Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/22501
DOI URL: http://dx.doi.org/10.21474/IJAR01/22501

RESEARCH ARTICLE

MANAGEMENT AND OUTCOMES OF IATROGENIC BILE DUCT INJURIES POST-CHOLECYSTECTOMY: A TERTIARY HOSPITAL EXPERIENCE IN RETROSPECTIVE REVIEW

Ayman H. Al Gadaa[1] and Abdullah S. Alayaaf[2]

1. Surgery Department, College of Medicine, Zagazig University and Qassim University.
2. Surgery Department, College of Medicine, Qassim University.

Manuscript Info

Manuscript History
Received: 16 October 2025
Final Accepted: 18 November 2025
Published: December 2025

Abstract

Background and Aim: Bile duct injuries (BDI) remain one of the most complex
problems in hepatobiliary surgery.Our aim is to assess iatrogenic BDI complicating laparoscopic and open cholecystectomy and to highlight the efficiency of BDI treatment and repair modalities of therapy.

Methods: This is a retrospective study from July 2020 to July 2025. 159 patients with BDI occurring during open and laparoscopic cholecystecto my were included in this study. 138 patients had major BDIs and 21 had minor BDI of short- or long-term failures of repair. 132 of them (83%) were referred to Zagazig University Hospitals after cholecystectomy had been done for them in different institutions, while the other 27 patients (17%) were operated on in Zagazig University Hospitals.

Results: Of 138 patients with major BDI, surgical repair was performed in 93 of 138 (67.4%). Postsurgical morbidity occurred in 12 patients (12 of 93 = 12.9%), and there was one postsurgical death among the 93 surgically repaired patients. The rate of excellent or good results after surgical repair was 80.6% (75 of 93 patients), and this increased to 87.1% (81 of 93 patients) by continuing treatment with stenting in postsurgical strictures. Out of the 45 patients treated by endoscopic or percutaneous stenting, 36 (80%) had an excellent or good outcome. Patients with minor BDIs underwent various combinations of surgical and endoscopic or percutaneous treatments, always with good results.

Conclusion: The choice of intervention is highly influenced by local expertise and should optimally be determined in a multidisciplinary fashion.

"© 2025 by the Author(s). Published by IJAR under CC BY 4.0. Unrestricted use allowed with credit to the author."

Corresponding Author:-Ayman H. AlGadaa
Address:-Surgery Department, College Of Medicine, Zagazig University and Qassim University.

Introduction:-

Literature review:

The laparoscopic approach remains the standard surgical treatment forcholecystolithiasis despite varying patient factors such as body habitus, surgical history, anatomical variations, and cholecystectomy difficulty grade, which may pose challenges to perform a laparoscopic total cholecystectomy (Chathurika S. D. et.al., 2024).
Bile duct injury (BDI) is a dangerous complication of cholecystectomy, with significant postoperative sequelae for the patient in terms of morbidity, mortality, and long-term quality of life(de'Angelis et al., 2021).
Iatrogenic bile duct injury (BDI) during laparoscopic cholecystectomy continues to be an entity of great clinical relevance in surgery, both because of its prevalence and the large number of complications associated with its definitive treatment (Cohen et. al., 2019 &Lopez-Lopez et. al., 2022).

Past studies stated that the rate of BDI has steadily declined, it remains significantly higher with laparoscopic cholecystectomy (LC) (0.4-0.6%) than open cholecystectomy (0.1-0.2%) [Lau WY and Lai (2007),Kurumi et.al., (2000),Misra et. al., (2004)&Mercado (2006)].However, Later studies found a considerable decline in the incidence of BDIs after LC, to around 0.2%0.4%, which is comparable to the rate observed with open cholecystectomy (Halbert et. al., 2016& Endo Y, et al., 2023).

The injury to the common bile duct during laparoscopic cholecystectomy is not a result of the practice below the standard, but an inherent risk of the operation (Fischer. 2009).
Prevention of BDI remains the most important aspect in the application of the surgeon's learning curve (Zidan et. al., 2024).

The World Society of Emergency Surgery (WSES) recommended in 2020 the use of a "Bailout" procedure when the anatomy is unclear in order to avoid BDI. While conversion to open cholecystectomy may improve visibility, there is inadequate evidence to substantiate that conversion reduces the incidence of BDI (de'Angelis et al., 2021). The timeliness of BDI identification is the most essential factor in managing BDI, which has a big effect on the patients' health, well-being, and death rate. (David et. al., 2016, Fletcher et.al., 2020 &Popa et. al., 2023).

Identifying the location of ductal injury and the availability of healthy proximal duct is critical; successful repair requires healthy, non-ischemic duct without tension or loss of length. Also, the mechanism and type of injury play critical roles in patient presentation and surgical management (Haney and Pappas 2008).The World Journal of Emergency Surgery guidelines from 2020 recommend Roux-en-Y hepatico-jejunostomy for all MBDI post LC (de'Angelis et. al., 2021).

Endoscopic procedures have gained increasing potential as the treatment of choice in the management of postoperative injuries to the bile duct are more likely to happen in people who have peripheral bile duct leaks or strictures. So, it should be the first treatment option for these patients. (Weber et. al., 2009 &Carannante et. al., 2023).

