



ORIGINAL RESEARCH PAPER

Surgery

STUDY OF FACTORS LEADING TO CONVERSION OF LAPAROSCOPIC CHOLECYSTECTOMY TO OPEN CHOLECYSTECTOMY

KEY WORDS:

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ABSTRACT

The aim of our present study is "To determine factors leading to conversion of laparoscopic cholecystectomy to open cholecystectomy".

MATERIALS AND METHODS

The Present clinical Study is a Retrospective analytical study conducted in Osmania General Hospital, Afzalgunj, Hyderabad,Telangana a Government ran tertiary teaching hospital attached to a medical college.The study period is from 2013 to 2015. All patients who underwent LC (n=302) in the study period were identified from the medical records maintained in our theaters.The study population included all patients irrespective of age or gender or type of admissionThe inclusion criterion was a patient who was converted to open laparotomy.

RESULTS

Factors that are leading to conversion of laparoscopic cholecystectomy to open cholecystectomy are: male gender & oldage which are pre-operative factors. Male gender showed a higher conversion rate as compared to female gender which was also observed in most of the similar studies.

CONCLUSION:

Factors that are leading to conversion of laparoscopic cholecystectomy to open cholecystectomy are: male gender & oldage which are pre-operative factors. Male gender showed a higher conversion rate as compared to female gender which was also observed in most of the similar studies. Oldage associated with higher conversion rates because of long standing symptomology & recurrent attacks in those age groups.

INTRODUCTION

Laparoscopic cholecystectomy[1] is now one of the most commonly performed operations of the digestive tract[2]. It has attained the position as the gold standard treatment for Gall-bladder disease and now considered the first line or standard treatment modality. Laparoscopic cholecystectomy offers increased safety in obese, faster operating time, decreased post operative pain, early initiation of enteral feeding, early ambulation, shorter hospital stay, decreased wound complications and improved[3-7]. But every new innovation has a catch or drawback. The procedure is expensive, requires specialized skills & bidxerity, provide a two dimensional view,restricted visual field and absence of tactile sensation6. These limitations can enforce the surgeon to convert laparoscopic approach to open .It is with this intention of deciphering the circumstances of conversion and exposing the true factors influence conversions, that this study was excogitated. With such knowledge patients at highrisk of conversion can be preoperatively counseled about the possibility of this outcome.

Leo Morgenstern describes hubris as the Achilles heel of the laparoscopic surgeon[1,8]. He stated that "It is a point of pride with some surgeons to, having begun a laparoscopic procedure, finish it no matter what the circumstances". The many advantages of Minimal invasive surgery for his patient and the pride of having minimal conversion rates prevent early conversions when hubris takes precedence over common sense8.The time during the metamorphosis of the surgical access may not be a comfortable one for the operating surgeon. The surgeon may resort from[7]the inevitable judicious conversion, prolong the operating time and induce more complications[9].

OBJECTIVES

The objectives of this study are to identify patient, disease and procedure related variables associated with conversion of laparoscopic cholecystectomy to open cholecystectomy,to bring out the circumstance dictating, and variables associated with the conversion,To determine the risk factor for conversion, find out the outcome of the converted cases.

MATERIAL AND METHODS

The Present clinical Study is a Retrospective analytical study conducted in Osmania General Hospital, Afzalgunj, Hyderabad,

Telangana a Government ran tertiary teaching hospital attached to a medical college. The study period is from 2013 to 2015.

The patients of all the 8 surgical units of the hospital were included in the study.

INCLUSION CRITERIA

All patients who underwent LC (n=302) in the study period were identified from the medical records maintained in our theaters. The study population included all patients irrespective of age or gender or type of admission The inclusion criterion was a patient who was converted to open laparotomy.All patients who were converted (n=20) were enrolled as cases. They were considered as converted if LC was planned but due some reason conversion to open laparotomy was necessitated. A detailed proforma was developed to record information on demographic, admission details, present history and examination findings, comorbidities, significant past medical and surgical history, investigations, ultrasound findings . The operative details like, chief operating surgeons designation, Circumstances of Conversion, reasons for conversion and postoperative complications was also recorded.

All the collected data was tabulated, analysed and compared with other studies.

