



## Single Stage Management of Concomitant Cholelithiasis and Choledocholithiasis

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### ABSTRACT

**Introduction:** Concomitant cholelithiasis and choledocholithiasis are commonly managed in two stage procedure, endoscopic management of common bile duct stone followed by laparoscopic cholecystectomy in different time and setting. We perform these two procedures in same sitting in operating room set up. We evaluated the procedure in terms of outcome, feasibility and complications.

**Methods:** Prospective cross-sectional study carried out since April 2013 to August 2016 in all patients who had undergone single stage endoscopic and laparoscopic management of concomitant cholelithiasis and choledocholithiasis. Patient's demography, procedural time for different procedure and procedure in total and post-operative complications were recorded and analyzed with suitable statistical methods.

**Results:** Out of 50 cases enrolled, 2 patients were converted to open. Out of 48 patients, 3 needed re-attempt for completion. Majority were female 36 (72%), mean age was 39.48 years. Mean common bile duct diameter and mean stone size was 11.43±2.63 cm and 7.99±2.01cm, respectively. Mean of total procedural time was 90.93±33.68 minutes. In most of the cases, laparoscopic cholecystectomy performed first followed by endoscopic method (66.7%). Total procedural time was less in the patients who underwent laparoscopy first in comparison to endoscopy first. Clinically significant complications like cholangitis, pancreatitis and duodenal perforation occurred in 7 patients. Out of 4 patients who developed pancreatitis, one had severe acute pancreatitis requiring prolonged hospitalization.

**Conclusion:** Single stage management of common bile duct and gall bladder stone by laparoscopic and endoscopic method is feasible in our setup with acceptable results. Endoscopic treatment of common bile duct stone if performed first, is associated with longer procedural time.

**Keywords:** choledocholithiasis; cholelithiasis; endoscopic retrograde cholangiopancreatography; laparoscopic cholecystectomy.

### INTRODUCTION

Incidence of concomitant cholelithiasis and choledocholithiasis is about 10%-20%, the management of which is controversial.<sup>1</sup> Pre-operative Endoscopic Retrograde Cholangiopancreatography (ERCP) followed by Laparoscopic cholecystectomy (LC) is the most common strategy since 1990, worldwide.<sup>2</sup> It is a two stage procedure associated with some organizational and technical problems as it is done by different team

at different time.<sup>3</sup>

In our center, ERCP is performed by surgeons in operating room (OR) set up. So, we combine LC with

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ERCP in the same sitting with same general anesthesia to deal concomitant CBD stone at once.

In this study, we have tried to see the feasibility and outcome of the procedure in our setup.

## METHODS

This is a prospective cross-sectional study, carried out in the department of surgery, Kathmandu Medical College since April 2013 till Aug 2016. The ethical approval was taken from IRC-KMC. The patients who were diagnosed as having gall bladder stone as well as common bile duct stones were given the options for different modality of management available in our unit like, single stage open surgery, single stage laparoscopic surgery, two stage ERCP and LC and single stage LC and ERCP. Those who were treated with laparoscopic cholecystectomy(LC) and endoscopic retrograde cholangiography (ERCP), endoscopic sphincterotomy (ES) and stone extraction in the same sitting are included in the study.

After taking informed consent, required patient's investigation were sent. Complete blood count (CBC), coagulation profile, grouping, renal function test (RFT), Liver function Test (LFT), Viral profile for hepatitis C, hepatitis B and Human immunodeficiency(HIV), Chest X-ray(CXR), Electrocardiogram (ECG) were done routinely in every patient. Initial mode of diagnosis of choledocholithiasis is Ultrasonogram (USG) at least done in our institute. Additional investigation like Echocardiogram (ECHO), Pulmonary function test (PFT), Magnetic Resonance Cholangio-pancreatogram (MRCP) and Computed Tomography (CT) were done according to the indication of the patient's disease and co-morbidities.

