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Incidence of Complications in Early vs. Late Laparoscopic Cholecystectomy after Acute Cholecystitis

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Abstract

Background: The majority of digestive tract illnesses are caused by biliary ailments. Cholelithiasis is one of them, that produces generalized illness, necessitating surgical intervention for complete recovery. **Aims:** The goal of this study was to compare the outcomes of early (within one week) and delayed (after six weeks) laparoscopic cholecystectomy for acute cholecystitis.

Patients and Methods: This study was took place from November 2019 to July 2021, at the General Surgery department, Beni-Suef University hospitals, with 54 cases diagnosed with acute cholecystitis during the study period were included. Patients were randomized using the closed envelope method.

Results: Operative time showed significant prolongation in the delayed group (76.12 vs. 37.98 minutes in the early group – $p < 0.001$).Early intervention was associated with a significant reduction in post-operative pain measured by VAS (3 vs. 4 in the other group – $p = 0.015$). Patient satisfaction was significantly improved in the early group compared to the late group ($p < 0.001$).

Conclusion: This study found that laparoscopic cholecystectomy at early stage is a safe and feasible therapeutic option for cholecystitis. It's linked to lower VAS scores, shorter operative times, and lower complication rates. It's not statistically significant, but related to higher patient satisfaction.

Keywords: Complications, early vs. Late Laparoscopic Cholecystectomy; Acute Cholecystitis

Background

Biliary diseases account for a large percentage of digestive system problems. Cholelithiasis is one of them, and it produces generalized illness, necessitating surgical intervention for complete recovery.[1] Women are three times as likely as males to have gallstones. Age-related prevalence climbs from 4% in the third to upto 30% in the seventh decade.[2]

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Cholecystitis in acute phaseis a serious side effect of gallstones. Several research paths have been pursued in the past several decades to produce less invasive, less painful, and less expensive gallstone treatment treatments. contact dissolution ,Oral desaturation, and extracorporeal shock wave lithotripsy techniques are all limited by the amount of stone present, its size, and the number of stones present. They also leave an entire gallbladder, which contains lithogenic bile.[3]

As a result, cholecystectomy by laparoscopic was conducted as an elective treatment, with the goals of a faster recovery time, lower costs, less post-operative pain, and better cosmetic results. Due to inflammatory process that made dissection difficult, as well as the friability of tissues and ill-defined operative planes in the early days of minimally invasive surgery, cholecystitis in acute phasewas long regarded to be a defined as the ratio contraindication to cholecystectomy by laparoscopy.[4]

Several studies have found that early cholecystectomies for acute cholecystitis reduce morbidity and death in patients who would otherwise require multiple admissions for recurrent symptoms due to complications.[5]

Patients and Methods

It was a randomised controlled trial with a prospective designconducted between November 2019 till July 2021, which was done at General Surgery department, Beni-Suef University hospitals, with 54 cases diagnosed with acute cholecystitis during the study period. Patients were randomized using the closed envelope method.

Study groups: Two equal groups of the included cases were collected randomly from the pool of candidates; The early group included 27 patients who underwent laparoscopic cholecystectomy within one week of diagnosis. The late group included the remaining 27 cases that experienced the same operation six weeks later when the acute attack had been settled.

Inclusion criteria: Patients diagnosed with acute cholecystitis were included on Tokyo guidelines 2018, 18 – 80 years old, and both genders.

Exclusion criteria: common bile duct (CBD) stones, previous upper GIT surgeries, immunosuppression, acute pancreatitis, cholangitis, unfitness for laparoscopy, and contraindications for general anesthesia.

Patient consent: Prior to the procedure, all patients signed a written informed consent form after learning about each surgical and post-operative strategy's specifics and risks.

Ethical consideration: This studyapproved by Local ethics committee and Beni-Suef University Institutional Review Board.

Patient evaluation:

History taking: Personal history including name, age, gender, occupation, and residence, symptoms including abdominal pain, jaundice, fever, nausea, and vomiting, the pain was analyzed regarding its onset, duration, character, radiation, association, along with aggravating and relieving factors, preexisting systemic comorbidities, and previous surgical operations.