ADMISSION AND SURGICAL TECHIQUE

The patients admitted from Surgicalults with those in literature OPD were labeled as elective admissions. Those who were more symptomatic and were admitted from the casualty department were labeled as emergency admissions.Depending on the treating surgeons preference patient admitted in the emergency were taken up for surgery as soon as possible or were managed conservatively and reviewed later for interval cholecystectomy. If surgery is the plan of action, all patients were transfered to the elective block, as our emergency department doesn't have a laproscopic unit Indications for operation.Patients were put on NPO from 10 pm on the precedingnight. All received a perioperative antibiotic injection.

The Chief operating Surgeon was a Professors, an Associate Professors or an Assistant Professors. Under training General

surgery post graduates were takes as assistants but no critical surgical step in the study period was performed by them.The operating Surgeon decides the route of access to abdomen (open or closed) and port placement (American or European). Pneumoperitoneum was developed using CO2 at pressure of 10-12mm of hg. Depending on the surgical preference a 0o or 30o degree camera was used. Hook cautery, graspers, Maryland forcep or scissors were used for dissection.The decision of conversion was also made by the chief operating surgeon.

RESULTS

Following were the observations and results of the present study.

TABLE NO 1

PROCEDURE	Total LC Attempted	Successful LC	CONVERTE D	Conversion rate
NO.OF PATIENTS	302	282	20	6.62

TABLE NO 2

YEAR	2013	2014	2015
LC ATTEMPTED	99	103	100
CONVERTED	7	7	6
PERCENTAGE	7.07	6.79	6

The patients were divided into 3 groups (<40yr, 41-60yr,61yr) in ,40yr the conversion rate of 6.12% which is less than over all conversion rate

TABLE NO 3; COMPARISON OF DURATION OF SYMPTOMS

DURATION OF SYMPTOMS	CASES	PERCENTAGE
≤90 Days	13	65.00
≥91 Days	7	35.00

TABLE NO 4:COMPARISON OF COMORBID CONDITIONS

CO MORBID CONDITION	NO. OF CASES	PERCENTAGE
Type 2 DM	3	15.00
Type 2 DM and HTN	4	20.00
Hypothyroidism	1	5.00
Old case of Pulmonary Tuberculosis	1	5.00

TABLE 5:COMPARISON OF PREVIOUS SURGERIES (N=20)

SURGERY	NO.CASES	PERCENTAGE
1 Emergency LSCS, 1 Elective LSCS, 1 Elective LSCS + Sterilization	1	5.00
1 Emergency LSCS	1	5.00
Elective LSCS + Sterilization	1	5.00
Hysterectomy	1	5.00
Left ECCE	1	5.00

ULTRA SOUND

Ultrasound detected calculi in all the cases. In 13 cases there were multiple calculi, where as in 7 there was only one calculus. Additionally Sludge was present in 5 cases. 5 patients had gall bladder wall thickness >4mm

ERCP

ERCP was done in 2 cases only. In both cases sphincterotomy and CBD imaging was done in which many CBD calculi were seen. In the second sitting the stones were basketed out and a stent was placed.

OTHERS

Upper Gastro Intestinal Endoscopy was performed in 18 patients , it was reported as normal in all of them.One patient's X-ray chest showed rightcostopheric angle blunting. Thereafter a CTscan chest was done which revealed minimal bilateral pleural effusion

TABLE NO 6: INDICATORS OF LC IN CONVERTED CASES

INDICATION	No. Cases	PERCENTAGE
Symptomatic of cholelithiasis	11	55
Interval cholecystectomy	06	30
Acute cholecystectomy	03	15

TABLE NO 7: COMPARISON OF ABDOMEN ACCESS

ABD. ACCESS	No. Cases	PERCENTAGE
OPEN	13	65.00
CLOSED	7	35.00

TABLE NO 8: COMPARISON OF TYPE OF CONVERSION

TYPE OF CONVERSION	No. Of Cases	Percentage
ELECTIVE	11	55
EMERGENCY	09	45

TABLE NO :10 REASONS FOR CONVERSION COMPARISON OF REASONS FOR CONVERSION (N=20)

E	REASONS	No. Cases	%	
L	Inability to define anatomy due to	08	40.00	
E	ADHESIONS			
C				
T	EQUIPMENT FAILURE	Camera problem	1	5.00
I	ALTERED ANATOMY	Short &thick cystic duct	1	5.00
V		Intra hepatic gallbladder	1	5.00
E				
	Total	11	55.00	
	BLEEDING	Gallbladder	2	10.00
		Unknown	1	5.00
		Dissected omentum	1	5.00
		Cystic artery	2	10.00
	CBD INJURY		2	10.00
	INJURY TO OTHER VISCERA	Stomach	1	5.00
	Total	09	45.00	

ELECTIVE CONVERSION

There were 11 elective conversions in this study. The most common grounds for conversion were the inability to define anatomy due to adhesions in 08 of the 11 cases. Equipment failure due to poor visibility from the camera probe was the reason in one case. Two patients had an altered anatomy. In one the cystic dust was short and thick making it impossible to clip. In the other the gallbladder was intra hepatic.