All patients received General anaesthesia. They were intubated with flexo-metallic tube. Some cases underwent LC first approach. In them, LC was performed in supine position, all with 3 ports. After the ports were closed, patient were turned to semi-prone position and ERCP, Endoscopic Sphincterotomy (ES) was performed and stones were extracted. Stone clearance was checked with completion cholangiogram at the end of the procedure in all cases. Those cases who underwent ERCP first approach, after completing the endoscopic procedure in semi-prone, they were turned up and LC performed with 3 ports.

At the end of endoscopic procedure, stenting of CBD with appropriate sized plastic stent was done selectively according to the surgeon's choice. Patients demographics, pre-operative findings, ERCP time (duration from insertion of duodenoscope to extraction of stones), LC time (duration from skin incision to skin closure) , total operating time (duration from the time of intubation to extubation), difficulties during procedures, complications, need of repeat ERCP and hospital stay period were recorded. Serum amylase was evaluated at 24hours and USG was performed before discharge to evaluate post-operative effects.

## RESULTS

During this period, 50 cases were attempted. Majority were females 36 (72%) and 14 (28%) were male. Size of common bile duct and stones as reported in USG. Duration for different events in operative procedures for single stage management of concomitant CBD stones and cholelithiasis as well as postoperative amylase in day1 (Table 1).

**Table 1. Pre-, per-, and post-operative parameters.**

	Number of cases	Minimum	maximum	Mean $\pm$ SD
Age (years)	50	18	65	39.48 $\pm$ 12.85
CBD diameter (cm) (Pre-Op USG)	50	5.5	15.6	11.43 $\pm$ 2.63
Stone Size(cm) (Pre-Op USG)	50	5	12.5	7.99 $\pm$ 2.01
ERCP cannulation time (minutes)	45	0.17	30	8.70 $\pm$ 9.81
Total ERCP and stone extraction	45	15	90	43.80 $\pm$ 19.56
Laparoscopic cholecystectomy Duration Time(minutes)	48	28	60	44.65 $\pm$ 9.0
Total procedural time (minutes)	45	45	180	90.93 $\pm$ 33.68
Post-Operative amylase day 1.	48	23	3047	297.31 $\pm$ 511.65
Hospital stay	50	3	21	4.56 $\pm$ 3.16

*Note: CBD=common bile duct; Cm=centimeter;USG=Ultrasonogram; Pre-Op= Preoperative;SD= Standard deviation*

Out of 50 cases, both the procedure could be performed in 48 patients, two patients had to be converted to open. In both of them, ERCP was attempted first

which failed, in one patient due to pyloric stenosis, the procedure was completed by open cholecystectomy and choledocholithotomy and in another because

of failure to cannulate despite prolonged attempt. The second patient was converted to laparoscopic procedure. The laparoscopic procedure also failed due to inability to visualize the Calot's triangle because of distended bowel loops. Then the patient was converted to open surgery which too was difficult. None of the other cases were converted to open due to failure to perform LC whether performed prior to ERCP or after ERCP. Out of 48 patients, both procedures LC and ERCP was successful in single sitting in 45 cases only. In three patients, LC was performed but ERCP failed due to failure to cannulate common bile duct. In all of these three patients, ERCP could be performed in subsequent attempt. Majority of patients underwent LC first followed by ERCP. Findings are given in table 2.

In table 3, we have compared common bile duct size with cannulation time, which does not show much difference. The cannulation time, we have measured, is the time taken to successful guide wire insertion into the CBD from starting to cannulate the papilla by sphincterotome tip. In table 4, We also compared the timing of LC whether prior to ERCP or after ERCP with LC time total procedural time for both the procedures.

Complications were observed in 7 cases. All of them were managed conservatively and successfully (Table 2). Duodenal perforation was suspected in one case when small amount of contrast extravasation was seen. Probably a small puncture was occurred in retroperitoneal portion of duodenum during ERCP needle knife sphincterotomy. The procedure was abandoned and patient was managed conservatively. The patient's condition was quite stable with no features of peritonitis and sepsis. She was started on oral feeds in second day. As the condition was stable, next attempt was done after four days, papilla was open due to previous needle knife sphincterotomy, so easy cannulation and stone extraction was successful. Three cases developed cholangitis, two of them had tiny liver abscesses as well, which were managed with conservative treatment.

