

Intraoperative flexible choledochoscopy: Outcomes of 216 cases over 23 years

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ABSTRACT

Objective: Intraoperative flexible choledochoscopy can help in the diagnosis and treatment of various biliary tract diseases by providing direct visualization of the bile ducts. This study discusses the role of choledochoscopy in diagnosing and treating most diseases of the hepato-biliary-pancreatic system particularly in patients in whom laparotomy with or without choledochotomy is planned or performed and in whom ERCP, MRCP, or other advanced techniques are not applied, deficient or unsuccessful.

Methodology: Choledochoscopy was performed via a vertical choledochotomy using a flexible choledochoscope during the surgical procedures on the patients, who were operated on because of hepato-biliary-pancreatic system diseases, and the choledochotomy line was closed by primary closure, t-tube application or choledochoduodenal anastomosis. The clinical records of 216 patients over the course of 23 years were retrospectively evaluated.

Results: The age range was 19-92 years (mean: 63.1 years), and 139 patients (64.4%) were female. The most common indication included the presence of suspected choledochal stones in 77 patients (35.6%). Additional diagnostic or therapeutic endoscopic procedures (stone or hydatid vesicula removal, biopsy or cytology, balloon dilation, and stent removal or placement) were performed on 106 patients (49.1%). The average choledochoscopy duration was 8.5 minutes (range: 5-25 minutes). Choledochoscopy confirmed the anticipated diagnosis in 98 patients (45.4%), whereas it provided additional unanticipated diagnostic information in 68 (31.5%) patients; the results were normal in 50 patients (23.1%). In the present series, complications occurred in four patients (1.9%), whereas no choledochoscopy-related mortality was observed.

Conclusion: Intraoperative flexible choledochoscopy is a safe and useful procedure that can aid in the diagnosis and treatment of various biliary tract diseases.

KEYWORDS: Biliary tract, Choledoch, Choledochoscopy.

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INTRODUCTION

Despite the introduction of ERCP in the early 1970s, endoscopic sphincterotomy in the mid-1970s, and MRCP in the early 1990s, direct endoscopic visualization of the biliary tract was needed to better define the disease and to design treatment of the hepato-biliary-pancreatic system.¹⁻³ After the first experience with choledochoscopy by Kawai et al.⁴ in 1976, significant technologic improvements were made in the design, optics and maneuverability of the endoscopes. These factors

rendered choledochoscopy a valuable endoscopic procedure in the diagnosis and treatment of biliary tract diseases.^{1,5,6} The purpose of this study was to discuss the outcomes of the choledochoscopies performed on 216 patients over 23 years.

METHODOLOGY

Between July 1988 and July 2011, 216 intraoperative flexible choledochoscopies were performed by general surgeons in the General Surgery Department of Ataturk University Medical School. The clinical records were retrospectively reviewed for age and gender of the patients, indications for choledochoscopy, type and number of additional diagnostic or therapeutic endoscopic procedures, duration of the procedure, diagnosis, and morbidity and mortality of the procedures.

All of the endoscopic procedures were performed during the surgical procedures on the patients, who were operated on under general anesthesia because of hepato-biliary-pancreatic system diseases. Choledochoscopy was performed via a vertical choledochotomy, and the choledochotomy line was closed by primary closure, t-tube application or choledochoduodenal anastomosis.

The following devices were used for flexible choledochoscopy and other endoscopic procedures:

an Olympus CHF T 20 flexible choledochoscope and an Olympus UES 10 electrocauter, with various balloon and basket catheters, lithotriptors, biopsy and cytology forceps, and coagulation electrodes. All procedures were performed by trained general surgeons.

RESULTS

The mean age of the patients was 63.1 years (range: 19-92 years). Of 216 patients, 139 (64.4%) were female and 77 (35.6%) male. As seen in Table-I, the most common indications for intraoperative flexible choledochoscopy were the presence of suspected choledochal stones in 77 patients (35.6%), high serum cholestatic enzyme levels without jaundice in 52 patients (24.1%), obstructive jaundice and/or high serum bilirubin level in 46 patients (21.3%), and wide choledoch in 42 patients (19.4%). Additional diagnostic or therapeutic endoscopic procedures were performed on 106 patients (49.1%), including stone removal in 68 patients (31.5%), biopsy or brushing cytology in 31 patients (14.4%), hydatid cyst vesicula removal in 12 (5.6%), balloon dilation in 10 (4.6%), and stent removal or placement in eight (3.7%), as observed in Table-II. Thus, the therapeutic procedure rate was 45.4% (98 patients).