EMERGENCY CONVERSION

09 were emergency or enforced conversions. Most common cause was bleeding which occurred in bed in 2 cases, from unknown area in 1 In 2 cases the clip on the cystic artery slipped leading to torrential bleeding. Iatrogenic organ injury was the reason in 3 cases. The anterior surface of the stomach was injured in one case while dissecting injured during dissection which was identified intraoperatively.

TABLE NO :11 COMPARISON OF POST OP COMPLICATIONS

COMPLICATIONS	NO.CASES	PERCENTAGE
WOUND INFECTION	7	35.00
WOUND INFECTION & BILE LEAK	1	5.00
HYPOVOLEMIC SHOCK	1	3.33

POST OPERATIVE HOSPITAL STAY

The average post operative hospital stay was 10.32days. The range being 26– 7days. 18 patients were discharged electively only 2 patients were discharged on request.

DISCUSSION

On account of our study subjects being converted cases of LC, which are usually few and uncommonly pass, we adopted a retrospective approach to facilitate utmost efficiency.

CONVERSION RATE

The frequency of conversions in laparoscopic surgery, just like any other contrary outcome of the surgical procedure, is varied. Our study conducted at Osmania General hospital, a tertiary level center in the heart of the city reports a conversion of 6.62% of patients undergoing

TABLE NO 12: CONVERSION RATE - COMPARISON WITH OTHER STUDIES.

Author	Dinkel HP (May2000)3	Tayeb M (2005)11	Simopoulos C (Jul2005)12	van der Steeg HJ et al(Jan2006)13	Priego P (Jan2009)10
Conve. %	6.7	7.5	5.2	12	8.3
Author	Raad Fadhil Al-Rubaey et al(April 2011)4	Raed jawad et al(dec 2013)44	Yarub Fadhil Hussein et al(may 2015)45	Present Study	
Conve. %	5.9	2.7	3.5	6.62	

Benjie Tang et al1 states that although the range of conversion rate of LC to the open approach is commonly reported as 1.5% – 10%, actual reported rates in different series can vary from 1%–74%, depending on the target patient populations and the associated risk factors for conversion. The conversion rate in the present study (6.62%) resembles other international studies

Male sex has been universally affiliated with high incidence of conversion. Additional pathological conditions like Diabetic mellitus[1,10,12]and hypertension 39 have been colligated to conversion by some authors. Ibrahim S et al[6] show that just the mere presence of diabetic mellitus was not associated with higher chance of conversion, but demonstrated that uncontrolled diabetic state (defined as HbA1c > 6%) was at a higher risk for conversion. Simopoulos Cet al[12] reflect that, the presence of diabetic mellitus in a patient is a compounding factor for conversion, but the presence of cardiovascular disease or hypertension has no such association with conversion. In the present study of the 20 converted cases, 15 % (n=3) were diabetic, 20% (n=4) patents were both hypertensive and diabetic, 5% (n=1) hypothyroidism and 5.00% (n=1) had history of treated pulmonary kochs. These observations are too small to make any assumption, other than that their incidence in the converted cases was very poor. History of a previous upper abdominal surgery was an associated risk factor for conversion[1,6,11,12] Even though in the present study 25% of patients confirmed a previous surgical history, only 20% were surgeries of the abdomen, none were upper abdominal surgeries. Ibrahim S et al[6] also state that just confirmed history of previous abdominal surgery does not have a negative impact for successfully completing LC, but previous upper abdominal surgery is associated with an increased incidence of conversion.

WEIGHT

Frank obesity or weight more than 65kg has been proposed as a risk for Conversion[1,6.] But our study shows frank obesity or weight more than 65kg is not a risk factor, as 55% of the converted patients carried 65kg or less body weight. Some authors disagree and claim that high body weight and BMI is not a risk factor per say but does significantly increase operating time[11,12].