Retained stones were observed in 7 cases during post-operative USG. Only, four of them needed subsequent ERCP, three in our center and one in center outside, whereas three of them were free of stone after follow-up in one week.

**Table 2. Procedure related findings.**

Number of Stones(n = 50)	single	21 (42%)
	Multiple	29 (58%)
Timing of laparoscopic cholecystectomy (n = 48)	Prior to ERCP	32 (66.7%)
	After ERCP	16 (33.3%)
Pre-cut for ERCP (n = 49)	Yes	11 (22.4%)
	no	38 (77.5%)
Stenting (n = 45)	Yes	36 (80%)
	No	9 (20%)
Retained stones(n = 47)	Yes	7 (14.9%)
	No	40 (85.1%)
Re- ERCP(n = 48)		4 (0.8%)
Conversion to open(n = 50)		2 (4%)
Complications (n = 48)	cholangitis	2 (4.2%)
	Duodenal perforation (suspected)	1 (2.1%)
	Pancreatitis (n = 4)	mild 3 (6.3%)
		Severe 1 (2.1%)

**Table 3. Relation of ERCP cannulation time with size of CBD.**

Total number of cases	Size of CBD (USG or MRCP)	Number of cases	Cannulation time(mean $\pm$ SD)	P= value (fischer's exact test)
45	< 1cm	11	7.11 $\pm$ 7.67	0.415
	> 1cm	34	9.24 $\pm$ 10.41	

**Table 4. Relation of Timing of LC with total operating time.**

Total number of cases = 45	Timing of LC	Number of cases	LC time in minutes(Mean $\pm$ SD)	P= value (fischer's exact test)	Total operating time in minutes (Mean $\pm$ SD)	P= value (fischer's exact test)
	LC prior to ERCP	29	43.47 $\pm$ 8.74	0.028	87.14 $\pm$ 32.76	0.009
	LC after ERCP	16	47 $\pm$ 9.35		97.81 $\pm$ 35.31	

*n=number of cases, SD=standard deviation.*

## DISCUSSION

Management of concomitant cholelithiasis and choledocholithiasis is still a confusion regarding proper way because there is no consensus on correct strategy. There is availability of many therapeutic options including laparoscopic, endoscopic, percutaneous and open traditional techniques, either through a combination of these procedures or by conducting them in a stepwise sequence.<sup>4</sup> Earlier, the standard treatment for the patient with concomitant choledocholithiasis and cholelithiasis was open cholecystectomy and CBD exploration<sup>5</sup> which is now mostly replaced by ERCP at most centers as single stage open procedure was considered to be associated with unacceptable mortality and morbidity and by some, this procedure was proposed to abandon in 1970s.<sup>2,6-8</sup> Contrary to this, conventional open cholecystectomy and choledochotomy with stone extraction and closure over T-tube or primary closure of choledochotomy still has good results where minimally invasive facilities are not available.<sup>9</sup> The open approach is sometimes unavoidable in the circumstances like intraoperative unexpected diagnosis of choledocholithiasis with CBD dilatation or where all other endoscopic, per-cutaneous and laparoscopic approaches fail. In modern day, Open approach remains the 'gold standard' for some selected patients such as those with Mirizzi syndrome, Billroth II anatomy and those requiring a drainage procedure.<sup>10,11</sup> Chocrane review of 16 RCTs in 2013 showed no significant difference in the mortality and morbidity between open surgery Vs ERCP for clearance of CBD stone. However, there were fewer incidence of retained stones in open surgery group.<sup>12</sup>

