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Effectiveness of Early Versus Delayed Laparoscopic Intervention in Bile Duct Injury Post–Cholecystectomy

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ABSTRACT

This was a study aimed at comparing the results of the early and delayed laparoscopic intervention on patients who had the bile duct damaged during the process of removing the gall bladder (cholecystectomy). The bile duct injury is an alarming evil and the restoration of the duct sometimes may impair the recovery. The research design was in the form of a quant study. In the research, 120 patients with bile duct injuries were included. Their age, gender, comorbidities, the severity of the injury, clinical stability, and surgery outcomes in terms of biliary leak, bile duct strictures, and hospital readmission were recorded. The analysis has been done through correlation, regression and chi-square tests so as to determine how timing and surgical costs and clinical outcomes relate with each other. The results based on the findings were that there were lesser complications and outcomes in early laparoscopic intervention. The regression analysis produced the result that early surgery positively influenced clinical recovery. Correlation further established that timing of surgery has a negative relationship as far as complications are concerned in other words the earlier surgery is done the fewer are the chances of leakage and strictures and readmission. The chi-square test revealed the significance of the relationships between increased injuries severity, comorbidities and the status of clinical stability to the time during which surgery was conducted. These facts support the suggestion that early laparoscopy repair is safer and more effective with regard to the management of the bile duct damage. The paper comes to the conclusion of early surgical intervention that remains an option should be preferred as long as it is clinically feasible.

INTRODUCTION

A cholecystectomy is the surgery to remove the gallbladder and is regularly done to patients of gallstones or a person who is infected by the gallbladder. The small-incisions laparoscopic innovation with a camera has since become the most favored one all over because it helps in rapid healing and shorter time the patient spends in the hospital[1]. However, this management could lead to development of a bile duct injury (BDI) which is very crucial. Despite the fact that BDIs represent a minority, as the situations when the condition takes place in laparoscopic procedures lie in the range between 0.3 and 0.6 percent, the condition is capable of causing long-term medical complications in the form of infections, liver pain, and liver damage [2].The usual causes of the BDIs are usually when there is a surgeon making a mistake and misidentifying one structure with another as well as, this is normally the common cause when swelling or bleeding occurs or when the structure of the anatomy does not match what it is that the surgeon anticipates[3] .Other more serious problems that might occur as a result of the injury include constriction of bile ducts (strictures), infections of the bile ducts (cholangitis), and liver injury when timely action is not taken.

The best timing of bile duct repair is one of the controversies when it comes to the management of bile duct injuries. Other professionals are of the view that laparoscopic surgery that is scheduled within 72 hours to two weeks will make the course of healing and reduction of complications a little faster[4]. Early stage repair can avoid infections and stop further deterioration of anything before its escalation. On the other hand, however, operative intervention at an early stage can be quite

demanding. The region may remain tender or still swollen thus the procedure may be even dangerous[5].Some even recommend 6 weeks or more in order to reduce the inflammation. This can facilitate the view of the surgeon and he or she can manipulate the tissues adequately[6]. Nevertheless, postponing leads to emergence of new complications, abscesses, leak of fluid, or development of scar tissue, which may render subsequent surgery impractical, and dangerous [7].It is necessary to operate early or late based on so many factors: skills of the surgeon, availability of the resources of the hospital, feeling of the patient. Scientists are yet to discover the time when the overall results will be optimal [8].

Medical findings have revealed that early repair not only can be highly successful but when those skilled in this surgery operate in giant hospitals. Such repairs tend to result in reduced lengths of stay in a hospital, limited repeated surgery and improved long-term bile duct functioning [9].Still, there are also studies, which oppose early surgery to unstable ones or when the swelling and damage makes the operation more hazardous. To these patients, waiting can minimize the risks [10].Due to the variation in the approach of surgeons and hospitals as well as due to variation in the symptoms of patients, the results differ. The reason why researchers feel that we require robust clear studies of early and delayed surgery is because of this. These studies ought to review such issues as the duration of the surgery, frequency of the problems, and the effectiveness of the bile duct post-surgery. This will assist the doctors in selecting the most appropriate approach to the individual patients[11].