PREOPERATIVE INVESTIGATION LIVER FUNCTION TESTS

Ibrahim S et al6 and Tayeb M et al[11] through their studies did not find any statistically significant risk of conversion in elevated

preoperative values of total bilirubin, transaminases and alkaline phosphatase. This correlates with the observations made in the present study as all over converted cases had near normal values of the antecedent mentioned variables. But in the study conducted by Simopoulos C et al[12], they noted a higher conversion rate in patients with values of total bilirubin >1.2mg/dl, AST >60U/L, ALT >60U/L.

WBC COUNT

WBC count on the larger side have been stated as risk factors for conversion of LC to open cholecystectomy[6,11,12]. WBC counts greater than 9000cell/ml, 10,000 cell/ml and 13,200cell/ml have been stated as associated to higher conversion by Tayeb M et al [11], Ibrahim S et al[6] and Simopoulos Cet al [12] respectively.

These observations are contrary to the observation made by this author. None of our converted cases had WBC count more than 9800cell/ml and only 5 cases had WBC count more 9000 cell/ml indicating no association of conversion and High WBC count.

BLOOD GROUP

Blood group distribution in the present study is comparable to the blood group distribution in the general population demonstrating no association of any ABO group with Conversion.

ULTRASOUND

Cholelithiasis was confirmed in all our converted cases by a preoperative sonographic examination, thus demonstrating the sensitivity, and accuracy with regards to diagnosis of cholelithiasis with this imaging technology reaching 100%. Same observation was corroborated by Dinkel HP et al[3]. Sonographic Gall bladder wall thickness of the higher range, >3mm to >3.5mm [3], is associated strongly with conversion. Dinkel HP et al[3] observation harmonizes with the antecedently mentioned authors as they states a wall thickness of more than 4mm is significantly associated with difficult dissection. In our study only few cases had increased gall bladder wall thickness. In gallstone disease, the histopathologic substrate for sonographic thickening of the gallbladder most frequently is acute or chronic pericholecystic inflammatory change. These gallbladder posses friable walls with enlarged vessels embedded within, which may break with the least disturbance leading to bleeding that compromises orientation and the visual exposure at surgery, forcing surgeons to change the operative access. The pericholecystic adhesions will also impede the detachment of the gallbladder from its bed[3].

CHIEF OPERATING SURGEONS EXPERIENCE

Even though Post graduate surgical trainees also perform LC under mentouring of a consultant, all of the converted cases were being operated upon by the Consultants themselves, id est ruling out the sparsely experience factor as a significant conversion risk. This observation is corroborated by Misawa T et al[15] who state in their study that experienced laparoscopic surgeons were in the driving seat in all of their converted cases due to CBD injuries. Contrary to what is stated above Ibrahim S et al[7] jallege a significant higher conversion rates when junior surgeons are operating compared to their seniorcounter parts. It has been said by few other authors that not less than 200 successful LC have to be accomplished by a trainee before he or she can acquire concrete proficiency over the procedure[1,15]

INDICATION FOR UNDERGOING LC

Even though LC done in the setting of an active acute cholecystitis is associated with high conversion rates [6,10,12] in the present study only 20.00% of our conversions were having active acute cholecystitis. As most cases presented late and because LC equipment is not available in our emergency block all the above mentioned active cholecystitis cases recived interventional LC after passing the golden window[16], of 72 hours of symptomology.

This observation is agreed upon by Tzovaras G et al[16] and Tang B et al [1]who state that a delay of more than 72 hours and 48 hours

respectively is associated with higher conversion. Interval LC that entails conservative treatment for the acute disease followed by delayed (interval) surgery increases the conversion rate, postoperative morbidity, and hospital stay according to Cuschieri A and Tang B1. And thus forwards a strong case for early LC at admission.

ACCESS TROCAR RELATED COMPLICATIONS, CONVERSIONS

Though in literature trocar related complication like Subcutaneous emphysema due to extra peritoneal insufflation [17], enteric injury or perforation [10,17] port site bleeding[10], have been described. None of the cases in the present series had a trocar related complication whether the access was closed or open. This could be explained by the incredibly larger amount of time that is dedicated to the initial access port at our institution. Also in more than half of the cases abdomen access was achieved by an open technique. The open technique of trocar insertion according to Malik AM et al [17] seems to have reduced access-related major vessel injury and mortality rate.

