Comparison of The Results of T – Tube Drainage Versus Choledochoduodenostomy after Open Common Bile Duct Exploration

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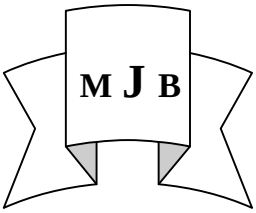

Abstract

Background :Retained or recurrent common bile duct stones (CBD) and cholangitis after open exploration of common bile duct are major problems in biliary surgery . Repeated surgical intervention on biliary tract to correct complications is a burden on both the patients in the form of increased morbidity and mortality and on the surgeons in form of complex technical difficulties . Objectives :The study aimed to compare the results of T-tube drainage versus choledochoduodenostomy after open common bile duct exploration

Patients and methods : This is a retrospective study of 154 patients which compare two surgical treatments of patients with choledocholithiasis from 1992 to 2009 . At the beginning of the study all patients were treated by exploration of CBD with T-tube insertion , Group A which included 83 patients . In 1999 the surgeon analyzed and made an audit of the results of this operation .The audit identified the incidence of retained or residual CBD stones and their risk factors . The risk factors were multiples CBD stones , hugely dilated CBD , recurrent stones and papillary stenosis . The second strategy were followed after holding an audit which implemented the use of choledochoduodenostomy for patients with the above mentioned risk factors (Group B) which included 71 patients .The end points were mainly retained stones and cholangitis . Analysis was performed to identify risk factors for stone recurrence and whether the new implemented strategy resulted in decrease in prevalence of retained CBD stones . Postoperative follow up was for 12 to 18 months . Statistical analysis with SPSS data base using Chi-Square test and test of comparison of proportions was used to analyze the data of this study .

Results: In group A " Pre-audit " , 7 patients developed retained CBD stones , 3 of them needed re-operation and 3 were managed by endoscopic sphincterotomy while in group B " Post-audit " , two patient developed cholangitis and improved on conservative treatment , no patient had residual stones and no patients needed re-operation .Statistical analysis with SPSS data base with using Chi-square test and test of comparison of proportions showed that multiple CBD stones , hugely dilated CBD and papillary stenosis were found to be independently associated risk factors for retained or recurrent CBD stones after open exploration of CBD which was significantly reduced by choledochodudenostomy in p value <0.05 and 95% confidence interval .

Conclusions : This study demonstrated that with the new strategy " Choledochoduodenostomy " , the incidence of CBD stones was reduced . Multiple CBD stones , hugely dilated CBD and papillary stenosis were risk factors for retained CBD stones

الخلاصة

أن حصى القناة الصفراوية الراجع يسبب مشاكل للجراح و المريض . تهدف هذة الدراسة التراجعية الـى مقارنـة نتـائج استكشاف القناة الصفراوية بطريقة التي تيوب و طريقة بزل القناة الصفراوية بالأثنى عشر .

شملت الدراسة 154 مريضا , 83 تمت معالجتهم بطريقة التي تيوب و 71 بطريقة بزل القناة الصفراوية بالأثنى عشر . أظهرت الدراسة الإحصائية بأن هناك عوامل خطورة لتكون حصى القناة الصفراوية بعد عملية استكشافها مثل الحصى المتعدد و توسع القناة الصفراوية وأن بزل القناة الصفراوية بالأثني عشر يقلل من نسبة رجوع حصى القناة الصفراوية بعد عملية استكشافها .

Inroduction

Choledocholithiasis forms about 15% of cholelithiasis .They are either primary or secondary stones . Primary stones form primarily in CBD due to stenosis as a result of an ampullary steonsis or stricture of CBD or a hugely dilatd CBD , secondary stones originate in the GB and then pass to CBD [1-3].

Its usual presentations are biliary colic with jaundice , gallstone pancreatitis ascending cholangitis and elevated bilirubin, alkaline phosphatase, transaminase [3]

The diagnosis is usually suggested by clinical findings and confirmed by laboratory investigations , ultrasound , MRCP of MRI or ERCP [1,2]. It can be treated by open surgery, laparoscopic cholecystectomy with laparoscopic exploration of CBD , preoperative ERCP with sphincterotomy & duct clearance followed by laparoscopic cholecystectomy or Laparoscopic cholecystectomy with postoperative ERCP & sphincterotomy according to the local availability and experiences [2- 4]