Table-I: The indications and results of choledochoscopy.

<i>Indication</i>	<i>Patient</i>	<i>%</i>	<i>Diagnosis confirmed</i>	<i>%</i>	<i>Normal</i>	<i>%</i>	<i>New diagnosis</i>	<i>%</i>
Choledochal stone	77	35.6	52	67.5	21	27.3	4	5.2
High serum cholestatic enzyme levels without jaundice	52	24.1	-	-	15	28.8	37	71.2
Obstructive jaundice and/or high serum bilirubin level	46	21.3	-	-	11	23.9	35	76.1
Wide choledoch	42	19.4	32	76.2	5	11.9	5	11.9
Abnormal cholangiogram	18	8.3	-	-	8	44.4	10	55.6
Biliary tract malignancy	15	6.9	11	73.3	2	13.3	2	13.3
Choledochal hydatid cyst	14	6.5	11	78.6	2	14.3	1	7.1
Choledochal cyst	13	6.0	8	61.5	3	23.1	2	15.4
Papillar stenosis	12	5.6	8	66.7	2	16.7	2	16.7
Choledochal anastomotic stenosis	9	4.2	7	77.8	1	11.1	1	11.1
Occluded stent	7	3.2	5	71.4	1	14.3	1	14.3
Extrinsic compression	6	2.8	4	66.7	1	16.7	1	16.7
Hemobilia	4	1.9	4	100.0	-	-	-	-
Sclerosing cholangitis	2	0.9	2	100.0	-	-	-	-
Ischemic injury	1	0.5	1	100.0	-	-	-	-
Total	318*/216	-	145*/98	45.4	72*/50	23.1	101*/68	31.5

*In some patients more than one

Table-II: Additional diagnostic or therapeutic endoscopic procedures.

<i>Procedure</i>	<i>Patient</i>	<i>%</i>
Stone removal	68	31.5
Biopsy	23	10.6
Hydatid cyst vesicula removal	12	5.6
Balloon dilation	10	4.6
Brushing cytology	8	3.7
Stent removal	5	2.3
Stent placement	3	1.4
Total	129*/106	49.1

*In some patients more than one

When choledochotomy and closure procedure periods were excluded, the average choledochoscopy duration was 8.5 minutes (range: 5-25 minutes). Choledochoscopy confirmed the anticipated diagnosis in 98 patients (45.4%). Importantly, it provided additional unanticipated diagnostic information in 68 patients (31.5%), whereas choledochoscopy was normal in 50 patients (23.1%). Thus, as seen in Table-1, choledochoscopy affected the diagnosis in 118 patients (54.6%).

As a complication, a choledochal tear in the choledochotomy line occurred in four patients (1.9%), who were treated with primary closure. No mortality was seen due to choledochoscopy or related problems in the present series.

DISCUSSION

Intraoperative flexible choledochoscopy has diagnostic importance and therapeutic value for most diseases of the hepato-biliary-pancreatic system and provides direct visualization of the biliary ducts. The technique allows for diagnostic or therapeutic endoscopic procedures such as biopsy or cytology, stone removal, balloon dilation, electrocoagulation, and stent removal or placement.^{1,5,6}

Although cholestasis (abnormal liver function or cholestatic tests with or without cholestatic jaundice) is a common indication for diagnostic ERCP or MRCP, and MRCP is accepted as the first choice in addition to the diagnostic ERCP is performed only when there is a suspected disease in the absence of abnormal images,^{2,3,7} intraoperative flexible choledochoscopy may also be used in both the diagnosis and treatment of some hepato-biliary-pancreatic system diseases, particularly in patients in whom laparotomy with or without choledochotomy is performed.^{1,5,6} It

is believed that both ERCP and MRCP are used successfully in the diagnosis of choledocholithiasis. In addition, ERCP is the most likely primary treatment for choledochal stones when combined with endoscopic sphincterotomy, basket/balloon catheterization and/or lithotripsy.^{1,2,5}