THE CONVERSIONS

Please refer the Material and method section for the definition of elective and emergency / enforced conversion. Most of our conversions were executed electively. The reasons of elective conversion in decreasing order of incidence are; inability to define anatomy due to adhesions, equipment failure, and altered anatomy. Most of our enforced (emergency) conversions were due to intraperitoneal bleeding.

REASONS FOR CONVERSION- COMPARISON WITH OTHER STUDIES. REASONS

After reviewing the literature the observation of this author that, adhesions around gallbladder which would have made the dissection of the calot's triangle both unsafe and difficult laparoscopically is the most common reason for converting the procedure to open has become established [1,4,6,11,12]. Bleeding, though not the second most common cause of conversion in some studies [11,12], was the overall second most common, and the most common cause for an enforced (emergency conversion) in the present study. Ibrahim S et al[6] and Tang B et al[1] share the same observation, strengthening over evidence for the same. Although some authors included slipped stones as a cause of conversion[12], in the present study though it occurred in few converted cases it was not brought out as it was not the reason for conversion to open. We have reported a Bile Duct Injury rate of 10% (n=20) which is on the higher side compared to Tayeb M et al[11], Misawa T et al [15], Simopoulos C et al [12] and Ibrahim S et al[6] who report an incidence of 2.73%, 0.64%, 2.13% and 1.9% respectively.

It has been observed that as the usage of LC has increased so has the incidence of BDI. It has been speculated that the two dimensional image, limited visual field, absence of tactile sensation may be responsible for this trend[15]. Also CBD is usually injured due to anatomical misidentification because of perceptual illusion identifying incorrectly the CBD for the cystic duct was based on an anatomical illusion[1,18,19]. Archer SB et al[18] suggested the quick learning and early independent initiation of the procedure, without the benefit of proctoring as the reason for the higher incidence of BDI[15]. The following methods have been proposed to avoid misidentification of the CBD as the cystic duct, and to reduce the incidence of BDI during LC:

- Lateral, rather than cephalad retraction of the infundibulum is preferable
- Incision of the ventral and dorsal serosae of Calot's triangle must be followed by anatomical observation
- The cystic duct junction with the gallbladder or the CBD must be identified precisely
- A 30°C angled viewing laparoscope or a flexible laparoscope should be used
- no clip to be placed on, and no incision to be made in, any structure until the
- transition between the cystic duct and the gallbladder infundibulum is clearly visualized

- A low threshold should be maintained for conversion to laparotomy when the anatomy cannot be identified precisely.
- Training should be imparted to heighten vigilance (OR exercise caution) against such potent misidentification (OR illusion) of the CBD as the cystic duct[14].

POST OPERATIVE COMPLICATIONS

"A statistically significant reduction in the conversion rate was not accompanied by an equivalent reduction in the complication rate." Thompson MH et al. The present study enjoyed a low complication rate 16.67% which is much less than the 33% reported complication rate in converted cases of Thompson MH et al , but is more than double the 6.1% complication rate stated by Ibrahim S et al[6]. There were 4 wound infection cases and one case of bile leak through abdominal drain. All were managed conservatively. One case that developed transitory hypovolemic shock needed 3 unit of blood transfusion.

POST OPERATIVE HOSPITAL STAY

The average Post operative hospital stay for our patients were 10.32 days, slightly higher than the 7.53 days reported by Ibrahim S et al[6]. In our the increase in post operative stay was due to wound infection in most of the cases.

CONCLUSIONS

After analysis of the data from the present study and that obtained from literature we came to following conclusions. Factors that are leading to conversion of laparoscopic cholecystectomy to open cholecystectomy are: male gender & oldage which are pre-operative factors. Male gender showed a higher conversion rate as compared to female gender which was also observed in most of the similar studies. Oldage associated with higher conversion rates because of long standing symptomatology & recurrent attacks in those age groups. Where as yearly hospital conversion rate, type of admission, duration of symptomatology, associated comorbid conditions, history of previous surgeries, abnormal LFT or WBC count, ABO blood group, sonographic wall thickness, surgeons experience and the indication of LC could not be established as powerful enough factors influencing conversion. Intraoperative factors which influenced conversion are peri gallbladder adhesions, intraperitoneal bleeding, altered anatomy and bile duct injuries.

