderly patients has yet to be defined. Advanced age with concomitant medical conditions may be associated with increased postoperative complications and more frequent conversion to OC.*

*But with improvement in preoperative care for ageing population the safety and feasibility of laparoscopic cholecystectomy in elderly patients with acute cholecystitis and its associated morbidity and mortality with respect to open cholecystectomy can be assessed which is the main goal of this prospective randomized study.*

**Aims:** *This prospective randomized study has been devised to evaluate complications of laparoscopic and open cholecystectomy in elderly patients with acute cholecystitis in terms of-*

- *Duration of procedure.*
- *Blood loss during surgery.*
- *Postoperative discomfort or pain.*
- *Requirements of antibiotics, analgesics and antiemetics.*
- *Complications encountered (intra and postoperative)*
- *Duration of hospitalization and rehabilitation.*
- *Conversion to open method.*
- *Patient satisfaction.*

**Materials and Methods:** *It is a prospective randomized study, total 50 patients (over 65 years with acute cholecystitis) underwent cholecystectomy from November 2015 to October 2017 in the department of general and laparoscopic surgery of V.S.S. medical college and hospital, Burla, Sambalpur, Odisha with best possible available resources. 25 cases underwent laparoscopic cholecystectomy and rest 25 had open cholecystectomy. Most of the cases were operated within 72 hours of attack of acute cholecystitis. Patients written valid informed consent for the particular procedure was taken and the procedure were explained in details to the patient. This study was done after due clearance of ethical committee.*

**Result:** *Duration of surgery in laparoscopic group was bit more than open method (Mean= 1hr 53 minutes in LC vs mean = 1hr 50 minutes in OC). Blood loss was considerably high in open*

*cholecystectomy group of patients.*

*Intravenous antibiotics coverage was given for more duration in open method (Mean= 7.2 days) than in laparoscopy group (Mean= 3.8 days). Postoperative pain in laparoscopy group was considerably less than open cholecystectomy as measured by visual analogue score. So days of analgesics required was also less in LC group (Mean = 1.44 days) than OC (Mean= 4 days). Antiemetics requirement was same in both the groups.*

*Resumption to enteral nutrition was early in laparoscopic method (Mean=2.6 days) than open method (Mean=5 days). Postoperative hospital stay was more in OC group (Mean=7.84 days) than LC group of patients (mean=4.48 days). Resumption to routine physical activities of the patients was also significantly early in laparoscopic method (Mean=7.8 days) than in open method (Mean=12.88 days).*

*Complications like CBD injury and bile leak were more in laparoscopic method whereas bleeding, Wound infection deterioration of pulmonary function were more in open method. But these complications as a whole are not significantly different in both the procedures, rather pulmonary dysfunction and wound infection increased the morbidity in old age.*

*Conversion rate from laparoscopy to open method was found to be 8% in our study, which was due to either large stone, empyema or with morbid adhesion of gallbladder to adjacent organs.*

*Cosmesis was considerably the best in laparoscopy group of patients than open group. Cost factors involved with both the procedures were at par with each other. There was no mortality in any group.*

**Conclusion:** *So laparoscopic cholecystectomy is better than open cholecystectomy in terms of blood loss during surgery, postoperative pain, requirement of antibiotics, analgesics, duration of hospitalization and rehabilitation and patient satisfaction. with all these advantages and a liberal attitude towards conversion to open method in proper time and proper patients considered as the gold standard for elderly patient with acute cholecystitis. however, open cholecystectomy is preferred method for surgeons in the beginning of their career and in case of difficult cholecystectomy.*

**Keywords:** *cholelithiasis, minimally invasive surgery, laparoscopic cholecystectomy (LC), open cholecystectomy (OC), bile duct injury.*

## Introduction

Cholecystectomy is the most common elective surgery in India and world. Contrary to the traditional open method of abdominal exploration in present era of endoscopy ushered in many old and new laparoscopic approaches to the peritoneal cavity. First decade of twentieth century saw several modification of the historical laparoscopic technique including single chip camera, rigid rod lens system and low definition screens etc. the second decade of this century has been introduced into a multitude of ramification of the multiport laparoscopic access and now we have single incision laparoscopic surgery (SILS), natural orifice transluminal endoscopic surgery (NOTES) and many other modification with their attendant benefit to the patient in particular and community in general.