Examination: Blood pressure, heart rate, respiration rate, temperature, and jaundice are all part of a general examination. Examining the area: Previous abdominal scars, abdominal distension, and respiratory motions are all looking for. Tenderness, murphy sign: The examiner advised the patient to take a deep breath while palpating the gallbladder fossa immediately beneath the liver margin. Deep breathing causes the gallbladder to drop toward and press against the examining fingers, causing increasing discomfort, the patient catching their breath, and rebound tenderness, rigidity, enlarged gall bladder, and hepatosplenomegaly in patients with acute cholecystitis.

Laboratory investigations: Complete blood count,complete liver function tests (albumin, bilirubin, SGOT, SGPT, INR, and alkaline phosphatase), serum creatinine, random blood sugar, and virology markers (HCVAb, HBsAg, and HIVAb).

Pelvia-bdominal ultrasound: Ultrasonographic criteria for diagnosis of acute cholecystitis included:[6] Thickened wall > 4 mm, gallbladder is edematous , gallbladder is distended , +ve sonographic Murphy's sign, pericholecystic fluid, and Gallstones.

Preoperative preparation: Both patients received supportive care during the acute phase. Intravenous (i.v.) fluid infusion and antibiotics (Ceftriaxone or Epicephen® 2g in addition to metronidazole or Flagyl® 500 mg) were given to all of the patients.

Operative technique: All cases were performed under general anesthesia. After obtaining a considerable intraabdominal pressure (12 – 15 mmHg), In the periumbilical region, the first 10 mm trocar was inserted. After inserting the camera, the remaining ports were inserted under visual guidance. Transillumination was performed to avoid visible veins in the abdominal wall. The adhesions surrounding the gall bladder were gently dissected from it **Figure (1)**.

Figure (1): The gall bladder is separated from the surrounding sealed omentum.

Care was taken to identify and prevent injury to the related organs hidden in the omentum, sealing the gall bladder. Dissection was continued till identifying the Hartmann pouch, cystic duct, and porta hepatis **Figure (2)**.

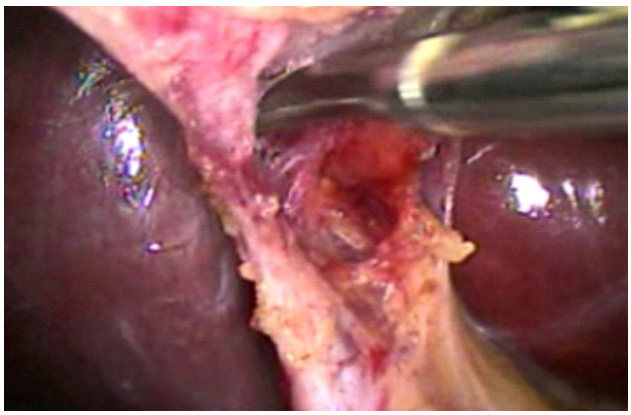

Figure (2): Dissection at Calot triangle to identify its structures.

The duct and gallbladder were dissected, beginning at the lower end of the cystic duct and continuing upwards until it reached the gallbladder neck on the posterior side.

The dissection began with little bands and strands of tissue in the Calot triangle. The cystic pedicle was removed using a curved dissector to separate the cystic duct and artery. The gallbladder was detached from its bed using a to-and-fro retraction technique with a monopolar cautery hook. The laparoscopic suction tool was frequently utilized to help with this. Spray diathermy was used to produce hemostasis in the gallbladder bed. The decision to convert to an open cholecystectomy by a right subcostal incision was based on the operating circumstances, including difficult dissection(no prograss within 20 minutes), poor intraoperative hemorrhage control, and Calot's triangle or liver bed adhesions **Figure (3)**.

Figure (3): View after conversion to laparotomy. Kocher incision was performed, and a 50-cm syringe was used to aspirate the over distended gall bladder

All excised specimens were sent to our pathology laboratory for histopathological examination. Suction canisters were measured before and after surgery, and the amount of irrigation used was subtracted to figure out how much blood was lost during the surgery.

Post-operative management: If the patients had no nausea or vomiting, they could eat 6–12 hours following surgery. The pain level was measured daily using a visual analog scale (VAS), with 0 indicating

no discomfort and 10 indicating the most severe pain.[7] Bile leakage was defined as the discovery of bile seeping through the intraoperatively inserted drain after surgery.[8] The period between surgery and discharge was used to calculate the average number of days a patient would need to stay in the hospital following surgery.