Laparoscopic cholecystectomy is a severe issue when it is accompanied by bile duct injury (BDI). Lots of scholars have also analyzed its consequences and causes. Majority of the injury occurs either at the time when the anatomy is not obvious or when the surgeon identifies the wrong bile duct because of inflammation, bleeding or malformed shape [12].Research indicates that it is possible to end up in such errors even on the part of the skilled surgeons, especially in the tough cases. Risk is more with emergency surgery or inflammation of the gallbladder being too high [13].It is also stated in the research that early detection of BDI enhances a successful treatment [14].In the event that the injury is not detected in the operation, the patient can go back later to present with fever, pain or leakage of bile into the abdominal cavity. This slowness in the catching of the diagnosis can be even more catastrophic. Accordingly, recent research works are concerned with enhancing the intraoperative modalities to counter the injuries, like the intraoperative cholangiography use or the near-infrared imaging [15].The methods help the surgeon see the bile duct when the surgery is conducted. The purpose of these studies is to minimize the BDIs and enhance patient safety in the process of laparoscopic cholecystectomy[16].

The present literature is comparing the result of an early operative repair and a delayed one. To give an example, its study found out that patients who underwent early repair were given fewer complications and hospital stay time as compared to patients who underwent a delayed procedure [17],among Booij et al. Nonetheless, in a different research the late surgery has been shown to add to extended term bile duct functionality and required less second/re-do surgeries [18].All these findings suggest that there is no one-solution. The success of such reparation usually depends on the hours that it takes, the type of injury and the skills of the surgical team. Some of them have suggested application of that strategy in that, whether a patient is being treated early or delayed should be based on the clinical stability of the patient and whether he/she was infected or not, as well as accessibility of special care [19].This is an indication of treatment planning sensitivity. There are new guidelines that are promoting this personalized care. It may also help in the identification of the best time to repair since it knows the state of the patient and has an experience on the surgeon.

Laparoscopic cholecystectomy Recent reviews of bile duct injury in laparoscopic cholecystectomy have created more emphasis in the field of predictive factors, and determination of guidelines to regulate its most successful management. In a study conducted by [20],it has been noted that successful repair of the bile duct is very much higher when procedures are done in high-volume centers with experts of hepatobiliary specialties and most likely when the injury is detected [21].This is in support of the fact that timing and surgical expertise are critical aspects in the determinants of outcomes. Also, other improvements in the imaging technology like direct placement of the ultrasound and fluorescence imaging can be used to conduct surgeries by identifying ducts with increased accuracy in surgery, thus, preventing possible mistaking of biliary anatomy [22].According to some research, these are technologies, which need to become the norm in high-risk and emergency surgery. Moreover, retrospective studies have revealed that the risks associated with injuries diagnosed and treated during the very first surgery are more successful than the ones found and treated at undersized facilities late or misdiagnosed [23].

The second prominent section of the literature is in the findings of psychological and quality-Of-Life post bile duct injury. [24].indicated that a portion of the patients with bile duct injuries had a more significant level of anxiety in the post-surgery stage, physical pain, and decreased daily functioning compared to patients who had undertaken cholecystectomy without complications [25].Re-operations and frequent hospital visits were also a common phenomenon that besides being physically straining, also set an emotional and financial toll on both the patients and their relatives due to the failure of the early stage of management or delay in the diagnosis procedure. In addition, there are researches claiming that incomplete repair of procedure, in particular those performed in well-organized hospitals will lead to a quicker recovery to normal activities, as well as satisfaction of the long-term patient [26].Delays in repair-as late as and including Technical Successful healing can be noted in terms of chronic sequelae of bile strictures or recurrent cholangitis. Findings of this kind emphasize how the timing of surgery repair is significant (not just in terms of clinical recovery but also in the long-run health and psychological well-being).

Research Objectives

1. To explore the association between the timing of laparoscopic intervention and the clinical outcomes in patients with bile duct injury following cholecystectomy.
2. To assess how early versus delayed surgical approaches influence the likelihood of postoperative complications such as biliary leakage, strictures, and hospital readmissions.
3. To examine whether patient-related and injury-related factors significantly influence the choice and effectiveness of intervention timing in bile duct injury management.