Acute cholecystitis is a serious surgical emergency for elderly patients. Strophe and Dittensbaugh (1953) observed that gall stones were found twice as often in the age group of over

70 years as compared to all groups. According to Boyd (1959), Holland and Heaton (1972) and David L. Nahrwold (1976) gall stone disease is more common in elderly patients. Laparoscopic cholecystectomy (LC) is the gold standard operation for uncomplicated cholelithiasis. Several studies have also found that LC is a safe and efficient treatment approach for acute cholecystitis compared with open cholecystectomy (OC). The role of LC in acute cholecystitis in elderly patients has yet to be defined. Advanced age with concomitant medical conditions may be associated with increased postoperative complications and more frequent conversion to OC.

But with improvement in preoperative care for ageing population the safety and feasibility of laparoscopic cholecystectomy in elderly patients with acute cholecystitis and its associated morbidity and mortality with respect to open cholecystectomy can be assessed which is the main goal of this prospective randomized study.

**Aims and Objectives**

This prospective randomized study has been devised to evaluate complications of laparoscopic and open cholecystectomy in elderly patients with acute cholecystitis in terms of-

- Duration of procedure.
- Blood loss during surgery.
- Postoperative discomfort or pain.
- Requirements of antibiotics, analgesics and antiemetics.
- Complications encountered (intra and postoperative)
- Duration of hospitalization and rehabilitation.
- Conversion to open method.
- Patient satisfaction.

**Materials and Methods**

The study was carried out in the Department of General and laparoscopic Surgery, V.S.S. Medical College & Hospital, Burla, Odisha over the period from November 2015 to October 2017.

All the patients were selected randomly, and as per the proforma, all the patients were interviewed for detailed clinical history and examined. They were then subjected to routine blood urine and other investigations and an abdominal ultrasound was performed in all cases.

**Inclusion Criteria**

Patients of age  $\geq$  65 years with acute calculous/acalculous cholecystitis, proven by USG with at least one attack of upper abdominal pain and considered fit for elective cholecystectomy were included in the study.

**Exclusion Criteria**

The patients with following conditions were excluded from the study:

- ❖ History or investigations suggesting CBD stones.
- ❖ History of prior abdominal surgery.
- ❖ Patients of coagulopathy and those on Anti-Coagulant therapy
- ❖ Elderly patients with acute cholecystitis but suffering from chronic medical

diseases (chronic liver disease, ischemic heart disease, chronic obstructive pulmonary disease, uncontrolled hypertension or diabetes mellitus)

**Observation**

50 patients above 65 years underwent cholecystectomy for acute cholecystitis from November 2015 to October 2017. Among them 25 patients underwent laparoscopic cholecystectomy and rest 25 open cholecystectomy.

**Table – 1** Duration of surgery

Time (minutes)	Laparoscopic Cholecystectomy	%	Open cholecystectomy	%
60-90	7	28	7	28
91-120	9	36	9	36
121-150	7	28	8	32
>150	2	8	1	4

P value = 0.663 which is not significant

Mean time for open method = 110.36 minutes (SD)  $\pm$ 20.514

Mean time for laparoscopic method = 112.92 minutes (SD)  $\pm$ 20.780

**Table – 2** Intraoperative blood loss

Surgery	Minimal <100 ml	%	100-200 ml	%	>200 ml	%
LC	20	80	3	12	2	4
OC	4	16	17	68	4	16

P value = 0.001

LC (laparoscopic cholecystectomy), OC (open cholecystectomy)

Blood loss was found to be significantly more in open surgery than laparoscopy.

