

TRANSDUODENAL SPHINCTEROPLASTY VERSUS CHOLEDOCHODUODENOSTOMY IN MANAGEMENT OF LOWER COMMON BILE DUCT STONES

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Abstract

Common bile duct stones have been noted in 10-15% of patients with gall stones, these stones are either primary (formed in the common bile duct) or secondary (formed in the gallbladder and migrate down to the common bile duct). Their management includes ERCP (Endoscopic Retrograde Choledochopancreatography), biliary drainage procedure and choledochal exploration.

In this interventional study, we compare between transduodenal sphincteroplasty and choledochoduodenostomy regarding morbidity (anastamotic and duodenal leak, cholangitis, and pancreatitis) and mortality related to each surgical option.

A review of 68 patients with lower common bile duct stones presents with different clinical presentations in an interventional study carried in Basrah General Hospital and Al-Moussawi Private Hospital, 22 patients underwent transduodenal sphincteroplasty and, 46 patients underwent choledochoduodenostomy. Both groups received general anesthesia and comparable in age and sex. Statistical analysis done by SPSS (Statistical Package for Social Sciences) version 18.

Age and sex are comparable in both groups, the incidence of postoperative cholangitis is 9.09% in the transduodenal sphincteroplasty group and 32.6% in choledochoduodenostomy group which is statistically significant (P value 0.01). The incidence of duodenal and anastamotic leak is 13.6% and 10.9% in transduodenal sphincteroplasty and choledochoduodenostomy group respectively which is statistically not significant (P value 0.707). The incidence of postoperative pancreatitis is 0% and 8.7% in transduodenal sphincteroplasty and choledochoduodenostomy group respectively which is statistically not significant (P value 0.296). The mortality is 0% after transduodenal sphincteroplasty and 6.5% after choledochoduodenostomy.

In conclusion, transduodenal sphincteroplasty is better than choledochoduodenostomy in the management of lower common bile duct stones, less postoperative cholangitis, pancreatitis, and lower mortality rate.

Introduction

Common bile duct stones have been noted in 10-15 % of patients with cholelithiasis¹, the incidence of choledocholithiasis increase with each decade after the age of 60, about 6% of patient undergoing cholecystectomy has lower common bile duct stones that were completely unsuspected^{1,2}.

Common bile duct stones may be small or large, single or multiple³. The vast

majority of ductal stones in western countries are formed within the gallbladder and migrate down the cystic duct to lower common bile duct, these are classified as secondary stones, in contrast to the primary stones that are formed in the common bile duct. The secondary stones are usually cholesterol stones in 25% and black pigment stones in 75% of patients^{1,3}. The primary stones are

associated with biliary stasis, and infection in 80% of the patients⁴, and are more commonly seen in Asian population³.

Common bile duct stones may be silent and often discovered incidentally; they may cause complete or incomplete obstruction which manifested as jaundice³. Patient with lower common bile duct stones may present with biliary colic, there may be nausea and vomiting with intermittent or constant epigastric or right upper quadrant pain^{1,3}, this clinical course may be complicated by pancreatitis, cholangitis, or rarely hepatic abscesses⁵.

Physical examination of patients with lower common bile duct stones may be normal, or reveal jaundice, icteric sclera, and abdominal tenderness over right upper quadrant without peritoneal signs, early in the course the signs are not very different from that of acute cholecystitis, but severe tenderness may point to gallstones acute pancreatitis, where as fever, hypotension, and confusion with biliary colic jaundice and rigor may suggest cholangitis (which previously represented by Charcot triad and when hypotension and confusion added to them it called Reynold's pentad)⁶.

Blood tests may reveal increase S. Alkaline Phosphatase, Gamma Glutamyl Transpeptidase, and Bilirubin. Mild elevation of AST, ALT, can be seen where these are particularly abnormal in situation of cholangitis¹.