Life-altering and severe bile duct injury (BDI) is an adverse complication that can occur during one of the most commonly done types of surgery offered to individuals with the diagnosis of gallbladder diseases, in the example of laparoscopic cholecystectomy. The frequency of BDI is quite low, yet the outcomes can be catastrophic and lead to the morbidity, recidivism of the hospitalization, and even the death. Possibly one of the most debatable medical questions having been discussed, is the prediction of proposing surgery fix, either early intervention is more constructive or the delay of it is more safe and more steady surgical arena. Lack of any agreement among surgeons and the variability in clinical performances has created ambiguity into handling of patients and has contributed to inconsistency of outcomes during the postoperative interval. This study contributes to a great extent closing this gap as it determines the rates of success and complicacies in patients with BDI in relation to prompt intervention or lost intervention using laparoscopy. Evaluation of the patient outcomes, as per the time of intervention and others, this study will also offer the surgeons evidence-based available recommendation and also minimize the post-operation problems and maximize the long-term recovery process.

MATERIALS AND METHODS

The study was quantitative in design, and it was selected because, through this design, numerical data can be gathered and analyzed. The aim of applying a quantitative method was to quantify the effectiveness of early and delayed laparoscopic treatment in biliary epithelium accident of cholecystectomy in an understandable and objective way. The study design was appropriate to compare the two groups after their results were measured using statistics. Information was obtained on the basis of medical records, clinical reports and follow-up of patients. The variables recorded and analyzed included the recovery time, hospital stay, complication and overall outcomes. Application of a quantitative approach helped to make comparisons and correct conclusions about the potential differences between the early and delayed intervention groups. This was also assistive in being consistent and minimizing bias under research.

The Patients involved in this research study were the patients who had experienced bile duct injury as a result of the performed cholecystectomy procedure. These patients were located in some of the tertiary care hospitals where patients were subjected to early and delayed laparoscopic intervention. The target population was also chosen depending on the fact that they were at risk of the same type of complication and underwent the same type of surgery and were, therefore, well suited in comparison to each other. The people who took part in the research were all adults regardless of when they were treated in the damage of the bile duct. This was to closely monitor the people within a given duration and in a manner that will ensure gathering of authentic information. A report of medical histories and surgical outcome was conducted and only those who met inclusion criteria were taken into account. The study sample was needed in the investigation of the effect of the timeliness on the outcomes of recovery and surgery.

In this study, a sample size of 120 patients was used that was deemed to be enough in carrying out statistical analysis and arriving to meaningful conclusions. This figure was chosen following an evaluation process of the patient records and making sure that sufficient cases existed between early and delayed intervention groups. The sample was split into two groups, those that received an early laparoscopic treatment and those that received delayed treatment. Similar conditions were provided in order to obtain an unbiased result in each of the groups. The sample itself was not too big and made it possible to compare the two methods of treatment in great detail. Ethical consent of the patients was obtained and confidentiality was ensured. The sample that was chosen was a big sample that demonstrated trends and patterns in the recovery and complications that could assist future surgical practices.

The research method in this study was purposive sampling, which implies that the selection of patients was made according to the criteria on a research topic. Patients were only included when actually having an injury of the bile duct after a cholecystectomy with subsequent laparoscopic follow-up, either soon after or with a delay. This was done as it enabled the researcher to consider only the most pertinent cases. The aim here was to see to it that the patients worked upon were directly attached to the research objectives. Purposive sampling was significant in keeping the study focused and also in narrowing down others unnecessary variations. It also assisted in amassing a high quality and rich amount of information about a population that was directly influenced by the problem that was been studied. The method worked well to make sure that the findings spoke about the actual effects that the right time of surgical action could have.

RESULTS

Table 1

Linear Regression Analysis Predicting Clinical Outcome from Timing of Laparoscopic Intervention

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE	Beta		
(Constant)	1.735	0.289	–	6.006	0.000
Timing of Laparoscopic Intervention	0.457	0.073	0.543	6.260	0.000

Based on the linear regression analysis, the laparoscopic intervention time would be one of the prognosis factors of the clinically related outcomes of patients with the bile duct injury following the cholecystectomy. Un-

standardized coefficient (B = 0.457) can tell us that when we assume a 1 unit change in the timing (i.e. being released out of late to early intervention) that there will be a difference (i.e. 0.457) in the measure of the clinical outcome score in the other scenario with all other factors held at their controls. The standardized coefficient (Beta = 0.543) informs that the correlation between the time of intervention and clinical outcomes turns out to be medium/high positive. The value of t = 6.260 and p - value = 0.000 indicates that this is a significant effect between the levels of 0.01. It suggests that the previous laparoscopic procedure is properly associated with the more favorable clinical outcome that involves the shorter recovery along with the decreased number of complications and related positive changes in the functioning of the bile duct. The model emphasizes the necessity of the appropriate surgical treatment which is the essential parameter that assists in the improvement of the prognosis of the patient with the injured bile duct.