REFERENCES

1. Tang B, Cuschieri A. Conversions during laparoscopic cholecystectomy: risk factors and effects on patient outcome. *J Gastrointest Surg.* 2006 Jul- Aug;10(7): 1081-91.
2. Karimian F, Aminian A, Mirsharifi R, Mehrkhani F. Surgical options in the management of cystic duct avulsion during laparoscopic cholecystectomy. *Patient Saf Surg.* 2008 Jun 20;2:17.
3. Dinkel HP, Kraus S, Heimbucher J, Moll R, Knüppfer J, Gassel HJ et al. Sonography for selecting candidates for laparoscopic cholecystectomy: a prospective study. *AJR Am J Roentgenol.* 2000 May;174(5):1433-9.
4. Kartal A, Aksoy F, Vatansav C, Sahin M, Yilmaz O, Belviranli M, Karahan O. Does estrogen cause low conversion rates in laparoscopic cholecystectomies for acute and chronic cholecystitis in women? *JLS.* 2001 Oct-Dec;5(4):309-12.
5. Ji W, Li LT, Li JS. Role of laparoscopic subtotal cholecystectomy in the treatment of complicated cholecystitis. *Hepatobiliary Pancreat Dis Int.* 2006 Nov;5(4):584-9.
6. Ibrahim S, Hean TK, Ho LS, Ravinathan T, Chye TN, Chee CH. Risk factors for conversion to open surgery in patients undergoing laparoscopic cholecystectomy. *World J Surg.* 2006 Sep;30(9):1698-704.
7. Ballal M, David G, Willmott S, Corless DJ, Deakin M, Slavin JP. Conversion after laparoscopic cholecystectomy in England. *Surg Endosc.* 2009 Oct;23(10):2338-44.
8. Morgenstern L. Achilles' heel and laparoscopic surgery. *Surg Endosc.* 1995 Apr;9(4):383.
9. Thompson MH, Bengler JR. Cholecystectomy, conversion and complications. *HPB Surg.* 2000 Aug;11(6):373-8.
10. Priego P, Ramiro C, Molina JM, Rodriguez Velasco G, Lobo E, Galindo J et al. Results of laparoscopic cholecystectomy in a third-level university hospital after 17 years of experience. *Rev Esp Enferm Dig.* 2009 Jan;101(1):20-30.
11. Tayeb M, Raza SA, Khan MR, Azami R. Conversion from laparoscopic to open cholecystectomy: Multivariate analysis of preoperative risk factors. *J Postgrad Med.* 2005; 51(1):17-20.
12. Simopoulos C, Botaitis S, Polychronidis A, Tripsianis G, Karayiannakis AJ. Risk factors for conversion of laparoscopic cholecystectomy to open cholecystectomy. *Surg Endosc.* 2005 Jul;19(7):905-9.
13. Van Der Steeg HJ, Alexander S, Houterman S, Slooter GD, Roumen RM. Risk factors for conversion during laparoscopic cholecystectomy-experiences from a general teaching hospital. *Scand J Surg* 2011; 100: 169-173.
14. Yol S, Kartal A, Vatansav C, Aksoy F, Toy H. Sex as a factor in conversion from laparoscopic cholecystectomy to open surgery. *JLS.* 2006 Jul- Sep;10(3):359-63.
15. Misawa T, Saito R, Shiba H, Son K, Futagawa Y, Nojiiri T et al. Analysis of bile duct injuries (Stewart-Way classification) during laparoscopic cholecystectomy. *J Hepatobiliary Pancreat Surg.* 2006;13(5):427-34.
16. Tzavaras G, Zacharoulis D, Liakou P, Theodoropoulos T, Paroutoglou G, Hatzitheofilou C. Timing of laparoscopic cholecystectomy for acute cholecystitis: a prospective non randomized study. *World J Gastroenterol.* 2006 Sep 14;12(34):5528-31.
17. Malik AM, Laghari AA, Mallah Q, Hashmi F, Sheikh U, Talpur KA. Extra-biliary

- complications during laparoscopic cholecystectomy: How serious is the problem? J Minimum Access Surg. 2008 Jan;4(1):5-8.
18. Archer SB, Brown DW, Smith CD, Branum GD, Hunter JG. Bile duct injury during laparoscopic cholecystectomy: results of a national survey. *Ann Surg.* 2001 Oct;234(4):549-58.
 19. Samir Shrestha, Surendra Shah S, Sanjay Poudyal, Jay N Shah, Vijay Kumar Jaiswal. Conversion from Laparoscopic to Open Cholecystectomy. *Journal of Patan Academy of Health Sciences.* 2014 Jun;1(1):30-32.