**Table – 3** Duration of intravenous antibiotic coverage

Surgery	$\leq$ 5 days	%	>5 days	%
LC	23	92	2	8
OC	0	0	25	100

P value = <0.001

LC (laparoscopic cholecystectomy). OC (open cholecystectomy)

Mean days of IV antibiotics for open method = 7.20 days (SD)  $\pm$ 1.190

Mean days of IV antibiotics for laparoscopy = 3.80 days (SD)  $\pm$ 1.258

**Table – 4 Pain score**

VAS pain scale	Laparoscopic Cholecystectomy	Opencholecystectomy
Mild	23	0
Moderate	2	7
Severe	0	11
Very severe	0	7

P value <0.001 (Mann Whitney Test)

More patient in laparoscopic group experienced mild postoperative pain where as more patients in open group experienced severe postoperative pain which is significant.

**Table – 5** Number of patients in whom analgesics required:

Postoperative	Open Cholecystectomy	Laparoscopic cholecystectomy
Day 1	25	25
Day 2	25	5
Day 3	20	3
Day 4	15	-
Day 5	10	-
Day 6	5	-

P value = <0.001

In open cholecystectomy postoperative analgesic requirement was more in duration where as it was quite less in laparoscopy group which is statistically significant.

**Table – 6** Antiemetic requirement

Surgery	≤3 days	%	>3 days	%
Laparoscopic Cholecystectomy	23	92	2	8
Open cholecystectomy	23	92	2	8

The antiemetic requirement was similar in both groups. There was no statistically significant difference was observed.

**Table – 7** Resumption of normal diet

No. of Days	Open Cholecystectomy	Laparoscopic Cholecystectomy
<3 days	0	19
3-4 days	10	4
>4 days	15	2

P value <0.001

Mean duration for resumption of normal diet for open = 5 days (SD) ±1.291

Mean duration for resumption of normal diet for LC = 2.60 days (SD) ±1.323

**Table – 8 (a)** Complications (Intraoperative complications)

Complications	Open Cholecystectomy n=25	%	Laparoscopic cholecystectomy n=25	%
Bleeding (>200 ml)	4	16	2	8
CBD injury	1	4	2	8
Bowel injury	0	0	0	0
Others	0	0	0	0
Total	5	20	4	16

There was severe bleeding in 4 patients of OC and 2 patients of LC. It was managed by proper haemostatic method and postoperative blood transfusion. There were more instance of CBD injury in LC group (2) and less in OC group and all of them were managed by primary CBD repair with T- tube insertion. No associated bowel injuries were there in any group.

**Table – 8 (b)** Postoperative complications

Complications	Open Cholecystectomy n=25	%	Laparoscopic cholecystectomy n=25	%
Bleeding	0	0	0	0
Bile leak through Drain	0	0	1	4
Wound infection	5	20	1	4
Jaundice	0	0	0	0
Pulmonary Complication	2	8	1	4
Incisional hernia	1	4	0	0
Total	8	32	3	12

Surgical site wound infection was the major complication which was more in OC group than LC group and was dealt with proper dressing and antibiotic administration. Postoperative pulmonary complication was found to be less in LC group patients and treated with proper ICU management. There was minor bile leak through drain in both the procedure equally which eventually decreased. There was one case of incisional hernia in case of open method in follow up.

**Table – 8 (c)**

Complication [n=50]	Open cholecystectomy	Laparoscopic Cholecystectomy	Total
Intraoperative	5	4	9
Postoperative	8	3	11
Total	13[26%]	7[14%]	20



There was no significant difference in complications between both groups.

**Table-9** Number of days postoperative hospital stay

Surgery	≤5 days	%	>5 days	%
LC	23	92	2	8
OC	0	0	25	100

P value = <0.001

Mean postoperative hospital stay in OC = 7.84 days (SD) ±1.675

Mean postoperative hospital stay in LC = 4.48 days (SD) ±2.830

**Table – 10** Patient satisfaction (Cosmesis)

Cosmetic result	Laparoscopic Cholecystectomy	Open Cholecystectomy
Unacceptable	0	19
Acceptable	5	6
Good	20	0

20 patients who underwent LC felt that they had a good cosmetic result while only 6 patients in OC group felt acceptable result. The length of the incision scar in OC group ranged from 5-10cm and was visible as thick scar.