Table 2

Correlation Analysis Table

Variables	Timing of Surgery	Biliary Leakage	Bile Duct Strictures	Hospital Readmissions
Timing of Surgery	1.000	-0.486	-0.502	-0.468
Biliary Leakage	-0.486	1.000	0.564	0.537
Bile Duct Strictures	-0.502	0.564	1.000	0.551
Hospital Readmissions	-0.468	0.537	0.551	1.000

The correlation analysis indicates that time of surgery and various types of postoperative complications related to bile duct injured patients, have high degree of correlation. The timing of surgery was determined to be related in a moderate negative way with biliary leakage (r = -0.486), bile duct strictures (r = -0.502) and hospital readmission (r = -0.468) indicating that, the earlier the surgery is done, the lesser the chances of getting such complications. It means that on-time laparoscopic repair will contribute to the better post-intervention outcomes in regard to the decreased risk of leakages, strictures, and readmission. In addition, the complications had a positive relationship among themselves in all, biliary leakage to the bile duct strictures (r = 0.564) and to readmission (r = 0.537) and bile duct strictures too were found to have a positive relationship with readmission (r = 0.551).

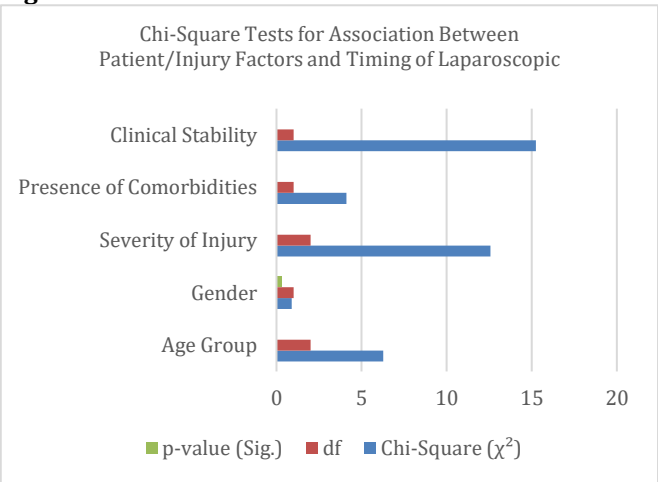
Table 3

Chi-Square Tests

Variable	Category	Chi-Square (χ^2)	df	p-value (Sig.)
Age Group	<40, 40–60, >60	6.273	2	0.043*
Gender	Male, Female	0.892	1	0.345
Severity of Injury	Minor, Moderate, Severe	12.581	2	0.002**
Presence of Comorbidities	Yes, No	4.116	1	0.042*
Clinical Stability	Stable, Unstable	15.234	1	0.000**

The chi-square test analyzed the existence of links between patient and injury factors and how laparoscopic intervention was done and performed as a resultant of bile duct injury. The findings showed that the predictors or determinants of time of surgery were all statistically significant, age group (X 2 = 6.273, p = 0.043), severity of the injury (X 2 = 12.581, p= 0.002), comorbidities (X 2 = 4.116, p = 0.042) and clinical stability (X 2 = 15.234, p= 0.000). This indicates that younger patients, less severe injured patients, patients without comorbid conditions, and clinically stable patients have higher chance of being subjected to early laparoscopic intervention. On the other hand, gender (x 2 = 0.892, p = 0.345) was not significantly related and this brings out the idea that surgical timing decision does not depend on the sex of the patient. The results point out the notion that clinical judgment on when to intervene is informed mostly by the medical state of the patient, type and nature of the injury, but not demographic aspects such as gender. Such combinations may be significant to comprehend to enhance Operational decision-making and personalization of surgical treatment plans, and bile duct injury management.

