Endoscopic retrograde cholangiopancreatography and laparoscopic cholecystectomy during the same session: Feasibility and safety

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Abstract

AIM: To explore the feasibility and safety of endoscopic retrograde cholangiopancreatography and laparoscopic cholecystectomy (LC) performed during the same session.

METHODS: Between July 2010 and May 2013, 156 patients with gallstones and common bile duct (CBD) stones were enrolled in this retrospective study. According to the sequence of endoscopic procedures and LC, patients were classified into two groups: in group 1, patients underwent endoscopic stone extraction and LC during the same session, and in group 2, patients underwent LC at least 3 d after endoscopic stone extraction. Outcomes of the endoscopic procedures and LC were compared between the two groups, respectively.

RESULTS: There were 91 patients in group 1 and 65 patients in group 2. The characteristics of the two groups were similar. The mean duration of the endoscopic procedures was 34.9 min in group 1 and 35.3 min in group 2. There were no significant differences in the success rate of the endoscopic procedures (97.8% for group 1 vs 98.5% for group 2), the total rate of endoscopic complications (4.40% for group 1 vs 4.62% for group 2) and CBD stone clearance rate (96.7% for group 1 vs 96.9% for group 2). Duration of LC was 53.6 min in group 1 and 52.8 min in group 2. There were no significant differences in the overall LC-related morbidity and postoperative hospital stay.

CONCLUSION: Endoscopic stone extraction and LC performed during the same session was feasible and safe in patients with gallstones and concomitant CBD stones.

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Key words: Cholecystectomy; Laparoscopic; Endoscopic; Therapy

Core tip: There is still controversy regarding the optimal therapeutic algorithm for patients with gallstones and concomitant common bile duct stones. Endoscopic retrograde cholangiopancreatography combined with laparoscopic cholecystectomy is an alternative technique. This study originated from a surgical team adept in the techniques of laparoscopy, duodenoscopy and choledochoscopy. The sample size in this study was larger than most current studies. We are confident that the outcomes from this study are more objective and helpful to the surgeons who manage gallstones and common bile duct stones during the same session.

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INTRODUCTION

Approximately 5% to 15% of patients with gallstones have concomitant common bile duct (CBD) stones[8]. As the debate on the optimal choice for these patients is ongoing, surgeons are often bewildered by the variety of therapies which have emerged in the minimally invasive era. Laparoscopic cholecystectomy (LC) combined with endoscopic clearance of CBD stones is an appropriate option. Early LC after endoscopic CBD stone extraction is currently considered a good algorithm[2-5]. Reports of endoscopic stone extraction and LC being performed during the same session have continued to rise since LC became the standard procedure for cholecystectomy[6,7]. Many efforts have been made to develop this type of combination and the results are encouraging[8-10].

If endoscopic stone extraction and LC are to be performed during the same session as routine practice, the feasibility and safety should be investigated objectively. In the present study, we compared this method with the current practice where LC is performed after endoscopic stone extraction. Our surgical team is adept in the techniques of laparoscopy duodenoscopy and choledochoscopy, and the indications for the use of these minimally invasive procedures were stricter and more objective. In addition, this study provided more details on the combination of laparoscopic and duodenoscopic therapy during the same session.

MATERIALS AND METHODS

In this retrospective study, 156 patients with gallstones and CBD stones underwent endoscopic stone extraction and LC performed by the same surgical team at Taizhou People’s Hospital (Taizhou, Jiangsu Province, China) between July 2010 and May 2013. The study was approved by our ethics committee, and written consent was obtained from each patient. After being informed about the related therapeutic maneuver, the patients chose the sequence of endoscopic procedure and LC. According to this sequence, the patients were classified into two groups: in group 1, patients underwent endoscopic stone extraction and LC during the same session, and in group 2, patients underwent LC at least 3 d after endoscopic stone extraction[8]. Dr. Zang JF, who has significant experience in manipulation of the duodenoscope, laparoscope and choleodochoscope, performed all main endoscopic and laparoscopic procedures in this study.