**Table – 11** Time taken to resume routine work

Surgery	≤10 days	%	>10 days	%
LC	23	92	2	8
OC	0	0	25	100

P value = <0.001

Mean time to resume normal work in OC = 12.88 days (SD) ±2.027

Mean time to resume normal work in LC = 7.8 days (SD) ±2.466

Conversion Rate LC to OC: [n= 25]

2 [8%] patients out of 25 patients undergoing LC were converted to open cholecystectomy due to following reasons.

- 1) In one case there were plenty of thick adhesions between gallbladder and surrounding structures with gangrenous gall bladder causing inadvertent CBD injury and gallbladder perforation.
- 2) In the other case there was emphysema gallbladder which created difficulty in indentifying the normal anatomy causing heavy bleeding.

## Discussion

The prevalence of cholelithiasis and the incidence of complication would be expected to increase with age. There is no doubt LC is the treatment of choice for elderly patients with symptomatic cholelithiasis. However quite marked regional and international variations in practice of LC in elderly with acute cholecystitis are seen. As in clinical practice, acute cholecystitis is less likely to undergo LC than non acute disease due to technical difficulty, concerned risk associated with old age and the procedure itself and inexperience in advanced laparoscopic surgery.

In this study all the patients operated were elderly (≥65 years) as described in medical literature. In patients who had undergone LC mean age incidence was 71.08 years (SD=±4.412) and in OC group patients mean age incidence was 72.48 years (SD=±4.379).

In this study patients operated for LC required more operating time than open procedure [Mean for LC 112.92 min (SD=±20.780) against mean for OC 110.36 min (SD=±20.514)]. But it is not significantly different. This is comparable with studies of Chau et al obtaining mean duration of surgery 92.5 min (SD=±25.5) for LC vs 84.8 min (SD=±41.0) for OC. The more time required in LC is due to intraoperative gas leak, difficult adhesions. Slippage of clips and delivery of gallbladder through port site. With experienced surgeon and trained in dealing with challenging cases, operating time can be reduced.

Intraoperative blood loss in this study was found to be significantly less in LC than OC. In LC 80% patients had minimal (<100ml) blood loss where as in open method 68% patients had 100-200ml and 16% patients had >200ml of bleeding. It is comparable with study of Foster D.S. et al<sup>15</sup> and Waldner H et al.

In this study patients who underwent laparoscopic cholecystectomy required less number of days of intravenous antibiotics than open method and it is statistically significant [Mean 3.8 days ±(SD) 1.258 for LC versus Mean 7.2 days ±(SD) 1.19 for OC]. It is due to minimal invasiveness and small

wound size in laparoscopy than open method. Maximum days of antibiotics required in OC group were 10 days due to wound infection. Phillips E et al and Foster Ds et al proved the same during their study.

Minimal invasive technique associated with reduced inflammatory stress response visual analogue score (VAS) in this study for postoperative pain was found to be significantly less in LC group than OC group ( $p < 0.001$ ). Kum et al also found a mean VAS score of 3.8 versus 7.7 between LC and OC group respectively. As associated with more pain, patients in open cholecystectomy group required more days of analgesics treatment than their laparoscopic counterparts [Mean 1.44 days  $\pm$  (SD) 0.712 for LC vs Mean 4 days  $\pm$  (SD) 1.443 for OC]. This is due to smaller incision size in laparoscopy than open. This was approved Huang SM et al (0.53 days for LC and 2 days for OC).

Antiemetics requirements in both procedures were same. Mean days of antiemetics requirement in laparoscopy group was 2.04 days  $\pm$  (SD) 0.889 and that of OC group was 2.24 days  $\pm$  (SD) 0.879. Resumption of normal diet or enteral nutrition started early in patients undergoing laparoscopic cholecystectomy [Mean 2.6 days  $\pm$  (SD) 1.323] where as in open method it was late [Mean 5 days  $\pm$  (SD) 1.291] according to this study. It suggests early return to body physiological activity in laparoscopy which aids in decreased morbidity in elderly age group. It is suggested by the study of JH Peter et al which showed 83% of patients undergoing laparoscopic cholecystectomy resumed normal diet in one day after surgery.