While endoscopic approaches offer an alternative, they may not be a viable option in most cases due to altered bowel anatomy after surgery (Kim et. al., 2024). Consequently, percutaneous treatment via the transhepatic route has been frequently employed as a primary treatment strategy (DePietro et. al., 2015).For patients with strictures in their bile ducts, especially short ones after laparoscopic cholecystectomy, percutaneous balloon dilatation and stenting can be a good option. Anastomotic strictures yield suboptimal outcomes when addressed through percutaneous interventional radiologic techniques (PIRT), achieving success in approximately 40% of patients. (LA MEDINAet. al., 2008).

A multidisciplinary approach was crucial during various stages of BDI treatment: initial assessment, management of secondary complications, resolution of sepsis, percutaneous stenting prior to surgical repair, dilation of strictures post-repair, final treatment in patients not surgically repaired, and follow-up care.(Nuzzo et. al., 2008). This study was performed to assess iatrogenic BDI complicating cholecystectomy and to highlight the efficiency of BDI treatment and repair by multidisciplinary therapy

Patients and Methods:

This is a retrospective study. From July 2020 to July 2025, 159 patients with BDI occurring during laparoscopic and open cholecystectomy were treated at Surgery department, Zagazig University Hospitals. 132 of them (83%) were referred to our hospital after cholecystectomy had been done for them in different institutions, while the other 27 patients (17%) were operated on in Zagazig University Hospitals.51 patients (32%) were males, and 108 patients (68%) were females, with mean age of 48.6±11.3 years (mean ± SD).

The hospital records of the patients were reviewed for: presenting history as well as type of operation (laparoscopic or open cholecystectomy), the nature of the BDI (transection, partial laceration and strictures of the CBD, major ducts at the biliary confluence or minor lesions), surgical findings at cholecystectomy, time of injury diagnosis, initial management, results of diagnostic and therapeutic procedures performed before referral, laboratory results, imaging studies, time of referral, subsequent management and complications.

The outcome was also recorded, and the long-term results was assessed by regular review in the out-patient clinic, together with laboratory tests, liver ultrasound and magnetic resonance cholangiography, if necessary, over a median follow-up period of 21 months (range, 3-36 months).Abdominal US were carried out in all patients. All patients also underwent ERC or MRC or PTC to delineate the type and level of injury.

Injuries were classified according to their location on the basis of modified Bismuth classification (Bismuth &Majino 2001): type I = distance from biliary confluence ≥2 cm, type II = distance from confluence <2 cm, type III = ceiling of confluence intact ' with right and left ductal system still communicating', type IV = ceiling of confluence destroyed 'with right and left ductal system separated', and type V = strictures of an isolated right branch associated with types I, II, or III. An isolated injury to the right hepatic duct was classified as Bismuth type VI.
Finally, ERCP sphincterotomy with stent placement was applied to reduce or eliminate bile leakage in distal lesions and percutaneous transhepatic stents was applied immediately before surgery in patientswith high-level injuries.

The patient outcomes were graded as excellent (asymptomatic and normal serum liver function tests), good (asymptomatic and mildly increased level of alkaline phosphatase and gamma-glutamyl transferase or patients with normal liver function tests and transient symptoms), fair (symptomatic and abnormal liver function tests), and poor (patients with recurrent stricture requiring further treatment).

Results:-

Between July 2020 to July 2025, 159 patients with BDI occurring during laparoscopic and open cholecystectomy were treated at Surgery Department Zagazig University Hospitals. The median time of presentation in patients with major BDI following LC was 2 days (range, 0–77 days) and 4 days (range, 0–82days) after open cholecystectomy with no statistical significance. 138 patients (86.8%) had major BDIs which were defined as any disruption (ligation, avulsion, or resection) of the extra hepatic biliary system, and 21 patients (13.2%) had minor BDIs which were defined as any injury occurring with intact ductal anatomy without any associated stricture.

Laparoscopic cholecystectomy was done for 126 patients (79.2%) while open cholecystectomy was done for 33 patients (20.8%). Among the patients of our study, there were 24 patients (15%) that underwent cholecystectomy predominantly for symptomatic gallstones disease, 27 patients (17%) for chronic calculus cholecystitis,and 108 patients (68%) for acute cholecystitis, where cholecystectomy was defined by the surgeon as technically difficult. Major BDI was detected during the primary surgical procedure in 52.2% (72/138) patients, where 21 of them occurred during open cholecystectomy, 63.6% (21/33), and 51 during LC, 40.5% (51/126). The injury was most recognized by the presence of bile in the surgical field.

The injury was recognized postoperatively in 47.8%(66/138) patientsand 36 underwent subsequent surgical repair before referral: 24 underwent bile duct reconstruction over T-tube; and 6 underwent reconstruction without T-tube.
21 patients had minor BDIs. In all these cases, the BDI was recognized postoperatively. In 15 patients, ERCP sphincterotomy and stent placement was adequate treatment. Three patients required laparotomy and bile duct ligation, and three patients underwent laparoscopy with additional ligation of a duct of Luschka.
Regarding the major duct injuries, these could be classified as Bismuth type I in 33patients (23.9%), Bismuth type II in 75 patients (54.3%), Bismuth type III in 24 patients (17.4%), Bismuth type IV in 6 patients (4.4%), table I.