Even with the great advanced in endoscopic intervention , Open common bile duct exploration is still an important operation when endoscopic retrograde cholangio-pancreatography fails or when expertise for laparoscopic common bile duct exploration is not available [5]. It includes choledochotomy , extraction of all stones and suturing of CBD on a t-tube or primary closure of CBD without T-tube. Although both techniques were proved to be an effective and safe , they are not always without problems [2-4, 6-8]. These major problems are bile stasis with cholangitis and retained or recurrent secondary common bile duct stones . There are a lot of controversies about the real incidence of CBD stones but in spite of all precautions , still it may occur . This may be treated by ERCP and sphincerotomy and stone extraction , but it may fail and need repeated open interventions on the biliary tract . This has technical surgical difficulties with added mortality and prolonged morbidity [9] . So the aim of every surgeon is to obviate the need for secondary surgical intervention on the billiary tract with all its problems .

Currently the suggested risk factors for postoperative complications are multiple stones with inadequately cleared CBD , papillary stenosis or hugely dilated CBD with improper drainage from CBD but still there are a lot of controversies about the real causes of stones recurrence and its prophylaxis [2] .

This study aimed to compare the results of T-tube drainage versus

choledochoduodenostomy in open exploration of CBD.

Patients and Methods

This is a retrospective study conducted in Hilla general teaching hospital which tried to compare two treatment of open CBD exploration during the period from 1992 through 2009 . Preoperative diagnosis was settled upon a delicate history and accurate physical examination. Investigations included liver function tests , prothrombin time , virus screening for hepatitis , blood urea , fasting blood sugars and full blood count .An abdominal ultrasound scan was done in all patients An abdominal CT scan was obtained only to exclude pancreatic pathology . A T-tube cholangiogram was obtained 7 to 10 day postopertively in all patients with T-tube.

After few days of conservative treatment to control sepsis , correct dehydration , assess renal functions and to correct clotting problem , semi-urgent open surgical interference was applied . At induction of anaesthesia , all patients were given a single dose of third generation cephalosporin and continued for five days postoperatively .At the beginning of the study the all patients were treated by exploration of CBD with T-tube insertion (Group A) which . In 1999 the surgeon evaluated his results and made an audit of o this operation trying to outline the complications of this operation mainly retained or residual stones and their risk factors . A new strategy was implemented and aimed at reducing the incidence of retained or recurrent stones for patients with underlying risk factors .This new strategy included implementation of side to side choledochoduodenostomy for patients with multiples CBD stones , hugely dilated CBD , recurrent stones and papillary stenosis (Group B) . Then the incidence of recurrent CBD stones was compared before and after that audit . The average operative time of CBD exploration and T-tube drainage was 0ne hours and 38 minutes and choledochoduodenostomy was one hour and 47 minutes. A multivariant analysis was performed to identify risk factors for stone recurrence and whether the new implemented strategy resulted in decrease in the incidence of retained CBD stones .Follow up period was from 12 to 24 months .

Statistical analysis

The data were analyzed by SPSS data base with application of Chi -square test and test of comparison of proportions , p value < 0.01-0.05 and 95% confidence interval to be significant .

Operative technique

Under general anaesthesia in supine position . Foley's urinary catheterization was done for all patients and kept for few days for assessment of the urinary output . Nasgastric tube was introduced for gastric decompression and removed after few postoperative days . All patients were explored through right sub costal incision . After general operative exploration, the gall bladder was palpated for stones , then the index finger of the left hand was introduced in the foramen of Winslow and the CBD was palpated between the index and the thumb for stones. An intraoperative cholangiogram was not done because it is not available in this centre . Then CBD was identified and ascertained by needle aspiration , two stay sutures were inserted while the needle is in place and a longitudinal choledochotomy was performed at the supraduodenal part of the CBD . The CBD was cleared of stones and mud by forceps , irrigation and when the

stones were big enough or impacted down in C BD they were milked up to the choledechotomy and removed .Probing of CBD by dilator 4-6 mm . Then a T-tube size 12-14 F according to the diameter of CBD was inserted in CBD . In group 11 ; after the CBD is cleared of stones and good caucherization of the duodenum ; side-to-side choledochduodenostomy was done in one layer using 2 0 Vicryl on a round needle . Intrapeitoneal tube drain was put and removed after 48-72 hours .