The management of patients with high suspicion, or proven choledocholithiasis is depend on local resources and expertise⁷. In general the lines of management of choledocholithiasis including impacted stones in the ampulla of Vater are:

ERCP :- in 1968, ERCP was introduced as diagnostic tool to aid in the management of biliary and pancreatic disease⁸ with sensitivity and specificity of 90% and 98% respectively, and accuracy of 96%, 5 years later with development of endoscopic sphincterotomy ERCP transformed to therapeutic modality, so

the diagnosis and treatment can be performed at the same setting. ERCP stone extraction is successful in 80-90% at the time using the technique of sphincterotomy and balloon catheter or dormia basket stone retrieval⁹.

Nowadays with the addition of mechanical, electrohydraulic, laser, or extracorporeal shock wave lithotripsy, for large stones increase the success rate to 95%¹.

Surgical drainage procedure: these procedures must be considered in situation of multiple stones, incomplete removal of stones, impacted distal bile duct stones, markedly dilated lower common bile duct, distal bile duct obstruction from tumor, or stricture, and re-occurrence after previous bile duct exploration. The methods of biliary drainage procedures are¹:

Trans duodenal sphincteroplasty(TDS): Is useful in the management of choledocholithiasis when these stones impacted in the ampulla of Vater especially if there is dense adhesions of previous surgery, papillary stenosis, and multiple stones particularly in the presence of non dilated lower common bile duct¹.

Choledochoduodenostomy(CDD): The first successful operation was done by Sprengel in 1891, choledochoduodenostomy is indicated in patient with recurrent stones requiring repeated intervention, impacted or giant stones, biliary sludge, and ampullary stenosis¹ and dilated lower common bile duct. The operation can be done either as elective, or emergency operation, the side to side anastomosis is the most commonly used technique¹. lower common bile duct diameter of 1.2cm or more is required³.

Choledochojejunostomy (CDJ): An alternative to choledochoduodenostomy¹ is done by bringing up a 45 cm Roux-en-Y limb of jejunum and anastomosing it end to side to the choledochus³.

Common bile duct exploration whether open or, laparoscopic is an option for management of common bile duct stones,

open common bile duct exploration (with or without T tube insertion) has become a rare procedure, but it remain a skill that surgeons require if ERCP has failed or not possible¹⁰.

Laparoscopic common bile duct exploration can be done for stones discovered intra operatively by intra-operative cholangiography or, intra operative Ultrasound, or stones discovered preoperatively but endoscopic clearance was either not available or, unsuccessful³.

The evaluation and treatment of choledocholithiasis has changed many times over last 100 years¹ in spite of that our region in south of Iraq still lacking of ERCP, and the expertise of laparoscopic choledochal exploration.

Patients and methods

An interventional prospective study conducted over period from January 2006 to September 2011 in Basrah General Hospital and Al-Moussawi Private Hospital in Basrah. Patient demographics, past history, recent history, drug history and accompanying systemic diseases were evaluated.

Sixty eight patients with lower common bile duct stones approached by history, clinical examination, liver function test, S. Amylase, US, CT Scan (computerized tomography scan), MRCP (magnetic resonance cholangiopancreatography), in addition to ordinary investigations are used to diagnose and categorize those patients into different clinical presentations. All patients gave informed consent. The lower common bile duct stones are the main indication for surgery to which 22 patients underwent transduodenal sphincteroplasty, and 46 patients underwent choledochoduodenostomy. All patients received general anesthesia with endotracheal intubation in elective lists and received third generation cephalosporine intra-operative and one day post-operative.

In those patients underwent transduodenal sphincteroplasty, we did

exploration of the abdomen via upper midline incision, mobilization of the duodenum (kocherization) next, to obtain exposure of the lateral portion of the second part of the duodenum. Oblique incision of 5 cm length is made on the lateral surface of the duodenum, then after locating the ampulla, 2 sutures line of vicryl 3/0 inserted on both sides of ampulla, then we do incise the ampulla at 11'oclock position starting at papillary orifice and extend above the ampullary sphincter using a scissor (pancreatic duct usually identified at 4'oclock position). Next we do extraction of the stones, and wash the common bile duct. Then we approximate the wall of the common bile duct to the duodenal mucosa. Closure of the duodenum with direction of the incision by interrupted 3/0 vicryl, and subhepatic drain insertion follows, and closure of the abdomen in layers.