Table (I): Level of injury in patients with major BDIs according to modified Bismuth classification

Bismuth classification	No. of patients	%
Type I	33	23.9
Type II	75	54.3
Type III	24	17.4
Type IV	6	4.4

In referred patients the interval from injury to definitive repair ranged from 0 to 360 days (mean, 45 days), table II.

Table (II): Time elapsed between cholecystectomy and patient's presentation

The time elapsed	No. of patients	%
Operative day	72	52.2
Early post operative (2-7 days)	44	31.9
One week - One month	18	13
One month - Six months	3	2.2
Six months - One year	0	0

At the time of referral, 60 patients had ongoing biliary leaks, resulting in biliary ascites, biliary peritonitis, biloma, abscess, or external biliary fistula. Another 48patients had obstructive jaundice, and 24 patients had recurrent cholangitis, table III.

Table (III): Symptoms at patient's presentation

Symptoms at presentation	No. of patients	%
Biliary ascites	12	8.7
Biliary peritonitis	25	18.1
Biloma	6	4.3
Abscess	3	2.2
External biliary fistula	20	14.5
Obstructive jaundice	48	34.8
Recurrent cholangitis	24	17.4

A total of 93 patients (93 of 138 =67.4%) underwent surgical repair. As shown in table (IV) the most common surgical procedure performed for the patients included in this study was Roux-en Y hepaticojejunuostomy, which represents (71%) of the operative procedures.

Table (IV): Different surgical procedures done for the patients.

Surgical procedure	No. of patients	%
Roux-en Y hepaticojejunuostomy	66	71
Hepaticodeuodenostomy	12	13
Primary repair over a T-tube	6	6.5
End to end anastomosis	6	6.5
Gastric tube choledecoplasty	3	3.2

There wasone postsurgical death among the 93 surgically repaired patients. Short-term complications occurred in 12 patients (12 of 93= 12.9%). These included cholangitis in 6, biliary fistula with intra-abdominal abscess in 3, and moderate liver insufficiency in 3patients.

The outcome was excellent or good in 75, fair in 6, and poor in 12 patients. Therefore, the rate of excellent or good results after surgical repair was 80.6% (75 of 93 patients). 12 patients had evidence of postsurgical biliary stricture with recurrent cholangitis: 6 of them underwent percutaneous biliary dilatation with insertion of stents progressively increasing in size (up to 14F or 16F). This treatment lasted 19±11 months (range 6 to 36 months), and the result was classified as good in these patients. The other 6 patients are still being treated with stenting (till the time of writing

this series). The total percentage of patients with excellent or good results after surgical repair alone, or after surgical repair and percutaneous stenting, was thus 87.1% (81 of 93 patients). No further surgical repair was performed.

Out of the 45patients treated by endoscopic or percutaneous stenting, 36 (80%) had an excellent or good outcome; in these patients the mean duration of stenting was 11±3 months (range 3 to 32). 9 patients are still being treated "till the time of writing this series" (6 endoscopically and 3 percutaneously) after a mean duration of stenting of 8±2 months (range 3to 14). This supports endoscopic/percutaneous approaches as effective definitive or bridging strategies in selected cases.

Figures:

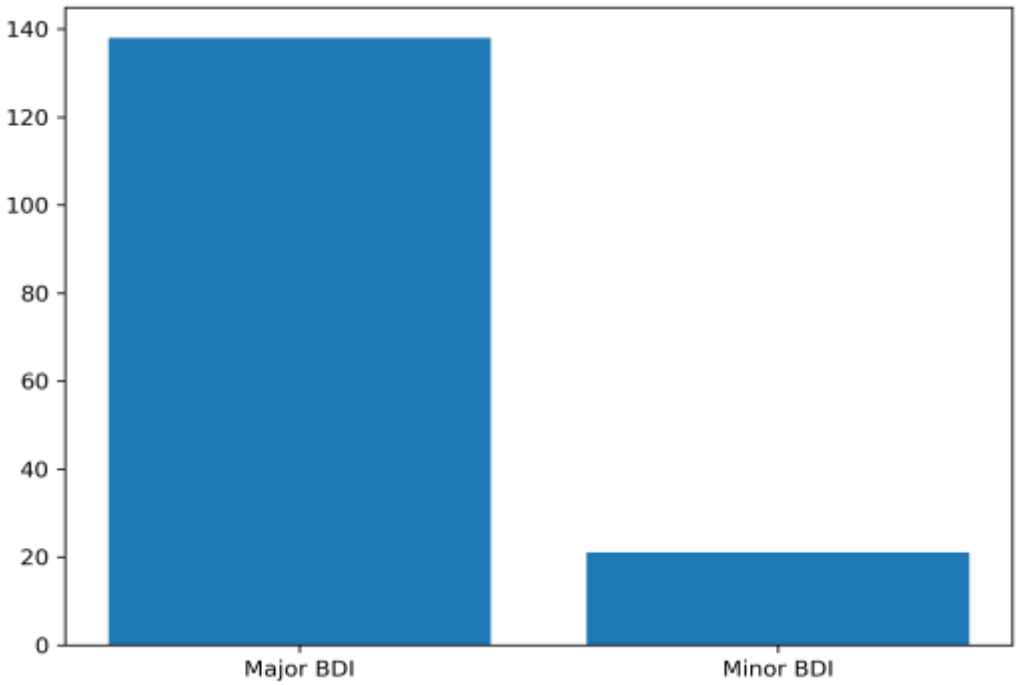

Figure 1. Distribution of bile duct injuries.