However, Scaffidi et al⁸ displayed a 28% false-negative rate and an 11% false-positive rate for MRCP in the diagnosis of choledochal stones. Similarly, the overall rate of failed ERCP cannulation ranged from 5.4% to 20.4%.^{9,10} Notably, pregnancy is a limitation of ERCP; therapeutic non-radiation ERCP is possible in limited centers and in select patients.² However, intraoperative flexible choledochoscopy has been shown to be highly effective in detecting and removing choledochal stones during laparotomy, particularly in patients in whom ERCP and MRCP were not applied, were deficient or were unsuccessful,^{1,5} which is in agreement with our clinical experience with 68 patients. Nagorney and Lohmuller⁵ detected residual stones by choledochoscopy after operative choledoch exploration in 10.1% of patients. According to their study, the sensitivity, specificity, and negative predictive values of choledochoscopy were 67%, 100%, and 95%, respectively.

Although the latter authors showed that choledochoscopy exceeded the total cost, they concluded that choledochoscopy is clinically efficacious in obtaining a stone-free choledoch. Similarly, Siddique et al¹ reported that choledochoscopy is clinically helpful in diagnosis and when combined with therapeutic procedures to manage choledochal stones, particularly in patients with residual or impacted stones. Choledochoscopy is also used in the diagnosis and palliative treatment of biliary tract or related (hepatic or pancreatic) cancers in combination with the use of biopsy or brushing cytology, stenting, and dilation procedures,^{1,5,11} as was shown in 34 patients in the present study.

Similarly, choledochoscopy is utilized in patients with intrabiliary rupture of hydatid cysts of the liver,¹² particularly in endemic areas, as was applied in our 12 patients. Choledochoscopy is also useful in the diagnosis and treatment of biliary tract and related disorders or problems including sclerosing or pyogenic cholangitis, hemobilia, malignant or benign strictures, papillary stenosis, cystic dilation, ischemic injury, and stent occlusion,^{1,5,13,14} as demonstrated in our study on 54 patients. As shown in our sample, the indications of choledochoscopy are similar to those reported in the literature.

In a 61-case intraoperative flexible choledochoscopy series, Siddique et al.¹ reported the anticipated diagnosis rate as 59%; this technique provided additional unanticipated diagnostic information in 29.5% of the patients. Similar rates of 45.4% and 31.5%, respectively, were determined in our study. The overall therapeutic procedure rate has ranged from 10.1% to 85.2%;^{1,5} this range was compatible with our rate of 45.4%.

After the first experience with choledochoscopy reported by Kawai et al.⁴ in 1976, significant technologic improvements have been made to the endoscopy system.^{1,5,6} When using the operative choledochoscopy technique, the procedure is preceded by a standard choledoch exploration using a rigid or preferably flexible choledochoscope, and the choledochotomy line is closed, preferably by primary closure, whereas the other reconstruction alternatives are t-tube application or choledochoduodenal anastomosis.^{1,5,15} Although laparoscopic,¹⁶ transpapillary,¹⁷ peroral mother-baby,¹⁸ or SpyGlass^{6,18} techniques are advanced alternatives to the intraoperative technique, intraoperative flexible choledochoscopy is a reliable procedure particularly in patients in whom laparotomy is planned or performed with or without choledochotomy.^{1,5}

Although the morbidity and mortality associated with operative choledoch exploration are well known, choledochoscopy-related prognosis is not sufficiently well documented^{1,5} for comparison with the results obtained here.

In conclusion, intraoperative flexible choledochoscopy is a reliable procedure in diagnosing and treating most diseases of the hepato-biliary-pancreatic system particularly in patients in whom laparotomy with or without choledochotomy is planned or performed and in whom ERCP, MRCP, or other advanced techniques are not applied, deficient or unsuccessful.

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