In those patients underwent choledochoduodenostomy, we did exploration of the abdomen via upper midline incision, complete kocherization of the duodenum done, we incise the duodenum longitudinally close to the bile duct, then we incise the common bile duct about 2 cm in length in its longitudinal axis, we clear the common bile duct from stones and wash the common bile duct, then single layer side to side anastomosis is done with vicryl 3/0. Subhepatic drain is inserted, and closure of the abdomen comes next.

Follow up of patients in the study continue for two years postoperatively, and we have no missed cases. Statistical analysis done by using SPSS version 18 computer software, frequency distribution of selected variables done first. The statistical significance of association between the variables done by Chi-Square test, the measure of statistical significance was established as P value less than 0.05.

Results

In this interventional prospective study, 68 patient managed for their common bile

duct stones, 22 of them underwent transduodenal sphincteroplasty, and 46 patient underwent choledochoduodenostomy, among these patients 51 (75%) female and, 17 (25%) male with male to female ratio 1:3, in transduodenal sphincteroplasty group 16 (72.7%) female and 6 (27.3%) male, in choledochoduodenostomy group 35 (76.1%) female and, 11 (23.9%) male. The P value by pearson Chi-square test is 0.765 which is more than 0.05 so the sex is insignificant factor affecting the outcome of each option of surgery as shown in table I.

The age of transduodenal sphincteroplasty group range from 18-62 years old with mean age of 38.9 and Standard Deviation of 11.2 and, the age of choledochoduodenostomy group range from 20-65 years old with mean age of 39.5 and standard deviation of 10.6, the P value by Pearson Chi-square test is 0.0737 which is more than 0.05 so the age is insignificant factor affecting the outcome of each option of surgery as in table II.

In transduodenal sphincteroplasty group, 1 patient (4.5%) present with biliary colic, 8 patients (36.36%) present with biliary colic and jaundice, 11 patients (50%) present with acute cholecystitis and common bile duct stones, 1 patient (4.5%) present with acute cholecystitis, acute cholangitis, and common bile duct stones, 1 patient (4.5%) present with acute cholecystitis, acute pancreatitis, jaundice, and common bile duct stones as in table III.

In choledochoduodenostomy group, 1 patient (2.2%) present with biliary colic, 17 patients (36.9%) present with biliary colic and jaundice, 23 patients (50%) present with acute cholecystitis and common bile duct stones, 2 patients

(4.3%) present with acute cholecystitis, acute cholangitis, and common bile duct stones, and 3 patient (6.5%) present with acute cholecystitis, acute pancreatitis, jaundice, and common bile duct stones as shown in table III.

In transduodenal sphincteroplasty group, 3 patients (13.6%) out of 22 developed duodenal leak. 2 of them (9.1%) treated conservatively and improved, and 1 patient (4.5%) re-explored.

Two patients (9.09%) out of 22 developed mild cholangitis which respond to conservative measures in the form of supportive I.V fluids, analgesia, antipyretics, and, antibiotics as shown in table IV.

No mortality reported (0 %) in the post operative period, and 2 years follow up.

In choledochoduodenostomy group, 5 patients out of 46 (10.9%) developed anastomotic leak, 2 of them (40%) re-explored and re-fashioned again, 2 patients (40%) improved with conservative measures while 1 patient (20%) died because of sepsis.

Fifteen patients out of 46 (32.6%) developed repeated attacks of cholangitis which managed conservatively (I.V fluids, antibiotics, analgesia, and antipyretics) as shown in table IV.

Four patients out of 46 (8.7%) developed moderate attacks of acute pancreatitis, managed conservatively (I.V fluids, antibiotics, and analgesia).as shown in table IV.

Six and half percent of 46 patients die within 1 year later, Patient developed pyogenic liver abscess and, sepsis following repeated attacks of cholangitis. Patient developed sever pancreatitis, and died. Patient developed cholangitis, sepsis, and died.