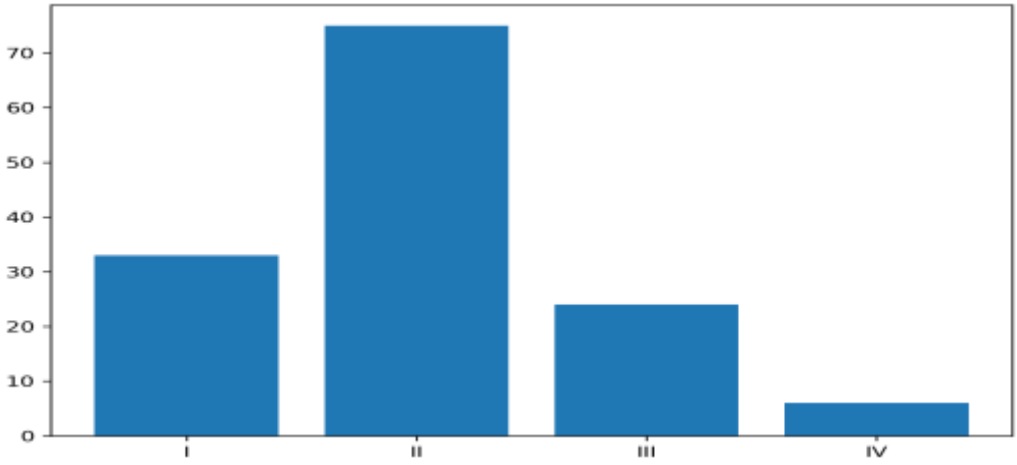

Figure 2. Major bile duct injuries according to modified Bismuth classification.

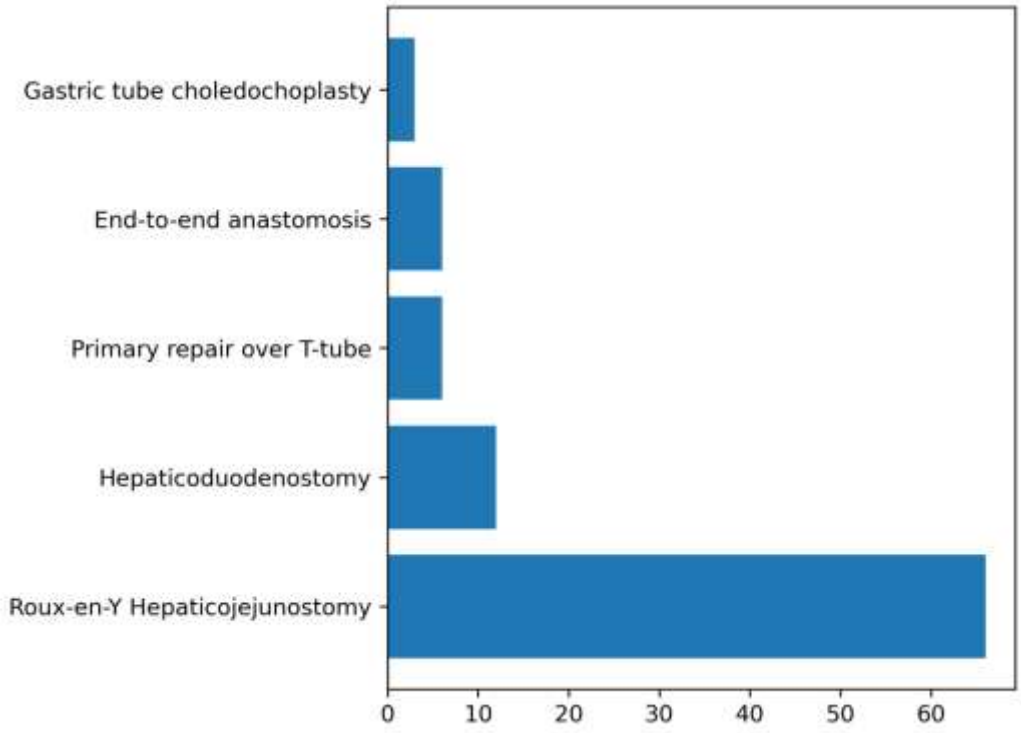

Figure 3. Surgical procedures performed for major bile duct injuries.