Follow-up: Follow-up assessment using clinical examination, liver function tests, and abdominal ultrasonography was performed after 1 week, 2 weeks, and one month after the operation. The patient himself subjectively assessed patient satisfaction

Data Analysis: The data entered into the computer was analysed using IBM SPSS version 22.0. Qualitative data was described using numbers and percentages. The Kolmogorov-Smirnov test was used to determine if the data were normal, and the median (minimum and maximum) and the mean (standard deviation) were used to report the data. The (0.05) level of significance was used to determine the significance of the results.

Results

The mean age of the included cases was 47.64 and 46.81 years in the early and late groups, respectively. The female gender was more predominant than males, as they constituted 85.19 and 81.48% of cases in the same groups, respectively. Body mass index had mean values of 33.15 and 33.67 kg/m^2 in the two groups, respectively. Regarding systemiccomorbidities, hypertension was present in 18.52 and 14.81%, whereas diabetes was present in 7.4 and 11.11% of cases in the two groups. In addition, smokers represented 11.11% of the included patients in both groups. When comparing the two groups, the previously indicated variables revealed no significant differences.($p > 0.05$). **Table (1)**

Table (1): Demographic data of the included cases

	Early group (n = 27)	Late group (n = 27)	P value
Age (years)	47.64 ± 7.25	46.81 ± 8.60	0.365
Sex -Male -Female	 4 (14.81%) 23 (85.19%)	 5 (18.52%) 22 (81.48%)	0.212
BMI (Kg/m2)	33.15 ± 3.4	33.67 ± 3.35	0.582
Comorbidities -Smoking -Diabetes -Hypertension	 3 (11.11%) 2 (7.4%) 5 (18.52%)	 3 (11.11%) 3 (11.11%) 4 (14.81%)	0.142

Regarding the sonographic findings, a thick edematous gall bladder wall was detected in 96.29 and 92.59% of cases in the study groups, respectively. Additionally, distended gall bladder was present in 70.73 and 81.48% of cases in both groups, respectively, while pericholecystic fluid was reported in 14.8% of cases in both study groups. Between the two groups, there was no significant difference in ultrasonographic findings. ($p > 0.05$). **Table (2)**

Table (2): Ultrasonographic findings in the study groups

	Early group (n = 27)	Late group (n = 27)	P value
Thick edematous wall	26 (96.29%)	25 (92.59%)	0.214
Distended gall bladder	19 (70.37%)	22 (81.48%)	0.062
Pericholecystic fluid	4 (14.81%)	4 (14.81%)	1

Operative time showed significant prolongation in the delayed group (76.12 vs. 37.98 minutes in the early group – $p < 0.001$). However, no significant difference was reported regarding intraoperative blood loss (135.98 and 142.1 ml in the early and late groups, respectively – $p = 0.114$). Conversion to the open approach was performed in 7.4% of cases in the late group, compared to no cases in the early group. However, statistical analysis showed no significant difference between the two groups. Drains were inserted at the Morrison pouch in all cases. **Table (3)**

Table (3): Operative data

	Early group (n = 27)	**Late group (n = 27)**	**P value**
Operative time	37.98 ± 5.7	76.12 ± 4.56	< 0.001*
Blood loss	135.5 ± 30.6	142.1 ± 28.5	0.114
Conversion to open	0 (0%)	2 (7.4%)	0.462
Drains	27(100%)	27(100%)	1

There was no significant difference in the amount of time spent in the hospital between the two groups. (median = 2 in the two groups). However, the range increased in the delayed group because bile leakage cases encountered in these cases required further hospitalization for proper management of that complication. Early intervention was associated with a significant reduction in post-operative pain measured by VAS (3 vs. 4 in the other group – $p = 0.015$). Patient satisfaction was significantly improved in the early group compared to the late group ($p < 0.001$). In post-operative complications, biloma was encountered in only two cases (7.4%) in the delayed group, and both of these cases were successfully managed by ultrasound-guided tube drainage. These cases were managed by post-operative ERCP and stenting. Both were due to a cystic duct leak. Common bile duct injury was encountered in only two cases in the late group (7.4%). Both of these cases were diagnosed after operation by bile discharge through the drain and evidence of CBD injury on MRCP. They were managed by bilioenteric bypass. One case underwent hepaticojejunostomy, while the other one underwent choledechoduodenostomy. The method of reconstruction was dependent on surgeon preference. Lastly, surgical site infection occurred in 3.7 and 7.4% of cases in the two groups, respectively. All of the previous complications did not differ significantly between the two groups. However, complications were commonly encountered in the late group. **Table (4)**