In group 1, general anesthesia with intubation from mouth was chosen in all patients. The endoscopic retrograde cholangiopancreatography (ERCP) procedure was performed with the patients in the prone position. A duodenoscope (TJF160R, Olympus, Japan) was inserted into the duodenal second segment via the mouth. A cholangiogram was carried out using C-arm X-ray (BV-Libra, Philips) and an endoscopic sphincterotomy (EST) was performed to extract the CBD stones. The stones were removed by basket or balloon catheter. Stones larger than 10 mm were removed using a mechanical lithotripter. A nasobiliary drain was inserted if there was a possibility of retained stones. This allowed sequential cholangiography and irrigation. Following ERCP, care was taken to remove all the gas from the stomach to facilitate LC. The patients were then placed in the reverse Trendelenburg position. LC was performed using the three trocar technique. A subhepatic drain was positioned if there was concern about the anatomy of the cystic duct and a danger of bleeding.

In group 2, patients underwent endoscopic stone extraction with general anesthesia by intubation. If there were no complications related to ERCP, LC was performed three d later. Otherwise, LC was delayed until the ERCP-related complications were successfully treated.

Statistical analysis

Medical records, endoscopic and operative reports were reviewed. The statistical data were analyzed using t test, Pearson’s χ2 or Fisher’s exact test. The results were analyzed using a statistical analysis program (SPSS 16.0). P < 0.05 was considered statistically significant.

RESULTS

Patients’ characteristics

The characteristics of the two treatment groups, including main pre-operative biochemical data, are shown in Table 1. No significant differences were identified with respect to age, gender and other medical conditions.

Outcomes of endoscopic procedures

During the same period, two patients undergoing ERCP in group 1 and one patient in group 2 converted to laparoscopic common bile duct exploration (LCBDE) due to unsuccessful bile duct cannulation. There was no significant difference in the success rate of endoscopic procedures (97.8% for group 1 vs 98.5% for group 2; Fisher’s exact test $P = 1.000$). The mean duration of endoscopic procedures was 34.9 min in group 1 and 35.3 min in group 2. Pancreatitis was observed in 2 patients in each group. EST-related hemorrhage occurred in one patient in group 1 and one patient in group 2. One patient in group 1 experienced cholangitis. The total rates of endoscopic complications were 4.40% in group 1 and 4.62% in group

| Table 1 Characteristics of the patients |
|-----------------------------------------|
| Characteristic                          | Group 1 ($n = 91$) | Group 2 ($n = 65$) |
| Age (yr)                                | 53.6 ± 8.7         | 55.3 ± 9.4         |
| Sex (male/female)                       | 32/59              | 17/48              |
| ASA (1 / II / III)                      | 63/23/5            | 12/4/19/49         |
| Diameter of CBD (mm)                    | 10.5 ± 2.6         | 11.2 ± 2.7         |
| Maximal diameter of CBD stone (mm)      | 6.4 ± 1.1          | 6.7 ± 1.3          |
| Bilirubin (μmol/L)                      | 37.3 ± 8.6         | 39.1 ± 9.2         |
| Alanine aminotransferase (U/L)          | 127.2 ± 43.5       | 119.5 ± 47.8       |
| Aspartate aminotransferase (U/L)        | 105.9 ± 32.7       | 109.8 ± 35.0       |
| Gamma glutamyl transpeptidase (U/L)     | 224.3 ± 63.3       | 233.1 ± 65.1       |

CBD: Common bile duct; ASA: American Society of Anesthesiologists.
2 (Fisher’s exact test, \( P = 1.000 \)). CBD stone clearance rates (96.7% for group 1 vs 96.9% for group 2; Fisher’s exact test \( P = 1.000 \)) were not significantly different. Complications of ERCP were treated conservatively. Outcomes of endoscopic procedures are shown in Table 2.