Table I: Gender frequency distribution

Gender	Transduodenal Sphincteroplasty	Choledochoduodenostomy	Total
female	16 (72.7%)	35 (76.1%)	51 (75%)
male	6 (27.3)	11 (23.1)	17 (25%)
total	22 (100%)	46 (100%)	68 (100%)

The P value by Pearson Chi-Square is 0.765 which is more than 0.05 so is insignificant

Table II: Age distribution

	Transduodenal Sphincteroplasty	Choledochoduodenostomy	P value
Age	18-62	20-65	0.737
Mean	38.9	39.5	
Standard deviation	11.2	10.6	

The P value by Pearson Chi-Square is 0.737 which is more than 0.05 so is insignificant

Table III: Clinical presentation frequency

Mode of presentation	Transduodenal Sphincteroplasty	Choledochoduodenostomy
Biliary colic	1 (4.5%)	1 (2.17%)
Biliary colic and jaundice	8 (36.36%)	17 (36.95%)
Acute Cholecystitis with Common bile duct stones	11 (50%)	23 (50%)
Acute Cholecystitis ,Cholangitis and common bile duct stones	1 (4.54%)	2 (4.34%)
Acute Cholecystitis, acute Pancreatitis, Jaundice and common bile duct stones	1 (4.54%)	3 (6.52%)
Total	22	46

Table IV: Postoperative complications frequency

	Transduodenal Sphincterotomy	Choledochoduodenostomy	P value
Duodenal and anastamotic leak	3 (13.6%)	5 (10.87%)	0.707
Postoperative cholangitis	2 (9.09%)	15 (32.6%)	0.01
Post operative Pancreatitis	0 (0%)	4 (8.7%)	0.296
Total	22	46	

The P value by Fisher's Exact Test is more than 0.05 insignificant and less than 0.05 is significant

Discussion

The management of common bile duct stones is something challenging and depend highly on the local resources and facilities, also on the expertise on laparoscopic and endoscopic biliary intervention. The best path is the one the surgeon is most adept at or the one that local expertise can accomplish most safely¹. From 1968-1973 ERCP introduced and transformed into therapeutic modality so the diagnosis and the treatment of common bile duct stones achieved in the same setting. In united state of America more than 150,000 endoscopic biliary sphincterotomies done annually¹. In IRAQ especially the southern part lack of ERCP and the expertise to do laparoscopic common bile duct exploration made the use of biliary drainage procedure vital option to deal and manage patients with common bile duct stones keep in mind that choledochal exploration with T-tube has become a rare

option to use in common bile duct stones management. Sometimes transduodenal sphincteroplasty indicated if there is dense adhesions in this subhepatic area from previous surgery that make identification of common bile duct difficult and hazardous¹.

In this interventional study, we compare transduodenal sphincteroplasty and the choledochoduodenostomy as different options of biliary drainage procedure, we review the anastamotic leak, cholangitis, pancreatitis, and mortality of both options. The ages of both groups (transduodenal sphincteroplasty and choledochoduodenostomy) are comparable and statistical analysis by Pearson Chi-Square test proves that there is insignificant relation between the age and the morbidity related to surgical procedure. The sex whether male and female had insignificant relationship with the outcome and morbidity of surgery we did for the patients in the study.

There was no significant difference between transduodenal sphincteroplasty and choledochoduodenostomy regarding duodenal and anastomotic leak in our study (13.6% and 10.87% respectively), but significant both statistical and clinical difference between transduodenal sphincteroplasty and choledochoduodenostomy in the development of postoperative cholangitis, 9.09% of patients of transduodenal sphincteroplasty developed cholangitis while 32.6% of patients with choledochoduodenostomy developed cholangitis with subsequent clinical sequel.

Also there was no statistical difference between transduodenal sphincteroplasty and choledochoduodenostomy in the development of postoperative pancreatitis, although clinical significance exists where 4 patients in the choledochoduodenostomy group developed pancreatitis post-operatively and no one developed pancreatitis in the transduodenal sphincteroplasty group.

No mortality related to surgery had been detected in 2 years follow up of patients in the transduodenal sphincteroplasty group while 3 patients died within 1 year of surgery in the choledochoduodenostomy group all of them due to surgical complications and change a normal anatomical path regarding the sphincter of Oddi (cholangitis and pancreatitis) so its evident clinically that choledochoduodenostomy associated with more surgery related mortality than transduodenal sphincteroplasty, although statistically not significant.