In last 30 years, there has been a major development in the management of gall stone related diseases. There has been wide availability of ERCP as routine procedure and laparoscopic cholecystectomy has replaced open approach as well as use of laparoscopic exploration of common bile duct (LCBDE) as per the need. Single stage LCBDE is an alternative approach and LCBDE has been found to be superior to open surgery in terms of efficiency, morbidity and mortality. Along with it, new imaging techniques such as magnetic resonance cholangiography (MRC) and endoscopic ultrasound (EUS) are being used to accurately visualize the biliary system without instrumentation of the ducts.<sup>2,13,14</sup> Initially, when CBD exploration was performed by laparotomy, prospective randomized trials did not show the superiority of pre-operative endoscopic techniques over open CBD surgery for stones.<sup>15,16</sup> With the rapid popularity of laparoscopic cholecystectomy, there was growing interest of laparoscopic common bile duct exploration, indeed. Because of an obvious lack of expertise in laparoscopic surgery, surgeons elected to detect and treat CBD stones pre-operatively

by ERCP and ES since, they considered LCBDE as an unduly, complex, and demanding procedure. But the endoscopic approach requires several sessions of anesthesia and cumulates the risk of ES and LC along with the increased operative cost.<sup>17,18</sup> Concomitant LC and LCBDE, whether transcystic or transcholedochal is an excellent option of single strategy associated with additional benefits of cost and hospital stay but the acceptance is far off due to steep learning curve and the meta-analysis is unable to show significant difference in clinical outcome in comparison to ES followed by LC group.<sup>19-22</sup>

The reported incidence of CBD stones found during laparoscopic cholecystectomy ranges from 3-10%.<sup>23,24</sup> It is unclear whether an asymptomatic choledocholithiasis requires treatment. Furthermore, it is well established that small stones may pass through the ampulla of Vater spontaneously.<sup>25</sup> Moreover, it is not clear what stone size precludes trans-papillary migration in to the duodenum and no any criteria to predict and recommend the treatment method to treat CBD stone whenever detected.<sup>26</sup> With the development of laparoscopic and endoscopic techniques, many alternative treatments options are available for concomitant cholelithiasis and choledocholithiasis. This has been observed in the study from Sweden reporting a 'paradigm shift' from open choledochotomy and cholecystectomy toward bile duct clearance using the endoscopic route and selective laparoscopic cholecystectomy in patients with concomitant cholelithiasis and choledocholithiasis.<sup>27</sup> ERCP is preferred approach in most centers for management of CBD stones however it is associated with pertinent complications like pancreatitis, hemorrhage, cholangitis, duodenal perforation and mortality.<sup>7</sup> Failure of ERCP is mentioned to be around 5-10%.<sup>4</sup> We also observed the similar experience in our series, two patients needed to be converted to open, three needed two sittings to complete the procedure and other four needed re-ERCP, three in our center and one in other center for retained stone. There were complications including cholangitis and pancreatitis including liver abscess and severe acute pancreatitis (Table 2). All of these problems were related to endoscopic procedure. It is probably because the procedure inherits the complication and being surgeons we have less experience in endoscopic technique in comparisons to laparoscopic surgery as well.

Timing of LC following the ERCP is another issue. The early laparoscopic cholecystectomy after ERCP and ES for concomitant cholelithiasis and choledocholithiasis in observational and randomized studies have found to have better outcome if performed within 72 hours in comparison to delayed approach. The reasons given to this benefits are cost of repeated hospital admission,

passage of another gallstone into the common bile duct during the waiting periods, and the ERCP induced peri-choledochal inflammation causing subsequent laparoscopic cholecystectomy more difficult.<sup>3,27-30</sup> If these are the reasons, "same sitting policy", which we do, is definitely more better than the "same hospital admission policy". Various ways of "same sitting policy" have been observed like complete laparoscopic approach, endoscopic and laparoscopic approach and Rendezvous technique (helping laparoscopic method to cannulate CBD for endoscopic clearance). Various studies performed with the comparisons between two procedures, ERCP followed by laparoscopic cholecystectomy with same sitting laparoscopic CBD exploration has shown no significant difference but cost effective associated with shorter hospital stay in single stage technique.<sup>21</sup>