Table (4): Post-operative data

	Early group (n = 27)	**Late group (n = 27)**	**P value**
Hospital stay	2 (1 – 3)	2 (1 – 13)	0.154
VAS	3 (2 – 5)	4 (3 – 6)	0.015*
Patient satisfaction			< 0.001*
-Completely satisfied	20 (74.07%) **A**	13 (48.15%) **B**	
-Satisfied	4 (14.81%) **A**	3 (11.11%) **A**	
-Fairly satisfied	3 (11.11%) **A**	3 (11.11%) **A**	
-Unsatisfied	0 (0%) **A**	8 (29.63%) **B**	

	Early group (n = 27)	Late group (n = 27)	P value
Complications			
-Biloma	0 (0%)	2 (7.4%)	0.462
-Cystic duct stump leakage	0 (0%)	2 (7.4%)	0.462
-Bile duct injury(leak or ligation)	0 (0%)	2 (7.4%)	0.462
-Port site infection	1 (3.7%)	2 (7.4%)	0.208

A, B: Similar letters suggest that the surrounding groups are statistically indistinguishable. A significant difference was found between adjacent groups is shown by different letters.

Discussion

In acute cholecystitis, laparoscopic cholecystectomy is an effective and safest option[9]. Acute cholecystitis was considered a contraindication for a minimally invasive technique in the first decade of the laparoscopic era. Laparoscopic cholecystectomy is currently the treatment of choice for acute cholecystitis patients.[10] Furthermore, past meta-analyses have revealed that cholecystectomy performed early is more beneficial.[11] Furthermore, in an additional literature review, The use of laparoscopy did not appear to be associated with an increased risk of complications post-operative.[12]

In our study, the female gender was more predominant than males, as they constituted 85.19 and 81.48% of cases in the same groups, respectively. Gender was not a significant variable when comparing the two groups (p = 0.212).

In accordance with our findings, Another study found that there was no statistically significant difference between the two groups when it came to gender. (p = 0.114). Females were more predominant than males as they constituted 86.67 and 93.33% of cases in the early and late groups, respectively.[13] Agarwal also confirmed the previous findings.[6]

On the contrary, another recent Egyptian study reported a higher prevalence of males, who constituted 71.6 and 68.9% of cases in the early and late groups, respectively (p = 0.719).[14]

In the current study, operative time showed significant prolongation in the delayed group (76.12 vs. 37.98 minutes in the early group – p < 0.001).

According to previous research, waiting for an inflammatory gallbladder to cool down causes the surrounding inflammation to mature, resulting in the formation of adhesions that make dissection more difficult.[16] According to some surgeons, edema and hyperemia around the gallbladder in early cholecystitis may assist dissection,[16] and that was evident in our setting. The presence of this edema, along with a thick gall bladder wall, made it easy for us to use the laparoscopic suction device to separate the gall bladder from its bed in most cases.

Similar to our findings, Roulin et al. reported that operative time was decreased in the early group versus the delayed group, as it had mean values of 75.9 and 90 minutes in the two groups, respectively.[17]

The mean operating time in another study was 60 minutes (range: 35–150 minutes) in the early group and 60 minutes (range: 45–100 minutes) in the delayed group, which is statistically insignificant (p = 0.8004).[6]

On the contrary, other authors reported that operative time was significantly prolonged in the early group, as it had a mean value of 126.55 and 109.94 minutes in the early and late groups, respectively (p = 0.015).[14]

We found no significant difference between the two groups in terms of blood loss (p = 0.114), with mean values of 135.5 and 142.1 ml in the early and late groups, respectively.