Figure 1



DISCUSSION

This investigation compared early laparoscopic intervention and delayed laparoscopic intervention in terms of probability of success and successful full recovery of biliary injury that had occurred in the course of cholecystectomy. Based on the regression and correlation analysis, it was observed that the patients that got early surgery had a far much better clinical status among the patients who got late intervention. These findings add to the same conclusions drawn above regarding the benefits of the surgery carried out at an early-period to restore what would cause minor losses in terms of tissue, the establishment of the lower risk of the infection, and elevated rates of recovery [27].It can be attributed to more favorable outcome since the early laparoscopic treatment does not involve further progress of the injury and pain of the patient. Utilizing the results of the regression model, the viable importance of timing surgery predictiveness was achieved, which means, the sooner the surgery repair is conducted the better the outcome of the patient is[28]. These outcomes indicate that time is among the important factors in the management of the bile duct injuries, and the aspect of early intervention is one that is supposed to be taken into consideration, such that is to be recommended to the clinician in the scenarios where it can be established and the condition does not preclude it[29].

Also, the clinically significant associations between some of the patient-related factors and the timing of laparoscopic intervention were identified with the help of

the chi-square analysis. As an illustration, clinical stability, age group, presence or absence of comorbidities and degree of injury had a bearing on whether the surgery would be performed early, or delayed. There is also an increased likelihood of early surgery among patients who were clinically stable and had moderate injuries[30]. This is an indication that surgeons can be more assured when operating on patients with lesser chances of surgery. Conversely the patients with unstable vitals or severe injuries were more likely to receive an intervention late which could be connected to the necessity to stabilize them prior to trying to surgically help. The amount to delay could also be dictated by the availability of surgical help, the experience of the surgeon and the very condition of the patient as a whole [31].This implies that real world choice is never straight forward since there is never only one factor upon which it is made. Such are the factors that should be taken into consideration in the treatment of bile duct injuries.

Correlation matrix also supported this point as timing of surgery has an impact on management of bile duct injury. There were high negative correlations with post-surgical risks such as leakage, stricture of bile ducts and readmission. Such results correspond to previous studies, as they have demonstrated that early repair is likely to narrow down the destruction left by the initial trauma and minimize adverse effects in the long run [32].By considering such associations, surgeons can achieve improvement in their time decisions. Moreover, there is also the correlation of postoperative complications which demonstrate an event can cause another one. Leakage of biliary as one of the possible complications may lead to infections and, finally, lead to the increase of hospital readmissions[33]. This underscores the power of the proactive model on intervention and taking into account not only the injury at hand but the potential form of a chain reaction of complications that can be ensuing. Early work to deal with the injury provides a hope to avoid this chain of adverse events and be of assistance in recovery of the patient in the long term [34]This points to the necessity of individual treatment plan. Although this is a research that may be quite effective in providing us with the valuable information, it needs to be said that it was focused on the study sample of 120 individuals, and hence, there could be the absence of generalization. Prospective studies on a larger scale will come in handy to reconfirm these study results and consequently arrive at clinical routine in treating injuries of the bile duct[35].

CONCLUSION

The current research has saw that early conversion surgery using laparoscopy after bile duct injury during cholecystectomy result in improved clinical outcomes than when surgery is delayed. Patients with early surgery had reduced cases of complications such as bile leakage, bile strictures and readmissions. The findings also indicated that clinical stability and other health issues including age of the patient affected when surgeries are done. An early intervention was more likely to be used in stable with moderate injuries much more flowing to assist recovery. This relationship is further justified by the fact that the correlation and chi-square tests both corroborated the fact of strong correlation between timing of surgery and outcomes of patients. The findings serve as evidence of the necessity to act as fast as it is possible and to resort to the early surgical repair in order to minimize the development of additional health-related issues and encourage quicker recovery. Nevertheless, not every patient will be a good candidate to undergo early surgery; therefore, medical judgment must not be completely disregarded. In general, the present study indicates that when approached with the appropriate evaluation and planning, early intervention can enhance patient safety, hospitals stays, and disease load of long-term complications.