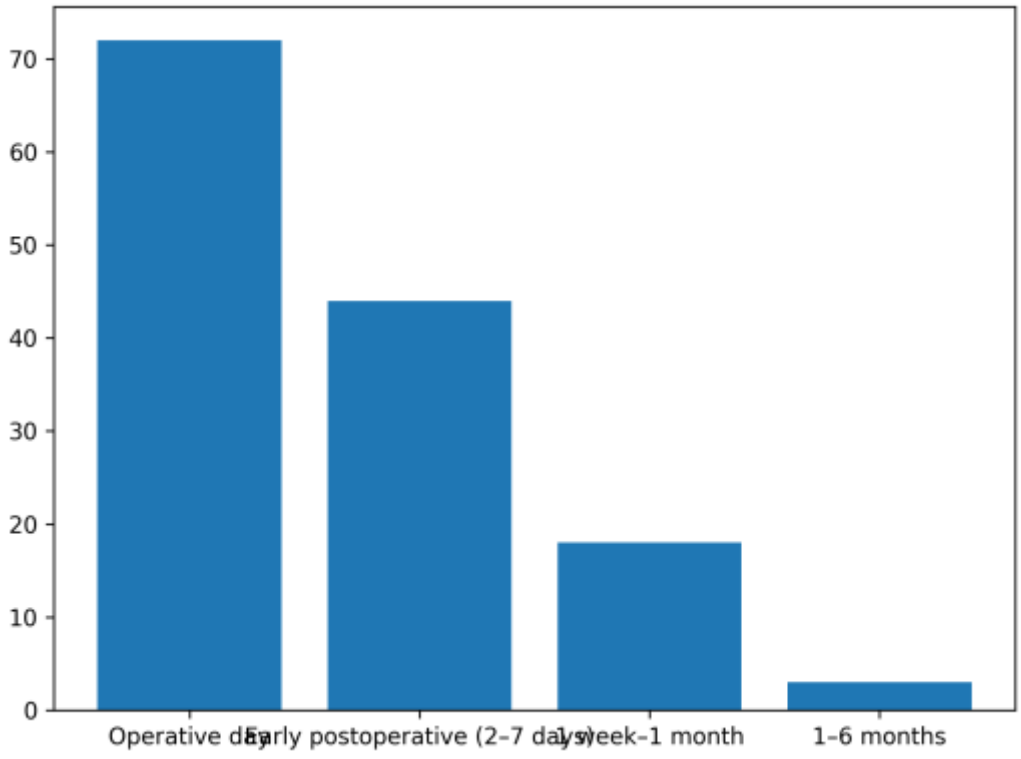

Figure 4. Timing of patient presentation after bile duct injury.

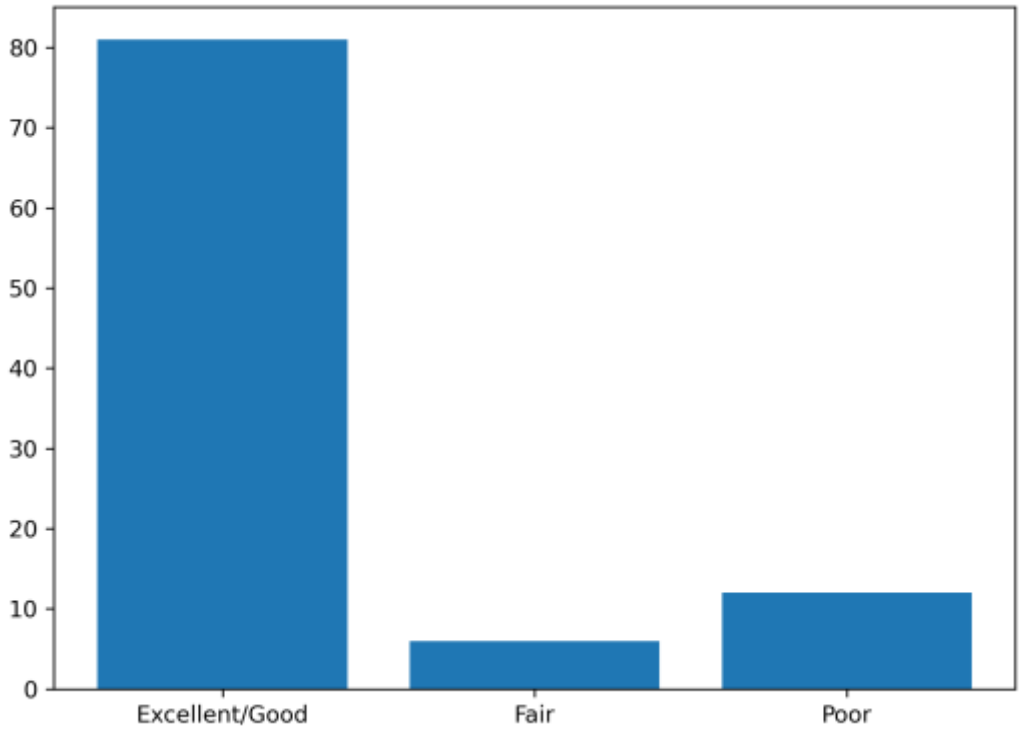

Figure 5. Treatment outcomes.