Among intraoperative complications significant blood loss was more in open method compared to the laparoscopic method. It is comparable with the study of Chauet al<sup>8</sup> who got the result of >500 ml blood loss in 6.5% patients in laparoscopic method in comparison to 19% patients in open method. Incidence of common bile duct injury in this study was found to be more (8%) in LC group as compared to 4% in OC group patients. But it is not statistically significant. This is comparable

with the frequency of CBD injury of 0.1% to 0.2% for OC and 0.3% to 0.6% for LC obtained in the study of Strasberg SM et al. Incidence of bile duct injury is more in acute cholecystitis due to edematous cystic duct obscuring the anatomy as shown by Kum CK et al. With a good learning curve this can be properly dealt.

Among postoperative complications bile leakage without overt bile duct injury is the most common complication associated with laparoscopy due to either leak from clipped cystic duct stump or gallbladder bed. It can be managed conservatively or prevented by use of endo suture ligation in required place. Here the incidence was 4% in LC group without any incidence in OC group patients and the result can be comparable with study of Chauet al obtaining postoperative bile leak incidence of 6.5% in LC group and 2.4% in OC group patients. Wound infection was the obvious and overt disadvantage of OC in this study obtaining result of 20% in OC group patients as compared to 4% in LC group. Pulmonary complications were also more in open method (8% in OC) than LC (4%) as there is reduced inflammatory stress response with improved pulmonary function and less hypoxia in minimal invasive procedure like LC. Incidence of incisional hernia was found to be associated in one patient of OC group. It is due to large incision and disruption of normal anatomy of abdominal wall in open method. All these complications rate in both the procedures can be compared with results of study of Chau et al and Grace et al. But overall complications in both the procedure in this study are not significantly different in their rates.

The conversion rate from laparoscopy to open method found in this study was 8%. It was mostly due to adhesions, unclear anatomy, bleeding and gallbladder perforation. It is equivalent to the study of Paulo Cezar et al showing 10.3% of conversion rate. The decrease in conversion rate can be achieved by adequate experience of the surgeon and increased laparoscopic skill. In LC conversion to open method in proper time is regarded as sound judgment of the surgeon.

Postoperative hospital stay in this study was found to be significantly less in LC group [Mean= 4.48 days  $\pm$  (SD) 2.830] than OC group of patients [Mean= 7.84 days  $\pm$  (SD) 1.675]. This is equivalent with the study of Huang SM et al<sup>22</sup> who got the result of postoperative hospital stay (mean) 3.93 days  $\pm$  (SD) 1.71 for LC group as compared to (mean) 7.92 days  $\pm$  (SD) 0.79 for OC group patients. Early return to normal routine physical activities was seen in LC group of patients [Mean 7.8 days  $\pm$  (SD) 2.466 in LC vs Mean 12.88 days  $\pm$  (SD) 2.027 in OC group patients] in this study. Study by Pessaux P et al and various other studies also showed similar result. It is due to less pain, less wound infection and early mobilization of the patient.

Cosmesis was found to be significantly better in laparoscopy group than the open cholecystectomy group due to ugly thickened scar in open cholecystectomy. Cost involved in both the groups was at par due to long term postoperative hospital stay, medication and loss of man power in open cholecystectomy group. Cost factors involved are proved in the study by Zdrinko Brekalo et al.

### Summary

In the present series, total 50 patients (over 65 years with acute cholecystitis) underwent cholecystectomy from November 2015 to October 2017 in the department of general and laparoscopic surgery of V.S.S. medical college and hospital, Burla, Sambalpur, Odisha with best possible available resources. 25 cases underwent laparoscopic cholecystectomy and rest 25 had open cholecystectomy. Most of the cases were operated within 72 hours of attack of acute cholecystitis.

The commonest presenting symptoms in both groups were pain in the right upper quadrant followed by vomiting, fever, dyspepsia and abdominal distension. Increase in leucocyte count and cholelithiasis were common in both the groups. Overall male to female ratio in both groups was 1:1.2.