In French study by Suter and colleagues, of 78 patients who underwent transduodenal sphincteroplasty, for common bile duct stones 3 patients died 1 from pulmonary embolism, 1 from pulmonary sepsis, and 1 from multiple organ failure syndrome complicating preoperative necrotizing pancreatitis. Of the 30 patients (38%) with complications, 20 were directly related to surgery and included 4 cases of hemorrhage not

requiring transfusion, 1 case of clinical pancreatitis, and 1 case duodenal fistula that healed after conservative therapy. No deaths were noted that were directly attributable to transduodenal sphincteroplasty¹¹. On the other hand in older review by Meyhoff, a 10% postoperative mortality was noted after transduodenal sphincteroplasty, with 4 patients developed fatal pancreatitis¹².

In review of 126 patients underwent choledochoduodenostomy after common bile duct exploration over 19 years, by Deutsch and colleagues reveal 4% mortality rate, with all deaths occurring in patients over 70 years old and morbidity included wound infection in 18 patients (14%) bile leak through the drain to over 2 weeks in 4 patients (3%).

Rameriz and colleagues, report their experience with choledochoduodenostomy and transduodenal sphincteroplasty for the treatment of common bile duct stones over period of 10 years, of 126 patients with transduodenal sphincteroplasty and 216 patients with choledochoduodenostomy, complications include 6 intra abdominal abscesses (2.7%) and 3 (1.4%) external biliary fistula in the choledochoduodenostomy group, and 4 (3.8%) intra abdominal abscesses and, 2 episodes (1.6%) of pancreatitis in transduodenal sphincteroplasty group. There was no difference in the mortality between both groups, and after mean follow up of 5.6 years 75.2% of transduodenal sphincteroplasty group and 71.5% of choledochoduodenostomy group were asymptomatic. In the symptomatic group 6 patients (2.7%) in the choledochoduodenostomy group and 3 patients (1.4%) in the transduodenal sphincteroplasty group developed cholangitis that resulted in reoperation^{13,14}.

In long term follow up of patients side to side choledochoduodenostomy and transduodenal sphincteroplasty done by A. R. Baker and colleagues, department of surgery. Leister Royal infirmary, 190

patients with choledochoduodenostomy and 56 patients with transduodenal sphincteroplasty, there were be 10 (5.3%) and 3 (5.3%) hospital deaths respectively 3.8% cholangitis in the transduodenal sphincteroplasty group compared to 8.1 % in the choledochoduodenostomy group other complication like anastomotic leak and intra-abdominal abscesses are not significant¹⁵.

In study of surgical treatment of choledocholithiasis done by Klimenko G.A and colleagues 241 patients with choledocholithiasis treated by transduodenal sphincteroplasty, and 118 treated with choledochoduodenostomy. The incidence of specific post operative complication after transduodenal sphincteroplasty 10.3% and 10.2 for choledochoduodenostomy, postoperative mortality was 6.2% for transduodenal sphincteroplasty and 6.8% for choledochoduodenostomy, the hospital stay duration from the time of operation till discharge from hospital is 16.8 for transduodenal sphincteroplasty and 21 days for choledochoduodenostomy so the author speculate that transduodenal sphincteroplasty is method of choice for

operative choledocholithiasis treatment¹⁶.

We conclude from this interventional study that transduodenal sphincteroplasty is associated with lower risk of developing cholangitis postoperatively than choledochoduodenostomy, and subsequent impact on the outcome of surgery since cholangitis is evident cause of mortality postoperatively and important factor in postoperative morbidity and prolonged hospital stay.

Transduodenal sphincteroplasty is safer and easier if there is dense adhesions from previous surgery.

There were no differences statistically between transduodenal sphincteroplasty and choledochoduodenostomy regarding anastomotic and duodenal leak.

There was no differences statistically between transduodenal sphincteroplasty and choledochoduodenostomy regarding postoperative pancreatitis, but clinically choledochoduodenostomy associated with higher rate of postoperative pancreatitis.

There were no differences statistically between transduodenal sphincteroplasty and choledochoduodenostomy regarding the postoperative mortality related to surgical option.

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