### Outcomes of laparoscopic cholecystectomy

Mortality was not observed in the treatment groups. Duration of surgery was 53.6 min in group 1 and 52.8 min in group 2 \( (P = 0.70) \). The overall LC-related morbidity (including conversion) was 3/91 in group 1 and 2/65 in group 2 (Fisher’s exact test, \( P = 1.000 \)). Bile duct injury was not observed in this study. The median time to flatus was 17.5 h in group 1 and 18.3 h in group 2 \( (P = 0.47) \). There was no significant difference in postoperative hospital stay between the groups \( (P = 0.27) \). The total length of hospital stay in group 1 was shorter than in that in group 2 \( (5.32 \pm 1.26 \text{ d in group 1 vs } 9.27 \pm 1.31 \text{ d in group 2, } P < 0.001) \). The outcomes of LC are shown in Table 2.

### DISCUSSION

As therapies for patients with gallstones and CBD stones are discussed in the current era of minimal invasion, biliary surgeons are required to master more techniques than ever before. Following the development of endoscopic techniques over the last three decades, these techniques have been confirmed as efficient and safe in the treatment of CBD stones. However, the diagnostic value of these methods in biliary diseases, especially benign diseases, has decreased markedly due to inherent invasion. Magnetic resonance choledangiopancreatography has gradually become an alternative and is considered to be a noninvasive diagnostic technique in biliary diseases\(^{[16-18]} \). ERCP combined with LC is widely used to treat gallstones with concomitant CBD stones. However, ERCP and LC are often performed by two separate surgical teams, which results in difficulties when these two procedures are carried out during the same session. In this study, ERCP and LC were performed by the same surgical team as a routine procedure. Therefore, the outcomes are more convincing and objective than many other reports\(^{[9,10]} \).

The feasibility of endoscopic CBD stone extraction and LC during the same session is a problem for surgeons. Although this protocol was proposed twenty years ago, only a few medical faculties have carried out this procedure. A likely reason for this is that there is no specific standard process to refer to. In addition, the technique is difficult, especially when choosing the patient’s position in ERCP and managing distension of the intestine due to air insufflation. Initially, patients were placed in the supine position. However, three problems forced us to change this: difficulty in locating the endoscopic tip in the second portion of the duodenum, trouble with positioning the papilla correctly and repeated interference due to liquid in the duodenal cavity. In our view and that of ElGeidie\(^{[13]} \), the disadvantages of the supine position advocated by Terruzzi et al\(^{[9]} \) may not be easily resolved due to the inherent anatomy of the papilla, which is located in the posterior medial duodenal wall. In comparison with the supine position, the prone position is our favored position which is optimal for cannulation of the papilla and obtaining good-quality radiographic images. Furthermore, the prone position provides a natural pressure due to the weight of the abdomen, restricting distension of the intestine. General anesthesia with tracheal intubation can reduce patients’ discomfort and make airway management easier. The only problem with the prone position was that it took operators a few minutes to change the patient’s position twice. In addition, we insufflated the least amount of air during ERCP and suctioned the duodenal and gastric cavity thoroughly at the end of ERCP. It is also important that endoscopists control the time of ERCP by prudent preoperative evaluation and exact intraoperative judgment, including optimal timing of conversion therapy. We selected patients in whom the maximal diameter of stones was less than 15 mm. Thus, the average duration of our endoscopic procedure was approximately 35 min. Using this protocol, ERCP was not an obstacle to subsequent LC if more attention was paid to the choice of patients and manipulation of ERCP.

The safety of the combination of laparoscopic and endoscopic techniques during the same session is also a focus of concern for surgeons. Currently, morbidity and mortality in endoscopic and laparoscopic procedures are very low with skilled operators. There are no disputes when LC and endoscopic CBD stone extraction are discussed. In the present study, there were no differences in complication rates and patients’ recovery between the two treatment groups, which demonstrated that this combination was safe. In order to reduce ERCP-related complications, many authors have used the laparo-endo-