In accordance with our previous findings, Agarwal reported an average blood loss of 159.6 mL (±58.1) in the early group and 146.8 mL (±10.5) in the delayed group. Blood loss was statistically

insignificantly different between the groups (p = 0.418).[6]

Alternatively, Arafa and his coworkers reported that there was a significant increase in blood loss in association with early laparoscopic intervention (216.17 vs. 133.02 ml in delayed operation – p < 0.001).[14] The increased blood loss was attributed to early intervention by highly vascular adhesions around the inflammatory gall bladder and oozing from the inflammatory gall bladder bed, according to the authors.

In the current study, conversion to the open approach was performed in 7.4% of cases in the late group, compared to no cases in the early group. This difference was not statistically significant between the study groups (p = 0.462).

Verma and his colleagues reported that conversion to open approach was performed in 10 and 6.67% of cases in the early and late groups, respectively (p = 0.780).[13] This is near to conversion rate reported by our results in the delayed group.

Another study found that conversion to the open method happened in 12.2% and 23% of instances in the early and delayed groups, respectively, with no significant difference between the two groups (p = 0.084). In the early cases, the main grounds for conversion were technical. One case of ambiguous Calot's triangle anatomy, suspicion of bile duct injury, mild bile duct injury, and gallbladder transaction at Hartman's pouch. Dense adhesions around Calot's triangle and gallbladder made dissection difficult in the delayed group, contributing to the conversion.[6]

In our study, the duration of hospitalization showed no significant difference between the two groups (median = 2 in the two groups) (p > 0.05).

Likewise, another study negated any significant difference between the two groups regarding the same parameter (1.67 and 1.47 days in early and late groups, respectively – p = 0.379).[13]

Early intervention was associated with a significant reduction in post-operative pain measured by VAS (3 vs. 4 in the other group – p = 0.015) in the current study.

In agreement with our findings, Macafee et al. reported that early operation was associated with significantly lower VAS compared to delayed operations (72.94 vs. 84.63 – p = 0.012).[18]

However, in another study, the average VAS score of post-operative analgesia was 2 in the early group and 2 in the delayed group, which was not statistically significant (p = 0.673).[6]

Regarding post-operative complications encountered in our study, biloma was experienced in only two cases (7.4%) in the delayed group versus no cases in the early group. In addition, cystic duct stump leakage was occurred in only two cases (7.4%) in the delayed group.

Another Pakistani study reported that bile leak occurred in 6.6 and 8.9% of cases in the early and late groups, respectively, with no significant difference between the two groups (p = 0.78).[10] Another study also supported the previous findings.[6] We reported an incidence rate within the aforementioned range.

In the current study, common bile duct injury was encountered in only two cases in the late group (7.4%). There was no significant difference between the two groups regarding that complication.

Other Egyptian authors reported that common bile duct injury was encountered in 1.4 and 5.4% of early and delayed cholecystectomy cases. There was no significant difference between the two groups regarding that complication (p = 0.366).[14]

As our results showed that early intervention, even if not significant statically, was associated with lower VAS score, conversion, and complication rates, it was reasonable that cases in that group expressed significantly better satisfaction than the other group. Of course, medical treatment will improve the acute condition, but the pathology is still there. As the stones still exist, there is always a risk of recurrent symptoms or further complications. Thus, early intervention makes an end to patient suffering.

All in all, our experience suggests that early laparoscopic intervention is preferred over delayed intervention. The delayed intervention will not provide an additional advantage, as both operations are expected to be difficult. In early intervention, as both interventions had comparable complication profiles, we prefer to eliminate the source of patient discomfort early.

Conclusion

According to the present research findings, early laparoscopic cholecystectomy appears to be a safe and feasible treatment option for acute cholecystitis. It is connected with lower VAS levels, faster surgical times, fewer complication rates, and no statistically significant differences in patient satisfaction, despite being associated with improved patient satisfaction.

List of abbreviations

CBD: Common bile duct.

VAS: Visual analog scale.