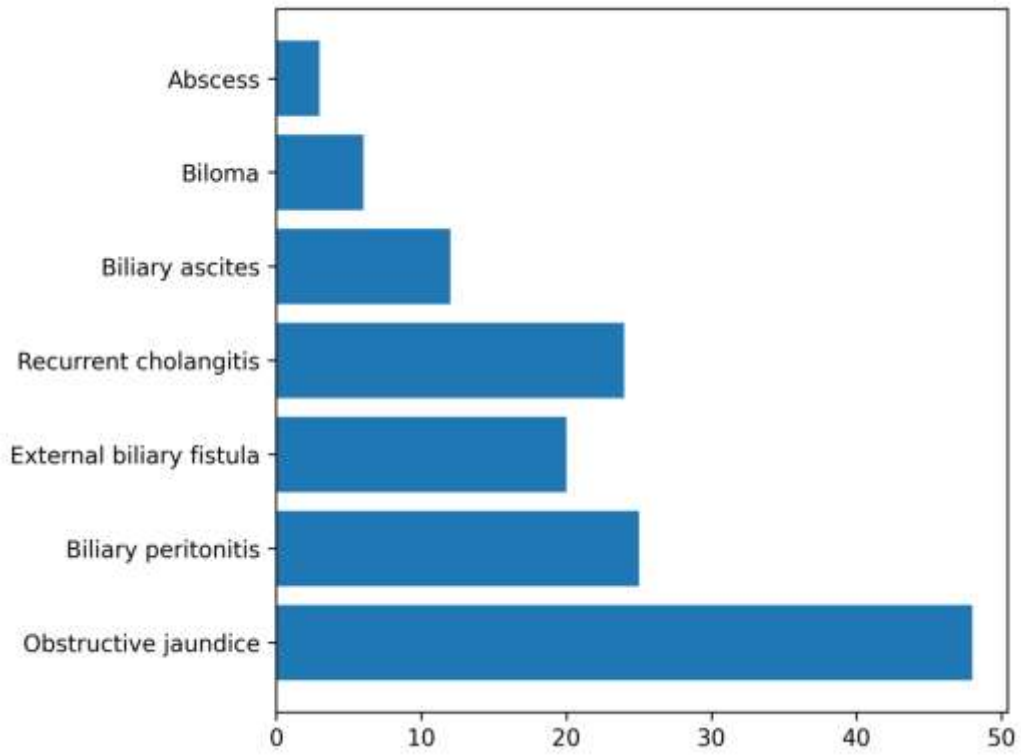

Figure 6. Clinical presentation at referral.

Discussion:-

Major bile duct injury during cholecystectomy is not only a disaster for the patient and the operating surgeon, but also an economic disaster, a serious problem for the health insurance, for the patient's family and finally it is a very serious legal problem (Deziel et. al., 1993 &Kaman, et. al., 2006).Since the introduction and widespread diffusion of LC, the incidence of BDI has at least doubled: the incidence during OC has been reported to be between 0.1% and 0.25%, whereas during LC it has been reported to be between 0.3% and 2.6% (Huerta and Pham 2021)**.** The main goal of biliary reconstruction is to make a high-quality bilioenteric anastomosis that will work well for a long time. (Goykhman et. al., 2008)**.**Multiple factors may alter outcome, including timing of repair,associatedsepsis, vascular injury, level of injury, and operative technique**Walshet.al., (2007,** Mier et. al., 2017 and Xianget. al., 2020).

When BDI occurs, it is important to recognize the lesion intra-operatively. In our series, this happened in 52.2% of patients with major BDIs (72 of 138) where 58 of them referred to our hospital (Zagazig University Hospital) immediately post operatively and the other 14 patients were operated on in our hospital. This is consistent with the results of Kaman et.al.,(2006) were 48% in LC group and 54% in OC group. While it was 46.2% of patients with major BDIs in David et.al., series in (2016) and 42% in Stilling et. al., in (2015). Salter et.al.,states in (2002) that in 20 to 50% of patients the BDI may be recognized at the time of surgery and can be repaired immediately. While Mier et. al., stated in (2017) that 20% BDI were recognized during initial surgery and 80% were diagnosed postoperatively.

Timing of repair raises interesting considerations when managing these patients. Intraoperative diagnosis and repair are an espoused goal in the management of injuries to reduce the severity of injuryand risk of litigation, while improving long-term outcome (McLean 2006). In our series all the patients with intraoperative recognized injuries were subjected to immediate repair. The same protocol was done by Nuzzo et.al.,(2008).Also, Flum et.al., reported in (2003) that early or intraoperative recognition may help in the primary repair at the time of the initial surgery, which may be important for the outcome. While Jose-Luis stated in (2016) that timing of surgical repair should be individualized, based on type of injury, coexistent comorbidities, septic complications, etc.

A major BDI detected during cholecystectomy can be repaired with a Roux-en-Y hepaticojejunostomy (HJ) if the expertise and experience are available "the best time to fix it is that time" (Lillemoe K.D. et. al., 2000). This is supported by Juan et. al., in (2013) who stated that the repairing BDI that happened during cholecystectomy by experienced hepatobiliary surgeons, whether through open or laparoscopic surgery, seems to be very important to get the best results. Also, in 2021, Sweigert suggested that early repair leads to shorter overall hospital stays for inpatients without increasing the risk of death after surgery.