### Table 2 Outcomes of endoscopic procedures, laparoscopic cholecystectomy

|                   | Group 1 (\( n = 91 \)) | Group 2 (\( n = 65 \)) |
|-------------------|------------------------|------------------------|
| **Endoscopic procedures** |                        |                        |
| Success rate      | 97.80%                 | 98.50%                 |
| Time (min)        | 34.9 ± 10.9            | 35.3 ± 9.7             |
| Complications     | 4.40%                  | 4.62%                  |
| Pancreatitis (n)  | 2                      | 2                      |
| Hemorrhage (n)    | 1                      | 1                      |
| Cholangitis (n)   | 1                      | 0                      |
| Nasobiliary drainage (n) | 11              | 8                      |
| CBD stone clearance | 96.70%                | 96.90%                 |
| **Laparoscopic cholecystectomy** |                    |                        |
| Operation duration (min) | 53.6 ± 12.1            | 52.8 ± 13.4            |
| Subhepatic drainage (n) | 6                | 5                      |
| Time to flatus (h) | 17.5 ± 6.7             | 18.3 ± 7.1             |
| Complications (n) |                        |                        |
| Infection         | 1                      | 1                      |
| Bleeding          | 1                      | 0                      |
| Conversion        | 1                      | 1                      |
| Hospital stay (d) |                        |                        |
| Postoperative     | 3.13 ± 0.96            | 2.95 ± 1.08            |
| Total (P > 0.01)  | 5.32 ± 1.26            | 9.27 ± 1.31            |

CBD: Common bile duct.
scopic rendezvous technique which was considered helpful in cannulation of the bile duct and preventing post-ERCP pancreatitis. However, this technique failed as the endoscopist performed ERCP with the patient in the supine position and the guidewire was unable to pass through the cystic duct. As proficient endoscopists, we regard the rendezvous technique as a transitional method and not the ultimate method. With the help of a guidewire and needle-knife, the overall success of bile duct cannulation was 97% and the mean time to bile duct access was 10 min according to our records. The rate of post-ERCP pancreatitis, which was mild in most patients, was 4% in our hospital. Direct ERCP during surgery is more likely to become the mainstream maneuver rather than the rendezvous technique. LC with endoscopic stone extraction during the same session could be considered a safe procedure as the rate of LC-related complications, including bile duct injury and conversion, was low in our hospital. This was consistent with our previous results which showed that the earlier LC is performed after the endoscopic procedure, the better the outcome will be.

With regard to same-session surgery for patients with concomitant gallstones and cholelithocholangitis, laparoscopic common bile duct exploration (LCBDE) is another good choice rather than the combination of duodenoscopy and laparoscopy. These techniques have similar primary ductal clearance rates and morbidity. Some studies have shown that LCBDE is more cost-effective and more beneficial in the preservation of papillary function than ERCP, although suffering due to T-tube placement is a major disadvantage. Difficulties in LCBDE include extraction of the CBD stone and suturing of the CBD incision. With regard to the indications for LCBDE and endoscopic stone extraction, a clear consensus has emerged although different surgeons have different opinions. A CBD with a diameter smaller than 8 mm is regarded as a contraindication to LCBDE. Similarly, large stones may be a barrier to duodenoscopy. Although endoscopic extraction of large stones (even 25 mm) has been reported, we prefer to perform LCBDE in these cases (stone diameter ≥ 15 mm). Laser lithotripsy by choledochoscopy in LCBDE may be more direct and easier for the management of large stones. For patients who were fit for both procedures, the final choice involved many aspects: patients’ desire, hospital resources, and surgeons’ technique. The long-term effects of endoscopic sphincterotomy include recurrent stones, cholangitis, and cholangiocarcinoma, however, current evidence may partly dispel these associations.

In conclusion, endoscopic stone extraction and LC performed during the same session is feasible and safe in patients with gallstones and concomitant CBD stones. We propose that surgeons mastering endoscopic and laparoscopic techniques may attempt this procedure. More objective studies including a comparison of this modality and LCBDE, especially the long-term effects, are urgently needed.

### COMMENTS

#### Background

Approximately 5% to 15% of patients with gallstones have concomitant common bile duct stones. The debate on the optimal treatment choice for these patients is ongoing, and surgeons are often bewildered by the variety of therapies emerging in the minimally invasive era. Endoscopic retrograde cholangiopancreatography (ERCP) and laparoscopic cholecystectomy (LC) performed during the same session have been reported in many studies with encouraging results. However, most available data have come from surgeons who have usually mastered one technique either ERCP or LC. Available studies on this combined therapeutic modality included small sample sizes.