Laparoscopic cholecystectomy with endoscopic treatment of CBD stones are although two procedures but are performed in various combinations together like preoperative ERCP followed by laparoscopic cholecystectomy, Laparoscopic cholecystectomy followed by ERCP, intraoperative ERCP and laparoscopic cholecystectomy. Laparoscopic cholecystectomy followed by ERCP creates problem with decision making if ERCP fails and requires open or laparoscopic procedures. The most favored method is ERCP followed by laparoscopic cholecystectomy worldwide. This is two step procedure mostly performed by separate group of clinicians, endoscopist and laparoscopic surgeon in separate setup in different time.<sup>10</sup> Basic purpose of our study is to evaluate the feasibility of single stage management of concomitant cholelithiasis and choledocholithiasis. Theoretically, if both the procedures can be performed in single sitting, it saves time, money and physical exhaustion to the patients specially in the country like ours where people come from remote areas to the cities to seek medical care for these problems.

In our center, author (MRJ) as being laparoscopic surgeon, also performs ERCP in operating room using C-arm instead of fluoroscopy. So, the two procedures, laparoscopic cholecystectomy and on table ERCP and ES are combined and performed by the same surgeon or group of surgeons. Whether to perform ERCP first or laparoscopic cholecystectomy first was matter of debate initially. ERCP first approach is theoretically better approach because if ERCP fails, LC and LCBDE can be performed changing the patients position in the same sitting. But this procedure created some

problems in our experience. After ERCP, there was bowel insufflation and distension impairing the visibility of Calot's triangle while performing LC specially when ERCP took long time. In one occasion, we had to convert to open procedure and this too was difficult due to excessive bowel distension. Then we started to perform LC first and majority of the cases were performed by LC first approach. In table 3 we compared the two approaches and has found strong benefit of LC first method in relation to time taken to complete the LC as well as total operating time. This reflects the procedural difficulty when ERCP done first. To avoid this problem, early abandonment of ERCP and switching over to LCBDE before excessive bowel distension could be done. We think there is a need of formal large scale comparative study to address this issue. We also compared the dilatation of CBD with ERCP cannulation time but did not find it as a determining factor for the easy cannulation (Table 3) contrary to common belief that cannulation is easier when the duct is dilated.<sup>31</sup>

## CONCLUSIONS

Performing ERCP and ES in the same sitting with laparoscopic cholecystectomy is possible, safe and beneficial in our setup provided the surgeons perform ERCP themselves or the ERCP team available in OR. Whether to perform ERCP first or laparoscopic cholecystectomy first requires further comparative study as both the procedures have advantages and disadvantages on either side. Having the complete armamentarium starting from open approach to minimally invasive approach like ERCP and laparoscopic common bile duct exploration in operating room helps to select the right procedure for the individual patients with unique problems in the same sitting as a complete package for the management of common bile duct stone. In case of failure, switching over to another suitable procedure ensures the maximum benefit to the patient in the same sitting, provided the safety of patient is taken care as a prime importance.