Results

The study included 154 patients with choledocholithiasis , . 98 females and 56 males with 1.75 to 1 ratio male to female ratio . Age ranged between 22 and 72 years with a mean of 53.4 years. Eighty-three (53.9%) were from the pre-audit period (group A) , 4 of them occurred after cholecystectomy and 1 of them after previous CBD exploration and the remaining 71(46.10 %) were from the post-audit period (Group B) , 2 of them after previous cholecystectomy and 1 after previous CBD exploration . The demographic criteria of both groups are shown in table (1) 51% of them above 50 years of age .The majority of them are female with 1.75 to 1 male to female ratio

Table 1 Demographic Criteria of both groups

Criteria	Pre-audit Group	Post audit group
Mean age (Yrs)	51.6	52.4
Male	21	19
Female	62	52
Total	83	71

The clinical , ultrasonographic and laboratory findings were analyzed , statistical analysis using Chi-Square test showed that abdominal pain, jaundice , dilated CBD and abnormal liver function tests are the main findings with no significant differences between the two groups in p value > 0.01-0.05 which means that, for sake of comparison , both groups were correlated with each other table (2)

Table 2 Clinical , Ultrasonographic and laboratory criteria of both groups

Criteria	Group A		Group B		P Value
	Frequency	%	Frequency	%	
Abdominal pain	78	93.97	67	94.36	0.36
Jaundice	79	95.18	69	97.18	0.41
Cholangitis	24	28.9	19	26.76	0.44
HBsAg Positive	2	2,40	1	1.14	0.56
HVC Positive	1	1.20	0	0	0.31
Dilated CBD	79	95.8	68	95.77	0.53
CBD Stones	68	81.16	61	85.91	0.36
Abnormal Liver Function Tests	81	95.59	69	97.18	0.32

Postoperatively , in Group A (Pre-audit)patients , 76 were well and 7 patients developed retained CBD stones , 2 of them were discovered on postoperative T-tube cholngiogram and needed reoperation , 2 after 7 months and treated by endoscopic sphincterotomy and 3 after one year , two of the them were treated by endoscopic sphincterotomy and in the third ERCP failed and treated by open exploration of CBD . In group B , 2 patients developed cholangitis which resolved on conservative treatment and no incidence of retained CBD stones and no patients needed reoperation Statistical analysis using test of comparison of proportions showed that the prevalence of retained CBD stones in the pre-audit group were significantly higher than in post-audit group choledochoduodenostomy decreased significantly the prevalence of CBD stones in p value < 0.05 and 95 % confidence interval . There were no significant differences in other complications between the two groups (Table 3) .

Table 3 Postoperative complications in both groups .

Complications	Types of Drainage		P value
	Group A (83) (T- Tube Drainage)	Group B (71) (Choledochoduodenostomy)	
Wound Infection	4 (4.81 %)	2 (2.81%)	0.52
Biliary Obstruction	1 (1.20%)	1 (1.40%)	0.91
Cholangitis	2 (2.40 %)	2 (2.81%)	0.87
Retained Stones	7 (8.43%)	0 (0 %)	0.01

Retrospective analysis of the records notes of these seven patients (Table 4) showed that four of them had multiple CBD stones , three had a hugely dilated CBD and in one of them Bakes dilator was impossible to be passed through ampulla of Vater and papillary stenosis was diagnosed .Two of these 7 patients had recurrent stones after previous cholecystectomy So multiple CBD stones , a hugely dilated CBD above 2.5 CMS , recurrent stone after CBD exploration and papillary stenosis are considered risk factors for residual or retained CBD stones .

Table 4 Retrospective analysis of patients with retained stones in group A .

Patient's no.	Age (Yrs)	Gender	T.S.B* (mgm/ 100ml)	S.G.P.T** (mgm/ 100ml	A.L.P*** (KAU	US Findings	Postoperative Complications	Treatment
1	62	F	14	19	37	CBD is hugely dilated	Retained Stones	Surgery
2	66	M	21	18	42	Multiple CBD Stones	Retained Stones	Surgery
3	65	F	25	25	34	Multiple CBD Stones	Retained Stones	Endoscopic Sphincterotomy
4	68	F	17	31	40	CBD is hugely dilated	Retained Stones	Endoscopic Sphincterotomy
5	71	M	19	17	38	Multiple CBD Stones	Retained Stones	Endoscopic Sphincterotomy
6	65	F	20	28	29	Multiple CBD Stones	Retained Stones	Surgery
7	70	F	22	25	43	CBD is hugely dilated	Retained Stones	Endoscopic Sphincterotomy

**TSB : Total Serum Blirubin

***SGPT : Serum Transaminase Enzyme

**** ALP (KAU): Alkaline Phosphatase (King-Armstrong's unit)

On comparing the results of the two groups ; 7 patients in the pre-audit group developed residual CBD stones while in the post-audit group ; 2 patients developed cholangitis and no patient had residual stones and no patients needed re-operation (Table 3).