#### Research Frontiers

Reports on endoscopic stone extraction and LC performed during the same session have continued to increase since LC became the standard procedure for cholecystectomy. If endoscopic stone extraction and LC are to be performed during the same session as routine practice, the feasibility and safety should be investigated. Although this protocol was proposed twenty years ago, no specific standard practice has been established. Mortality and mortality in both endoscopic and laparoscopic procedures are very low with skilled operators. The safety of combining laparoscopic and endoscopic techniques during the same session should be evaluated before it becomes a routine procedure.

#### Innovations and Breakthroughs

This method was compared with the method used in current practice, laparoscopic cholecystectomy after endoscopic stone extraction. Their surgical team is adept in the techniques of laparoscopy, duodenoscopy and choledochoscopy, and the indications for use of these minimally invasive procedures are stricter and more objective. In addition, this study provided more details on the combination of laparoscopic and duodenoscopic therapy during the same session.

#### Applications

The outcomes of this study are more objective for evaluating the effect of ERCP/LC on gallstones and concomitant common bile duct (CBD) stones. Also, it offers surgeons more choice when they want to manage gallstones and CBD stones during the same session.

#### Peer Review

ERCP and LC performed during the same session is a good choice for patients with gallstones and concomitant CBD stones. This study originated from a surgical team, which is adept in the techniques of laparoscopy, duodenoscopy and choledochoscopy. It is helpful for surgeons to manage gallstones and common bile duct stones during the same session.

### REFERENCES

1. Ko CW, Lee SP. Epidemiology and natural history of common bile duct stones and prediction of disease. *Gastrointest Endosc* 2002; 56: S165-S169 [PMID: 12447261]

2. Schiphorst AH, Besselink MG, Boerma D, Timmer R, Wiezer MJ, van Erpecum KJ, Broeders IA, van Ramshorst B. Timing of cholecystectomy after endoscopic sphincterotomy for common bile duct stones. *Surg Endosc* 2008; 22: 2046-2050 [PMID: 18270708 DOI: 10.1007/s00464-008-9764-8]

3. Salman B, Yilmaz U, Kereim M, Bedi A, Sare M, Sakra O, Tatlicioglu E. The timing of laparoscopic cholecystectomy after endoscopic retrograde cholangiopancreatography in cholelithiasis coexisting with cholecdocholithiasis. *J Hepatobiliary Pancreat Surg* 2009; 16: 832-836 [PMID: 19701600 DOI: 10.1007/s00535-009-0169-4]

4. Reinders JS, Goud A, Timmer R, Kruyt PM, Witteman BJ, Smakman N, Breumelhof R, Donkervoort SC, Jansen JM, Heisterkamp J, Grubben M, van Ramshorst B, Boerma D. Early laparoscopic cholecystectomy improves outcomes after endoscopic sphincterotomy for choledocholithiasis. *Gastroenterology* 2010; 138: 2315-2320 [PMID: 20261797 DOI: 10.1053/j.gastro.2010.02.052]

5. 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 Percutaneous Tech* 2011; 21: 120-122 [PMID: 21471806]
Laparoscopic cholecystectomy combined with endoscopic sphincterotomy and stone extraction or laparoscopic cholecystectomy and electrohydraulic lithotripsy for management of cholelithiasis. Surg Endosc 1992; 6: 10-15 [PMID: 1344571]

Deslandres E, Gagner M, Pomp A, Rheeault M, Leduc R, Clermont R, Gratton J, Bernard EJ. Intraoperative endoscopic sphincterotomy for common bile duct stones during laparoscopic cholecystectomy. Gastrointest Endosc 1993; 39: 54-58 [PMID: 8454146]

Enochsson L, Lindberg B, Swahn F, Arneko U. Intraoperative endoscopic retrograde cholangiopancreatography (ERCP) to remove common bile duct stones during routine laparoscopic cholecystectomy does not prolong hospitalization: a 2-year experience. Surg Endos 2004; 18: 367-371 [PMID: 14752630 DOI: 10.1007/s00464-003-9021-0]