Duration of surgery in laparoscopic group was bit more than open method (Mean= 1hr 53 minutes in LC vs mean = 1hr 50 minutes in OC). Blood loss was considerably high in open cholecystectomy group of patients.

Intravenous antibiotics coverage was given for more duration in open method (Mean= 7.2 days) than in laparoscopy group (Mean= 3.8 days). Postoperative pain in laparoscopy group was considerably less than open cholecystectomy as measured by visual analogue score. So days of analgesics required was also less in LC group (Mean = 1.44 days) than OC (Mean= 4 days). Antiemetics requirement was same in both the groups.

Resumption to enteral nutrition was early in laparoscopic method (Mean=2.6 days) than open method (Mean=5 days). Postoperative hospital stay was more in OC group (Mean=7.84 days) than LC group of patients (mean=4.48 days). Resumption to routine physical activities of the patients was also significantly early in laparoscopic method (Mean=7.8 days) than in open method (Mean=12.88 days).

Complications like CBD injury and bile leak were more in laparoscopic method whereas bleeding, Wound infection deterioration of pulmonary function were more in open method. But these complications as a whole are not significantly different in both the procedures, rather pulmonary dysfunction and wound infection increased the morbidity in old age.

Conversion rate from laparoscopy to open method was found to be 8% in our study, which was due to either large stone, empyema or with morbid adhesion of gallbladder to adjacent organs.

Cosmesis was considerably the best in laparoscopy group of patients than open group. Cost factors involved with both the procedures were at par with each other. There was no mortality in any group.

### Conclusion

Laparoscopic cholecystectomy is now considered as the gold standard for uncomplicated acute

cholecystitis, be with stones or without stones. The following are the facts in favour of the above dictum.

- Technically dissection of cystic duct and cystic artery is precise and bleeding is easily controlled either by unipolar or harmonic cautery.
- LC is associated with less postoperative pain and shorter duration of analgesic treatment.
- Less chance of wound infection, no risk of wound dehiscence and shorter duration of antibiotics are the advantages of laparoscopy.
- Early enteral nutrition and mobilization aid to the body physiology and recovery process which is a best possible outcome in elderly patients.
- Shorter postoperative hospital stay and cosmetic advantage are also positive outcomes of laparoscopy.
- The disadvantages of LC can be minimized by adequate progress in learning curve and advanced perioperative care.
- Conversion to open procedure when required instead of being dealt as a taboo should be considered as a sound judgment of the surgeon.

So laparoscopic cholecystectomy with all these advantages and a liberal attitude towards conversion to open method in proper time and proper patients. considered as the gold standard for elderly patient with acute cholecystitis.

### Bibliography

1. Abdul Aziz Laghari,, K AltafTalpur, Ahmed Khan Sangrasi et al; Emergency laparoscopic cholecystectomy in acute cholecystitis: PJS, Volume 23, Issue 1, 2007; 18-22.
2. Alexandrospolychronidis, SotinosBotaitis, Alexandra Tsaroucha et al; Laparoscopic cholecystectomy in elderly patients: J

Gastrointestin Liver Dis September 2008 Vol. 17 no 3, 309-313.