Statistical analysis of both groups of patients using Chi-Square test and test of comparison of proportions with p value < 0.05 reveals that multiple CBD stones , hugely dilated CBD and papillary stenosis were found to be independent risk factors for retained or recurrent CBD stones Choledochoduodenostomy was significantly effective in decreasing recurrent or retained CBD stones .

Discussion

Retained or residual CBD after open CBD exploration is a burden on both the surgeon and the patient . There are a lot of controversies about the

prevalence of missed stones after choledochotomy . Kamran Khalid et al quoted a prevalence of 14.8 % in a study of 59 patients [10] Harold et al quotes 11% retained after choledochotomy with stones [11]. Lygidakis et al reported 20.0% recurrent and missed stones after conventional choledochotomy and T-tube drainage . This risk is increased if exploration of CBD revealed stones and can not be completely eliminated even with the use of intraoperative cholangiography and choledochoscopy and T-tube [10]. The optimal method for performing open common bile duct exploration is unclear , But basically it should fulfill two criteria ;complete clearance of the duct of stones and mud and avoidance of cholestasis by effective biliary drainage, otherwise retained or recurrent or residual CBD stones and cholangitis , [4,5,10,12,13] This study showed that , in the pre-audit group , the prevalence of retained stones is 8.43% which is lower than earlier studies probably due to short postoperative follow up .

Retrograde analysis of these cases showed that most of them had risk factors for stone recurrence This is consistent with a study by Moreaux-J , Fry-DE et al which showed that the incidence of complications increase if there are multiple CBD stones and bile stasis due to hugely dilated CBD [4,5,7] . Presence of multiple stones leads to doubtful complete clearance of the duct and increased incidence of retained or missed stones [6]. Prolonged bile stasis in a hugely dilated CBD leads to bile infection and damage of CBD mucosa which predispose for ineffective drainage of CBD and stone formation [12-14].

In the post-audit group i.e. .with drainage by choledochoduodenostmy in patients with above mentioned risk factors, out of 71 patients , choledochoduodenostomy was carried out in 14 patient with risk factors, only two patient developed cholangitis who improved on conservative treatment, no patients developed retained stones and no patient needed further interference. Statistically, using test of comparison of proportion showed that choledochoduodenostomy reduced significantly retained CBD stones in p value of < 0.05 and 95% confidence interval. This is consistent with a study by Kamran et al in study of 54 patients treated by choledochoduodenostomy with no incidence of residual stones. It sounds that the problem is due to inadequate drainage of bile and addition of choledochoduodenostomy will provides a safe and effective biliary drainage [10]. The draw back of this study is that choledochoduodenostomy is infrequently carried out nowadays due to advancement in endoscopic technique , but still it may be indicated in selected or difficult cases where the expertise of advanced laparoscopic biliary surgery is not available . It can not be applied for all patients . It is only done if the diameter of CBD exceeds 1.5-20 mm to avoid the possibility of CBD stricture[10,15].

The two most important objections to choledochodudenostomy are the recurrent cholangitis and ‘ sump syndrome ‘ . Cholangitis may occur early and late due to supposed reflux of food contents through the stoma .In this study it was seen in two patients . Most of the studies agreed that it is not very frequent and occurred due to stenosis at the stoma that is why it is carried out only when the CBD is dilated . Sump syndrome presents with upper abdominal. Pain , chills, rigors and jaundice . It is postulated that it is due to sludge , stones or food residue filling the lower blind end of CBD which will eventually cause cholangitis

, jaundice & pancreatitis .This was not seen in this study probably due to short term follow up and only few patients are actually described and many authors could not identify similar problems[11-16].

In spite of all these and if one considers the technical difficulties and added significant morbidity and mortality of re-operation on biliary tree and weighing it against the very rare complications related to choledochoduodenostomy which may be comparable to those of t- tube drainage , it is logical to apply this operation and to get rid of all these problems [17-20].

Conclusions

From this study , one can conclude that open side to side choledochoduodenostomy still has a role in biliary surgery , it is easy , safe and it significantly decreased retained or recurrent CBD stones compared to CBD exploration with t-tube when there are risk factors for their occurrence .

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