Declarations

- Ethics approval and consent to participate:
  - This studyapproved by Local ethics committee and Beni-Suef University Institutional Review Board.
  - FWA#: FWA00015574
  - Approval NO: FMBSUREC/05012020/ ALI
- Consent for publication: yes
- Availability of data and material: data of all patients all available at any time for review
- Competing interests: no competing of interest
- Funding: no funding
- Authors' contributions:all authers are involved in this research
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References

1. Shabanzadeh DM. Incidence of gallstone disease and complications. Current opinion in gastroenterology. 2018 Mar 1;34(2):81-9.
2. Gul R, Dar RA, Sheikh RA, Salroo NA, Matoo AR, Wani SH. Comparison of early and delayed laparoscopic cholecystectomy for acute cholecystitis: experience from a single center. North American journal of medical sciences. 2013 Jul;5(7):414.
3. Mou D, Tesfasilassie T, Hirji S, Ashley SW. Advances in the management of acute cholecystitis. Annals of gastroenterological surgery. 2019 May;3(3):247-53.
4. Lee SO, Yim SK. Management of acute cholecystitis. The Korean Journal of Gastroenterology. 2018 May 25;71(5):264-8.
5. Uchiyama K, Onishi H, Tani M, Kinoshita H, Ueno M, Yamaue H. Timing of laparoscopic cholecystectomy for acute cholecystitis with cholecystolithiasis. Hepato-gastroenterology. 2004 Mar 1;51(56):346-8.
6. Agrawal R, Sood KC, Agarwal B. Evaluation of early versus delayed laparoscopic cholecystectomy in acute cholecystitis. Surgery research and practice. 2015 Feb 3;2015.
7. Heller GZ, Manuguerra M, Chow R. How to analyze the Visual Analogue Scale: Myths, truths and clinical relevance. Scandinavian journal of pain. 2016 Oct 1;13(1):67-75.
8. Matsui Y, Hirooka S, Kotsuka M, Yamaki S, Yamamoto T, Kosaka H, Satoi S. Use of a piece of free omentum to prevent bile leakage after subtotal cholecystectomy. Surgery. 2018 Sep 1;164(3):419-23.
9. Goh JC, Tan JK, Lim JW, Shridhar IG, Madhavan K, Kow AW. Laparoscopic cholecystectomy for acute cholecystitis: an analysis of early versus delayed cholecystectomy and predictive factors for conversion. Minerva Chirurgica. 2017 Jun 16;72(6):455-63.
10. Khalid S, Iqbal Z, Bhatti AA. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Journal of Ayub Medical College Abbottabad. 2017 Oct 15;29(4):570-3.
11. Skouras C, Jarral O, Deshpande R, Zografos G, Habib N, Zacharakis E. Is early laparoscopic cholecystectomy for acute cholecystitis preferable to delayed surgery?: best evidence topic (BET). International Journal of Surgery. 2012 Jan 1;10(5):250-8.
12. Borzellino G, Sauerland S, Minicozzi AM, Verlato G, Di Pietrantonj C, De Manzoni G, Cordiano C. Laparoscopic cholecystectomy for severe acute cholecystitis. A meta-analysis of results. Surgical endoscopy. 2008 Jan;22(1):8-15.
13. Verma S, Agarwal PN, Bali RS, Singh R, Talwar N. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a prospective randomized trial. International Scholarly Research Notices. 2013;2013.
14. Arafa AS, Khairy MM, Amin MF. Emergency versus delayed laparoscopic cholecystectomy for acute cholecystitis. The Egyptian Journal of Surgery. 2019 Apr 1;38(2):171-9.

15. Cho KS, Baek SY, Kang BC, Choi HY, Han HS. Evaluation of preoperative sonography in acute cholecystitis to predict technical difficulties during laparoscopic cholecystectomy. Journal of Clinical Ultrasound. 2004 Mar;32(3):115-22.
16. Chandler CF, Lane JS, Ferguson P, Thompson JE, Ashley SW. Prospective evaluation of early versus delayed laparoscopic cholecystectomy for treatment of acute cholecystitis. The American Surgeon. 2000 Sep 1;66(9):896.
17. Roulin D, Saadi A, Di Mare L, Demartines N, Halkic N. Early versus delayed cholecystectomy for acute cholecystitis, are the 72 hours still the rule?. Annals of surgery. 2016 Nov 1;264(5):717-22.
18. Macafee DA, Humes DJ, Bouliotis G, Beckingham IJ, Whynes DK, Lobo DN. Prospective randomized trial using cost–utility analysis of early versus delayed laparoscopic cholecystectomy for acute gallbladder disease. Journal of British Surgery. 2009 Sep;96(9):1031-40.