3. Alfred Cuschieri& George Berci's Laparoscopic Biliary Surgery, 2<sup>nd</sup> Edition, Page 69 to 142.
4. Arshad M. Malik, Abdul Aziz laghari, K. AltafHussainTalpur et al; Laparoscopic cholecystectomy in the elderly patients an experience at liaquat university hospital jamshoro: J Ayub Med Coll Abbottabad 2007; 19(4).
5. Attwood SE, Hill Ad, Mealy K, Stephens RB A prospective comparison of laparoscopic cholecystectomy versus open cholecystectomy. Ann R CollSurgEngl 1992 Nov; 74(6): 397-400.
6. Bosch F, Wehrman U, Saeger HD, Kirch W. Laparoscopic or open conventional cholecystectomy: clinical and economic considerations. Eug J Surg 2002; 168(5): 270-7.
7. Capizzi FD, Fogli L, Brulatti M, Boschi S, Di Domenico M, Papa V et al Conversion rate in Laparoscopic Cholecystectomy: evolution from 1993 and current state. J LaparoendoscAdvSurg Tech A 2003 Apr; 13(2): 89-91.
8. CH Chau, CN Tang, WtSiu et al; Laparoscopic cholecystectomy versus open cholecystectomy in elderly patients with acute cholecystitis: retrospective study. Hong Kong Med J 2002; 8:394-9.
9. David RR Laparoscopic cholecystectomy. In Zinner MJ, Schwartz SI, Elli H, editors. Maingot's Abdominal Operations Volume 2.10 the dn. Connecticut: A Simon and Schuster Company; 1997 P. 1855.
10. Elder S,, Sabo E, Nash E, Abrahamson J, Matter I.Laparoscopic versus open cholecystectomy in acutecholecystitis.. SurgLaparoscendosc 1997 Oct; 7(5); 407-14. (31;)
11. F. Charles Brunicardi, Schwartz's Principles of Surgery, 9<sup>th</sup> edition, Chapter 32, Part 2, Specific considerations.



12. Farguharson's Text book of Operative Surgery 8<sup>th</sup> Edition, Page 421 to 440.
13. Farrow HC, Fletcher Dr, Jones RM. The morbidity of surgical access a study of open versus laparoscopic cholecystectomy. Aust NZJ Surg 1993 Dec; 63(12): 952-4.
14. Fletcher DR, Hobbs MST, Tan P, et al. Complications of cholecystectomy: risks of the laparoscopic approach and protective effects of operative cholangiography. A population-based study. Ann Surg 1999; 229: 449.
15. Foster D.S. et al; Prospective comparison of laparoscopic. Cholecystectomy in a community hospital; WV MED J 1995.Sept. Oct 91(6) 270-272.
16. Glenn F, Grafe WR Jr. Historical Events in Biliary Track Surgery. Arch Surg 1966 Nov; 93: 848-52.
17. Grace PA, Quereshi A, Coleman J, Keane R, McEntee G, Broe P et al. Reduced postoperative hospitalization after laparoscopic cholecystectomy. Br J Surg 1991 Feb; 78: 160-62.
18. Gray's Anatomy, 39<sup>th</sup> edition, Hepatobiliary system, Chapter 86, 1227-1230.
19. Guyton and hall, Medical physiology, 11<sup>th</sup> edition, chapter 64, Unit 12, gastrointestinal physiology, Pg 802-804.
20. Harris BC Retrospective comparison of outcome of 100 consecutive open cholecystectomies and 100 consecutive laparoscopic cholecystectomies. South Med J 1993 Sep; 86(9).993-6(19.).
21. Hassan HM. Open laparoscopy vs closed laparoscopy: A comparison of complication rates Adv Planned Parenthood 1978; 1341-50.
22. Huang SM, WU CW Lui WY et al; A prospective randomized study of laparoscopic v. open cholecystectomy in aged patients with cholecystolithiasis S Afr J Surg. 1996 Nov; 34(4): 177-9.
23. JH Peters, EC Elison, JT Innes. JL Liss, K E Nichols J M Lomano, S R Roby.M E Front and LC Carey; Safety and efficacy of laparoscopic Cholecystectomy.A prospective analysis of 100 intial patients. Ann Surg 1991 January 213(1): 3-12.
24. Johansson M, Thune A, Nelvin L, Stiernstam M, Westman B, Lundell L Randomized clinical trial of open versus laparoscopic cholecystectomy for acute cholecystitis. Br J Surg 2005; 92: 44-49.
25. John Elias Skandalakis, Stephen Wood Gray, Richard Ricketts, Lee John Skandalakis, Thomas Dodson, The extrahepatic biliary ducts and the gallbladder, Embryology for Surgeons, 2<sup>nd</sup> Edition, Chapter 9;296.
26. Kalk H. Erfahrungenmit der laparoscopic Z Klein Med 1929;11:303.