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## REFERENCES

- Ko CW, Lee SP. Epidemiology and natural history of common bile duct stones and prediction of disease. *Gastrointest Endosc* [Internet]. 2002 Dec ;56(6 Suppl):S165-9. [Full Text]
- Williams EJ, Green J, Beckingham I, Parks R, Martin D, Lombard M, et al. Guidelines on the management of common bile duct stones (CBDs). *Gut* [Internet]. 2008 Feb 27;57(7):1004-21. [PubMed]
- McAlister VC, Davenport E, Renouf E. Cholecystectomy deferral in patients with endoscopic sphincterotomy. McAlister V, editor. *Cochrane database Syst Rev* [Internet]. Chichester, UK: John Wiley & Sons, Ltd; 2007 Oct 17;(4):CD006233. [Full Text]
- Ammar SA, Bar MA, Shafy M El. Laparoscopic Cholecystectomy after Endoscopic Retrograde Cholangiopancreatography: The Optimal Timing for Operation. *World J Laparosc Surg* [Internet]. 2014;7(2):69-73. [Full Text]
- Bansal VK, Misra MC, Garg P, Prabhu M. A prospective randomized trial comparing two-stage versus single-stage management of patients with gallstone disease and common bile duct stones. *Surg Endosc* [Internet]. 2010 Aug 5;24(8):1986-9. [Full Text]
- Wills VL, Gibson K, Karihaloot C, Jorgensen JO. Complications of biliary T-tubes after choledochotomy. *ANZ J Surg* [Internet]. 2002 Mar;72(3):177-80. [PubMed]
- Coelho-Prabhu N, Shah ND, Van Houten H, Kamath PS, Baron TH. Endoscopic retrograde cholangiopancreatography: utilisation and outcomes in a 10-year population-based cohort. *BMJ Open* [Internet]. 2013 May 31;3(5):e002689. [PubMed]
- Pitt HA. Role of open choledochotomy in the treatment of choledocholithiasis. *Am J Surg* [Internet]. 1993 Apr;165(4):483-6. [PubMed]
- Ambreen M, Shaikh AR, Jamal A, Qureshi JN, Dalwani AG, Memon MM. Primary closure versus T-tube drainage after open choledochotomy. *Asian J Surg* [Internet]. 2009 Jan;32(1):21-5. [Full Text]
- Bencini L, Tommasi C, Manetti R, Farsi M. Modern approach to cholecysto-choledocholithiasis. 2014;6(2):32-40. [Full Text]
- Phillips EH, Toouli J, Pitt HA, Soper NJ. Treatment of Common Bile Duct Stones Discovered during Cholecystectomy. *J Gastrointest Surg* [Internet]. 2008 Apr 5;12(4):624-8. [PubMed]
- Dasari BV, Tan CJ, Gurusamy KS, Martin DJ, Kirk G, McKie L, et al. Surgical versus endoscopic treatment of bile duct stones. In: Dasari BV, editor. *Cochrane Database of Systematic Reviews* [Internet]. Chichester, UK: John Wiley & Sons, Ltd; 2013. p. CD003327. [PubMed]
- Grubnik V V, Tkachenko AI, Ilyashenko V V, Vorotyntseva KO. Laparoscopic common bile duct exploration versus open surgery: comparative prospective randomized trial. *Surg Endosc* [Internet]. 2012 Aug 21;26(8):2165-71. [Full Text]
- Sharma A, Dahiya P, Khullar R, Soni V, Baijal M, Chowbery PK. Management of common bile duct stones in the laparoscopic era. *Indian J Surg*. 2012 Jun;74(3):264-9. [PMC | DOI]
- P, Khullar R, Soni V, Baijal M, Chowbey PK. Management of common bile duct stones in the laparoscopic era. *Indian J Surg* [Internet]. 2012 Jun 19;74(3):264-9. [Full Text]
- Neoptolemos JP, Carr-Locke DL, Fossard DP. Prospective randomised study of preoperative endoscopic sphincterotomy versus surgery alone for common bile duct stones. *Br Med J (Clin Res Ed)* [Internet]. 1987 Feb 21;294(6570):470-4. [PubMed]
- Suc B, Escat J, Cherqui D, Fourtanier G, Hay JM, Fingerhut A, et al. Surgery vs endoscopy as primary treatment in symptomatic patients with suspected common bile duct stones: a multicenter randomized trial. *French Associations for Surgical Research. Arch Surg* [Internet]. 1998 Jul;133(7):702-8. [PubMed]
- Urbach DR, Khajanchee YS, Jobe BA, Standage BA, Hansen PD, Swanstrom LL. Cost-effective management of common bile duct stones: a decision analysis of the use of endoscopic retrograde cholangiopancreatography (ERCP), intraoperative cholangiography, and laparoscopic bile duct exploration. *Surg Endosc* [Internet]. 2001 Jan;15(1):4-13. [PubMed]
- Vecchio R, MacFadyen B V. Laparoscopic common bile duct exploration. *Langenbeck's Arch Surg* [Internet]. 2002 Apr 1;387(1):45-54. [Full Text]
- Hanif F, Ahmed Z, Samie MA, Nassar AHM. Laparoscopic transcystic bile duct exploration: the treatment of first choice for common bile duct stones. *Surg Endosc* [Internet]. 2010 Jul 1;24(7):1552-6. [PubMed]
- Topal B, Vromman K, Aerts R, Verslype C, Van Steenberghe W, Penninckx F. Hospital cost categories of one-stage versus two-stage management of common bile duct stones. *Surg Endosc* [Internet]. 2010 Feb 25;24(2):413-6. [Full Text]
- Bansal VK, Misra MC, Rajan K, Kilambi R, Kumar S, Krishna A, et al. Single-stage laparoscopic common bile duct exploration and cholecystectomy versus two-stage endoscopic stone extraction followed by laparoscopic cholecystectomy for patients with concomitant gallbladder stones and common bile duct stones: A randomized con. *Surg Endosc Other Interv Tech*. 2014;28(3):875-85. [PubMed]
- Poulose BK, Arbogast PG, Holzman MD. National analysis of in-hospital resource utilization in choledocholithiasis management using propensity scores. *Surg Endosc* [Internet]. 2006 Feb 9;20(2):186-90. [Full Text]
- Barkun JS, Barkun AN, Sampalis JS, Fried G, Taylor B, Wexler MJ, et al. Randomised controlled trial of laparoscopic versus mini cholecystectomy. The McGill Gallstone Treatment Group. *Lancet (London, England)* [Internet]. 1992 Nov 7;340(8828):1116-9. [PubMed]