Kapoorin (2015) did not recommend early repairs and record that early repair, in the presence of sepsis, is fraught with dangers. While (Monroy, 2022) and (Kong, 2025) reported that there were no statistical differences between the timing of bile duct reconstruction and the postoperative outcomes. The availability of experienced endoscopists and radiologists is of paramount importance not only in the acute management of septic patients but also for the definitive treatment of those injuries that can be successfully repaired without surgery. In our series, this occurred in 45 patients with major BDIs, 32.6%, (45/ 138). This is nearly going with the results of Nuzzo et.al.,in (2008) who record35.9% of MBDIs were successfully repaired without surgery.

The most common surgical procedure performed for patients included in this study was Roux-en-Y hepaticojejunostomy (HJ). This accord with (Seeras et. al., 2023) who said thatthe most common technique to repair major bile duct injuries is the Roux-en-Y hepaticojejunostomy (RYHJ). Kapoor also reported in (2007) that, tension-free, mucosa-to-mucosa HJ performed in a single layer, using interrupted fine absorbable sutures between unscarred proximal bile ducts (right and left hepatic) and a 60-cm-long Roux loop of jejunum is the procedure of choice for benign biliary stricture (BBS) and can be performed in all cases including those patients with Bismuth type IV BBS.Whileaccording to Sekido et. al., in(2004) duct-to-duct anastomosis should be the first choice of treatment after common bile duct transection as, according to the author's experience, postoperative cholangitis has not occurred in such patients as compared with those having undergone duct enterostomies.

In our series there was one postoperative mortality out of 93 operative cases (1.1%). Nearly same that of Sicklicket.al.,in (2005) who showed a mortality rate of 1.5% in the post injury period caused by uncontrolled sepsis.

The rate of excellent to good long-term results in surgically repaired patients with major BDIs was 80.6% (75 of 93 patients), and this increased to 87.1% (81 of 93) patients by continuing treatment with stenting in postsurgical strictures. This is nearly like the results of Nuzzo et.al.,(2008) which was 78.0% (32 of 41).
All these data show clearly the importance of a multidisciplinary approach not only to decide the best treatment for each patient but also to combine different types of treatment.

Acknowledgements:-
I extend my sincere thanks and appreciation to the Deanship of Scientific Research and Qassim University for their continuous support and encouragement to produce high-quality scientific research that meets international standards.

Conclusion:-
Regardless of the inciting event leading to injury of the bile duct, management strategies for similar types of injuries remain the same. The choice of intervention is highly influenced by local expertise and should optimally be determined in a multidisciplinary fashion with the involvement of therapeutic endoscopists, interventional radiologists, and surgeons with experience in managing hepatobiliary complications.

References:-
1. Bismuth H. and Majino P.E. (2001). Biliary strictures: classification based on the principles of surgical treatment.World J Surg. 25: 1241-1244.
2. CarannanteF. et al., (2023). Identification and management of subvesical bile duct leakage after laparoscopic cholecystectomy: A systematic review. Asian Journal of Surgery. 46(10): 4161-4168.
3. Chathurika S. D. et al., (2024). A comparison of outcomes including bile duct injury of subtotal cholecystectomy versus open total cholecystectomy as bailout procedures for severe cholecystitis: A multicenter real-world study. Surgery. 176(3). 605-613.
4. Cohen J.T. et al., (2019). An Update on Iatrogenic Biliary Injuries: Identification, Classification, and Management. Surgical Clinics of North America. 99(2): 283-299.
5. David M. et al., (2016). Bile duct injuries after laparoscopic cholecystectomy: 11-year experience in a tertiary center. BioScience Trends.10(3):197-201.
6. de'Angelis N., et al., (2021). 2020 WSES guidelines for the detection and management of bile duct injury during cholecystectomy. World J Emerg Surg..16(1):30.
7. DePietro D.M. etal., (2015). Long-Term Outcomes of a Benign Biliary Stricture Protocol. Journal of Vascular and Interventional. 26(7): 1032-1039.
8. Deziel D.J. et al., (1993). Complications of laparoscopic cholecystectomy: a national survey of 4292 hospitalsand an analysis of 77 604 cases. Am. J. Surg. 165: 9–14.
9. Endo Y, et al., (2023). Impact of AI system on recognition for anatomical landmarks relatedto reducing bile duct injury during laparoscopic cholecystectomy.Surg Endosc.37:5752-5759.
10. Fischer JE. (2009). Is damage to the common bile duct during laparoscopic cholecystectomy an inherent risk of the operation?The American Journal of Surgery. 197: 829-832.
11. Fletcher R, et al., (2020). Bile duct injuries: a contemporary survey of surgeon attitudes and experiences. Surg Endosc.34(7):3079–84.
12. Flum D.R. et al., (2003). Bile duct injury during cholecystectomy and survival in Medicare beneficiaries. JAMA. 290:2168–2173.
13. Goykhman Y. et al., (2008). Long-term Outcome and Risk Factors of Failure after Bile Duct Injury Repair.JGastrointest Surg. 12: 1412-1417.
14. Halbert C, et al., (2016). Beyond the learning curve: incidence of bile duct injuries following laparoscopic cholecystectomy normalize to open in the modern era. Surg Endosc.;30(6):2239–43.
15. Haney JC and Pappas TN (2008). Management of Common Bile Duct Injuries.Operative Technique in General Surgery. 01: 175-184.
16. Huerta S. and Pham T. (2021). Bile duct injuries: incidence, prevention, and management.Dig Med Res. 4:44.
17. Jose-Luis B.H. (2016). Current controversies in management of bile duct injuries. J Liver Res Disord Ther.2(2):41–42.
18. Juan P. et al., (2013). Intraoperative Management and Repair of Bile Duct Injuries Sustained during 10,123 Laparoscopic Cholecystectomies in a High-Volume Referral Center. Journal of the American College of Surgeons. 216(5): 894-901.