Hong DF, Xin Y, Chen DW. Comparison of laparoscopic cholecystectomy combined with intraoperative endoscopic sphincterotomy and laparoscopic exploration of the common bile duct for choledochocholedocholithiasis. Surg Endos 2006; 20: 424-427 [PMID: 16395539]

La Greca G, Barbagallo F, Di Blasi M, Chisari A, Lombardo R, Bonacorso R, Latere S, Di Stefano A, Russello D. Laparoscopic “Rendezvous” to treat cholecysto-choledocholithiasis: Effective, safe and simplifies the endoscopist’s work. World J Gastroenterol 2008; 14: 2844-2850 [PMID: 18473408 DOI: 10.3748/wjg.14.2844]

Tekin A, Ogetman Z, Altunel E. Laparoendoscopic “rendezvous” versus laparoscopic antegrade sphincterotomy for choledocholithiasis. Surgery 2008; 144: 442-447 [PMID: 18707043 DOI: 10.1016/j.surg.2008.04.013]

Ghazal AH, Sorour MA, El-Riwini M, El-Bahrawy H. Single-step treatment of gall bladder and bile duct stones: a combined endoscopic-laparoscopic technique. Int J Surg 2009; 7: 338-346 [PMID: 19481184 DOI: 10.1016/j.ijsu.2009.05.005]

ElGeidee AA, ElShebary MM, Naem YM. Laparoscopic exploration versus intraoperative endoscopic sphincterotomy for common bile duct stones: a prospective randomized trial. Dig Surg 2011; 28: 424-431 [PMID: 22236538 DOI: 10.1159/000331470]

Jakobsen HL, Vilimann P, Rosenberg J. Endoscopic sphincterotomy for common bile duct stones during laparoscopic cholecystectomy is safe and effective. Surg Laparosc Endosc Percutan Tech 2011; 21: 450-452 [PMID: 22146170 DOI: 10.1097/SLE.0b013e31823bad9]

Tzovaras G, Baloyiannis I, Zachari E, Symeonidis D, Zacharoulis D, Kapsoritakis A, Paroutoplou G, Potamianos S. Laparoendoscopic rendezvous versus preoperative ERCP and laparoscopic cholecystectomy for the management of choleysto-choledocholithiasis: interim analysis of a controlled randomized trial. Ann Surg 2012; 255: 435-439 [PMID: 22261836 DOI: 10.1097/SLA.0b013e3182456eda]

Maccioni F, Martellini M, Al Ansari N, Kagarmanova A, De Marco V, Zippi M, Marini M. Magnetic resonance cholangiography: past, present and future: a review. Eur Rev Med Pharmacol Sci 2010; 14: 721-725 [PMID: 20707292]

Miao L, Fan ZN, Ji GZ, Wen W, Wang X, Xiong GY, Jiang GB, Wang M, Liu Z, Wu P. [Comparative study of ultrasound, magnetic resonance cholangiopancreatography and endoscopic retrograde cholangiopancreatography in common duct stones]. Zhonghua Wai Ke Za Zhi 2008; 46: 1465-1467 [PMID: 19094622]

Hekimoglu K, Ustdag Y, Yusak A, Erdem Z, Karademir B, Aydemir S, Gundogdu S. MRCP vs. ERCP in the evaluation of biliary pathologies: review of current literature. J Dig Dis 2008; 9: 162-169 [PMID: 18996595]

Terruzzi V, Radaelli F, Meucci G, Minoli G. Is the supine position as safe and effective as the prone position for endoscopic retrograde cholangiopancreatography? A prospective randomized study. Endoscopy 2005; 37: 1211-1214 [PMID: 16329019 DOI: 10.1055/s-2005-870511]

Noble H, Tranter S, Chesworth T, Norton S, Thompson M. A randomized, clinical trial to compare endoscopic sphincterotomy and subsequent laparoscopic cholecystectomy with primary laparoscopic bile duct exploration during cholecystectomy in higher risk patients with choledocholithiasis. J Laparoendosc Adv Surg Tech A 2009; 19: 713-720 [PMID: 19792866 DOI: 10.1089/lap.2008.0428]