REFERENCES

1. Omar, M.A., et al., Post-cholecystectomy major bile duct injury: ideal time to repair based on a multicentre randomized controlled trial with promising results. International Journal of Surgery, 2023. 109(5): p. 1208-1221. https://doi.org/10.1097/js9.0000000000000403
2. Felekouras, E., et al., Early or delayed intervention for bile duct injuries following laparoscopic cholecystectomy? A dilemma looking for an answer. Gastroenterology research and practice, 2015. 2015(1): p. 104235. https://doi.org/10.1155/2015/104235
3. Wang, X., et al., Early versus delayed surgical repair and referral for patients with bile duct injury: a systematic review and meta-analysis. Annals of surgery, 2020. 271(3): p. 449-459. https://doi.org/10.1097/sla.0000000000003448
4. Kambakamba, P., et al., Timing of surgical repair of bile duct injuries after laparoscopic cholecystectomy: A systematic review. World Journal of Hepatology, 2022. 14(2): p. 442. https://doi.org/10.4254/wjh.v14.i2.442
5. Perera, M.T.P., et al., Specialist early and immediate repair of post-laparoscopic cholecystectomy bile duct injuries is associated with an improved long-term outcome. Annals of surgery, 2011. 253(3): p. 553-560. https://doi.org/10.1097/sla.0b013e318208fad3
6. Cao, A.M., G.D. Eslick, and M.R. Cox, Early cholecystectomy is superior to delayed cholecystectomy for acute cholecystitis: a meta-analysis. Journal of Gastrointestinal Surgery, 2015. 19(5): p. 848-857. https://doi.org/10.1007/s11605-015-2747-x
7. Wu, X.-D., et al., Meta-analysis comparing early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Journal of British Surgery, 2015. 102(11): p. 1302-1313. https://doi.org/10.1002/bjs.9886
8. Battal, M., et al., Early surgical repair of bile duct injuries following laparoscopic cholecystectomy: the sooner the better. The Surgery Journal, 2019. 5(04): p. e154-e158. https://doi.org/10.1055/s-0039-1697633
9. Lyu, Y., et al., Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: an up-to-date meta-analysis of randomized controlled trials. Surgical endoscopy, 2018. 32(12): p. 4728-4741. https://doi.org/10.1007/s00464-018-6400-0
10. Gurusamy, K.S., M. Nagendran, and B.R. Davidson, Early versus delayed laparoscopic cholecystectomy for acute gallstone pancreatitis. Cochrane Database of Systematic Reviews, 2013(9). https://doi.org/10.1002/14651858.cd010326.pub2