19. Kaman L. et al., (2006). Comparison of major bile duct injuries following laparoscopic cholecystectomy and open cholecystectomy.ANZ J. Surg. 76 :788-791.
20. Kapoor VK (2007). Bile duct injury repair: when? what? who?J Hepatobiliary Pancreat Surg.14: 476–479.
21. KapoorV. K. (2015). Bile duct injury repair —— earlier is not better. Front Med. 9(4); 508-511.
22. Kim K. Y. et al., (2024). Percutaneous treatment of bilioenteric anastomotic strictures: Comparison of long-term outcomes between temporary covered stents and balloon dilation. European Journal of Radiology.181: 111816.
23. Kong J. et al., (2025). Bile Duct Injury: A Novel Risk Stratification System for the Timing of Repair. The American Surgeon. 91(7): 1163-1169.
24. Kurumi Y, et al., (2000). The prevention of bile duct injury during laparoscopic cholecystectomy from the point of view of anatomic variation. Surg LaparoscEndoscPercutan Tech; 10: 192-199.
25. LA MEDINAA.R.,et al., (2008). Management of benign biliary strictures by percutaneous interventional radiologic techniques (PIRT).HPB.10: 428-432.
26. Lau WY and Lai EC (2007). Classification of iatrogenic bile duct injury.HepatobiliaryPancreat Dis Int; 6: 459-463.
27. Lillemoe K.D. et al., (2000). Postoperative bile duct strictures: management and outcome in the 1990s. Ann Surg. 232: 430–441.
28. Lopez-Lopez V. et al., (2022). Vascular injury during cholecystectomy: A multicenter critical analysis behind the drama. Surgery. 172(4): 1067-1075.
29. McLean T.R. (2006). Risk management of observations from ligation involving laparoscopic cholecystectomy.Arch Surg. 141: 643-648.
30. Mercado M. A. (2006). Early versus late repair of bile duct injuries.SurgEndosc; 20: 1644-1647.
31. Mier G. M. et al., (2017). Factors Associated with Adverse Outcomes after Surgical Repair of Bile Duct Injury. J Gastroenterol Res.1(2):67-73.
32. Misra S, et al., (2004). Percutaneous management of bile duct strictures and injuries associated with laparoscopic cholecystectomy: A decade of experience. J Am Coll Surg; 198: 218-226.
33. Monroy D. C. et al., (2022). Early versus delayed reconstruction for bile duct injury a multicenter retrospective analysis of a hepatopancreaticobiliary group. Scientific Reports.12:1160.
34. Nuzzo G, et al.,(2008). Advantages of multidisciplinary management of bile duct injuries occurring during cholecystectomy.The American Journal of Surgery. 195: 763-769.
35. Popa C, et al., (2023). Aretrospective analysis of bile duct injuries treated in a tertiary center: the utility of a universal classification-the ATOM classification.Surg Endosc.37:347-357.
36. Salter K. etal., (2002). Iatrogenic bile duct injury: The scourge of laparoscopic cholecystectomy. Aust NZ J Surg.72: 83-88.
37. Seeras K. et al., (2023). Bile Duct Repair. NCBI (National Center for Biotechnology Information) In: Stat Pearls [Internet].
38. Sekido H. et al., (2004). Surgical strategy for the management of biliary injury in laparoscopic cholecystectomy. Hepato-gastroenterology.51: 357-361.
39. SicklickJ.K. et al., (2005). Surgical management of bile duct injuries sustained during laparoscopic cholecystectomy. Ann Surg.241: 786 –792.
40. Stilling N. J. et al., (2015). Long-term outcome after early repair of iatrogenic bile duct injury. A national Danish multicentrestudy.HPB. 17: 394–400.
41. Sweigert P. J. et al., (2021). Biliary Enteric Reconstruction After Biliary Injury: Delayed Repair Is More Costly Than Early Repair. Journal of Surgical Research. 257: 349-355
42. WalshR.M.et al., (2007).Long-term outcome of biliary reconstructionforbile duct injuries from laparoscopic cholecystectomies. Surgery. 142: 450-457.
43. Weber A. et al., (2009). Long-term outcome of endoscopic therapy in patients with bile duct injury after cholecystectomy.JGH; 24:762-769.
44. XiangW. et al., (2020). Early Versus Delayed Surgical Repair and Referral for Patients with Bile Duct Injury A Systematic Review and Meta-analysis. Annals of Surgery. 271(3): 449-459.
45. Zidan M. H. E. et Al., (2024). Post-cholecystectomy bile duct injuries: a retrospective cohort study. BMC Surgery. 24:8.