25. Frazee RC, Roberts J, Symmonds R, Hendricks JC, Snyder S, Smith R, et al. Combined laparoscopic and endoscopic management of cholelithiasis and choledocholithiasis. *Am J Surg* [Internet]. 1993 Dec;166(6):702-5; discussion 705-6. [PubMed]
26. Acosta JM, Ledesma CL. Gallstone migration as a cause of acute pancreatitis. *N Engl J Med* [Internet]. 1974 Feb 28;290(9):484-7. [Full Text]
27. Smadja C, Helmy N, Carloni A. Management of common bile duct stones in the era of laparoscopic surgery. *Adv Exp Med Biol* [Internet]. Springer US; 2006;574:17-22. [Full Text]
28. Sandzén B, Haapamäki MM, Nilsson E, Stenlund HC, Oman M. Treatment of common bile duct stones in Sweden 1989-2006: an observational nationwide study of a paradigm shift. *World J Surg* [Internet]. 2012 Sep 19;36(9):2146-53. [Full Text]
29. Reinders JSK, Goud A, Timmer R, Kruijt PM, Kruijt PM, Witteman BJM, et al. Early laparoscopic cholecystectomy improves outcomes after endoscopic sphincterotomy for choledochocystolithiasis. *Gastroenterology* [Internet]. 2010 Jun;138(7):2315-20. [Full Text]
30. Zang J, Zhang C, Zhou H, Gao J. Early laparoscopic cholecystectomy after endoscopic common bile duct stone extraction: the experience from a developing country. *Surg Laparosc Endosc Percutan Tech* [Internet]. 2011 Apr;21(2):120-2. [Full Text]
31. Akaraviputh T, Rattanapan T, Lohsiriwat V, Methasate A, Aroonpruksakul S, Lohsiriwat D. A same day approach for choledocholithiasis using endoscopic stone removal followed by laparoscopic cholecystectomy: a retrospective study. *J Med Assoc Thai* [Internet]. 2009 Jan;92(1):8-11. [PubMed]
32. Usküdär O, Parlak E, Dişibeyaz S, Köksal AS, Çiçek B, Kılıç ZMY, et al. Major predictors for difficult common bile duct stone. *Turk J Gastroenterol* [Internet]. 2013;24(3):260-5. [PubMed]