Rogers SJ, Cello JP, Horn JK, Siperstein AE, Schecter WP, Campbell AR, Mackerse RC, Rodas A, Kreuel HT, Harris HW. Prospective randomized trial of LC+LCBDE vs ERCP/5+LC for common bile duct stone disease. Arch Surg 2010; 145: 28-33 [PMID: 20085751 DOI: 10.1001/archsurg.2009.226]

Topal B, Vromman K, Aerts R, Verslype C, Van Steenbergen W, Penninckx F. Hospital cost categories of one-stage versus two-stage management of common bile duct stones. Surg Endos 2010; 24: 413-416 [PMID: 19554369 DOI: 10.1007/s00464-009-0594-0]

Saito M, Tsuyuguchi T, Yamaguchi T, Ishihara T, Saisho H. Long-term outcome of endoscopic papillotomy for choledocholithiasis with cholecystolithiasis. J Gastroenterol 2005; 40: 1632-1637 [PMID: 15705353 DOI: 10.1251/jg.2005.06.012]

Arregui ME, Davis CJ, Arkush AM, Nagan RF. Laparoscopic cholecystectomy combined with endoscopic sphincterotomy and stone extraction or laparoscopic cholecystectomy and electrohydraulic lithotripsy for management of cholelithiasis. Surg Endosc 1992; 6: 10-15 [PMID: 1344571]

Maccioni F, Martellini M, Al Ansari N, Kagarmanova A, De Marco V, Zippi M, Marini M. Magnetic resonance cholangiography: past, present and future: a review. Eur Rev Med Pharmacol Sci 2010; 14: 721-725 [PMID: 20707292]

Miao L, Fan ZN, Ji GZ, Wen W, Wang X, Xiong GY, Jiang GB, Wang M, Liu Z, Wu P. [Comparative study of ultrasound, magnetic resonance cholangiopancreatography and endoscopic retrograde cholangiopancreatography in common duct stones]. Zhonghua Wai Ke Za Zhi 2008; 46: 1465-1467 [PMID: 19094622]

Hekimoglu K, Ustdag Y, Yusak A, Erdem Z, Karademir B, Aydemir S, Gundogdu S. MRCP vs. ERCP in the evaluation of biliary pathologies: review of current literature. J Dig Dis 2008; 9: 162-169 [PMID: 18996595]

Terruzzi V, Radaelli F, Meucci G, Minoli G. Is the supine position as safe and effective as the prone position for endoscopic retrograde cholangiopancreatography? A prospective randomized study. Endoscopy 2005; 37: 1211-1214 [PMID: 16329019 DOI: 10.1055/s-2005-870511]

Noble H, Tranter S, Chesworth T, Norton S, Thompson M. A randomized, clinical trial to compare endoscopic sphincterotomy and subsequent laparoscopic cholecystectomy with primary laparoscopic bile duct exploration during cholecystectomy in higher risk patients with choledocholithiasis. J Laparoendosc Adv Surg Tech A 2009; 19: 713-720 [PMID: 19792866 DOI: 10.1089/lap.2008.0428]

Rogers SJ, Cello JP, Horn JK, Siperstein AE, Schecter WP, Campbell AR, Mackerse RC, Rodas A, Kreuel HT, Harris HW. Prospective randomized trial of LC+LCBDE vs ERCP/5+LC for common bile duct stone disease. Arch Surg 2010; 145: 28-33 [PMID: 20085751 DOI: 10.1001/archsurg.2009.226]

Topal B, Vromman K, Aerts R, Verslype C, Van Steenbergen W, Penninckx F. Hospital cost categories of one-stage versus two-stage management of common bile duct stones. Surg Endos 2010; 24: 413-416 [PMID: 19554369 DOI: 10.1007/s00464-009-0594-0]

Saito M, Tsuyuguchi T, Yamaguchi T, Ishihara T, Saisho H. Long-term outcome of endoscopic papillotomy for choledocholithiasis with cholecystolithiasis. J Gastroenterol 2005; 40: 1632-1637 [PMID: 15705353 DOI: 10.1251/jg.2005.06.012]