11. De Santibañes, E., et al., Bile duct injuries: management of late complications. Surgical Endoscopy And Other Interventional Techniques, 2006. 20(11): p. 1648-1653.
12. Dageforde, L.A., et al., A cost-effectiveness analysis of early vs late reconstruction of iatrogenic bile duct injuries. Journal of the American College of Surgeons, 2012. 214(6): p. 919-927. https://doi.org/10.1016/j.jamcollsurg.2012.01.054
13. Zidan, M.H.E.-D., et al., Post-cholecystectomy bile duct injuries: a retrospective cohort study. BMC surgery, 2024. 24(1): p. 8.
14. Rauws, E. and D. Gouma, Endoscopic and surgical management of bile duct injury after laparoscopic cholecystectomy. Best Practice & Research Clinical Gastroenterology, 2004. 18(5): p. 829-846. https://doi.org/10.1016/j.bpg.2004.05.003
15. Booij, K.A., et al., Morbidity and mortality after minor bile duct injury following laparoscopic cholecystectomy. Endoscopy, 2015. 47(01): p. 40-46.
16. Siiki, A., et al., Initial management of suspected biliary injury after laparoscopic cholecystectomy. World journal of gastrointestinal surgery, 2023. 15(4): p. 592. https://doi.org/10.4240/wjgs.v15.i4.592
17. Machado, N.O., Biliary complications post laparoscopic cholecystectomy: mechanism, preventive measures, and approach to management: a review. Diagnostic and therapeutic endoscopy, 2011. 2011(1): p. 967017.
18. Nebiker, C.A., et al., Early versus delayed cholecystectomy in patients with biliary acute pancreatitis. Surgery, 2009. 145(3): p. 260-264. https://doi.org/10.1016/j.surg.2008.10.012
19. Eikermann, M., et al., Prevention and treatment of bile duct injuries during laparoscopic cholecystectomy: the clinical practice guidelines of the European Association for Endoscopic Surgery (EAES). Surgical endoscopy, 2012. 26(11): p. 3003-3039.
20. El Nakeeb, A., et al., Impact of referral pattern and timing of repair on surgical outcome after reconstruction of post-cholecystectomy bile duct injury: a multicenter study. Hepatobiliary & Pancreatic Diseases International, 2021. 20(1): p. 53-60. https://doi.org/10.1016/j.hbpd.2020.10.001
21. Emara, M.H., et al., Post-cholecystectomy iatrogenic bile duct injuries: Emerging role for endoscopic management. World Journal of Gastrointestinal Surgery, 2023. 15(12): p. 2709.
22. Gad, E.H., et al., Surgical management of laparoscopic cholecystectomy (LC) related major bile duct injuries; predictors of short-and long-term outcomes in a tertiary Egyptian center-a retrospective cohort study. Annals of medicine and surgery, 2018. 36: p. 219-230. https://doi.org/10.1016/j.amsu.2018.11.006
23. Martin, D., et al., Bile duct injuries after laparoscopic cholecystectomy: 11-year experience in a tertiary center. Bioscience trends, 2016. 10(3): p. 197-201. https://doi.org/10.5582/bst.2016.01065
24. Gul, R., et al., Comparison of early and delayed laparoscopic cholecystectomy for acute cholecystitis: experience from a single center. North American journal of medical sciences, 2013. 5(7): p. 414. https://doi.org/10.4103/1947-2714.115783
25. Barbier, L., et al., Long-term consequences of bile duct injury after cholecystectomy. Journal of visceral surgery, 2014. 151(4): p. 269-279. https://doi.org/10.1016/j.jviscsurg.2014.05.006
26. Kerimoğlu, R.S., et al., Management of laparoscopic cholecystectomy-related bile duct injuries: A tertiary center experience. Archives of Iranian Medicine, 2017. 20(8): p. 0.
27. Gallagher, T., M. Kelly, and E. Hoti, Meta-analysis of the cost-effectiveness of early versus delayed cholecystectomy for acute cholecystitis. BJS open, 2019. 3(2): p. 146-152. https://doi.org/10.1002/bjs5.50120
28. Moody, N., et al., Meta-analysis of randomized clinical trials of early versus delayed cholecystectomy for mild gallstone pancreatitis. Journal of British Surgery, 2019. 106(11): p. 1442-1451. https://doi.org/10.1002/bjs.11221
29. Jee, S.L., et al., Outcomes of early versus delayed cholecystectomy in patients with mild to moderate acute biliary pancreatitis: a randomized prospective study. Asian journal of surgery, 2018. 41(1): p. 47-54. https://doi.org/10.1016/j.asjsur.2016.07.010
30. Brunt, L.M., et al., Safe cholecystectomy multi-society practice guideline and state-of-the-art consensus conference on prevention of bile duct injury during cholecystectomy. Surgical endoscopy, 2020. 34(7): p. 2827-2855. https://doi.org/10.1097/sla.0000000000004396
31. Nuzzo, G., et al., Advantages of multidisciplinary management of bile duct injuries occurring during cholecystectomy. The American journal of surgery, 2008. 195(6): p. 763-769. https://doi.org/10.1016/j.amjsurg.2007.05.046
32. Gupta, V. and S. Jayaraman, Role for laparoscopy in the management of bile duct injuries. Canadian Journal of Surgery, 2017. 60(5): p. 300. https://doi.org/10.1503/cjs.003317
33. Yeh, T.-S., et al., A multidisciplinary approach to major bile duct injury following laparoscopic cholecystectomy. JSLS: Journal of the Society of Laparoendoscopic Surgeons, 1998. 2(2): p. 147.
34. Lindemann, J.D., The surgical management and prevention of laparoscopic cholecystectomy associated bile duct injuries. 2020. https://doi.org/10.17159/2078-5151/2020/v58n1a3185
35. Kapoor, V.K., Bile duct injury repair——earlier is not better. Frontiers of medicine, 2015. 9(4): p. 508-511 https://doi.org/10.1007/s11684-015-0418-7