Laparoscopic Cholecystectomy *Versus* Open Cholecystectomy in Children

RAVIT RUANGTRAKOOL, M.D.*, MONGKOL LAOHAPENSANG, M.D.*,
AKKRAPOL MUNGNIRANDR, M.D.*, CHANA SATHORNKICH, M.D.*

Abstract

Introduction: Laparoscopic cholecystectomy (LC) is well accepted as the standard cholecystectomy only in adult patients. However, the advantages of LC over open cholecystectomy have never been proved in pediatric patients because the number of pediatric cholecystectomies is limited as well as the faster ability of pediatric patients to resume their normal activity.

Material and Method: Retrospective study of 42 pediatric cholecystectomies (laparoscopic cholecystectomy (n = 8) (LCs), open cholecystectomy alone (n = 8) (OCs) and open cholecystectomy concomitant with splenectomy (n = 26)(OCs + S)) done in Siriraj University Hospital, Bangkok, Thailand between 1992 and 2000 was conducted.

Results: Statistical comparison revealed that LC was superior to OC in regard to diet resumption. LCs resumed soft diet on 1.38 days, whereas OCs and OCs + S could resume soft diet on 3.38 and 3.35 days respectively. The average length of hospitalization following LCs was significantly shorter than OCs' and OCs + S' ones (3.00 *vs* 8.38 and 4.85 days respectively). There was no morbidity and mortality in LCs, whereas two OCs and three OCs + S had complications.

Conclusion: In this preliminary study, laparoscopic cholecystectomy is a preferred method of cholecystectomy in children because it has a shorter post-operative interval of diet resumption and shortens hospitalization with minimal morbidity. However, this study has a limited number of patients and further study is still required to conclude the benefits of LC.

Key word : Cholecystectomy, Laparoscopic, Cholelithiasis, Gall Bladder, Child, Infant, Adolescence, Human, Retrospective Studies, Length of Stay, Treatment Outcome

RUANGTRAKOOL R, LAOHAPENSANG M, MUNGNIRANDR A, SATHORNKICH C
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* Division of Pediatric Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

In children, cholecystectomy is quite a rare operation because the number of children who have gall stones is limited. Previously published literature which compared laparoscopic cholecystectomy and traditional cholecystectomy were mainly conducted in adult patients. Only a few published studies, confined only to pediatric populations, had enough patients to elucidate the advantages of laparoscopic cholecystectomy and most of the series had less than 60 cholecystectomy cases.

Although these advantages were clearly demonstrated in adults, laparoscopic cholecystectomy has been questioned in children because children recover from any abdominal operations faster than adults. Much of the literature revealed that laparoscopic cholecystectomy decreased pain and ileus after surgery and shortened hospitalization in the pediatric age group. However, these studies were conducted without any comparison with the traditional cholecystectomy[1-6]. Therefore, the aim of this study was to investigate the certain advantages of laparoscopic cholecystectomy compared to the traditional cholecystectomy in children.

MATERIAL AND METHOD

This was a retrospective study of 42 children under the age of 16 who had cholecystectomy done in Siriraj University Hospital, Bangkok, Thailand between March 1992 and November 2000. The authors collected data: indications of cholecystectomy, underlying diseases, investigative findings, operative techniques of cholecystectomy, intraoperative findings, post-operative dates of resuming oral fluid and oral diet, post-operative length of hospitalization, complications and pathological findings from the medical records.

Laparoscopic cholecystectomy was attempted on nine patients. Unfortunately, one laparoscopic cholecystectomy failed from bleeding and converted into open cholecystectomy. According to this study, this case was classified as the "open cholecystectomy" group. Six patients had splenectomy done before cholecystectomy was planned. Another 26 patients had open cholecystectomy concomitant with splenectomy. In order to rule out the effects of splenectomy procedure on the post-operative outcome of cholecystectomy, the patients were separated into three groups (laparoscopic cholecystectomy alone (n = 8) (LCs), open cholecystectomy alone (n = 8) (OCs) and open cholecystectomy concomitantly combined with splenectomy (n = 26)(OCs+ S)) and the outcomes of each group were compared. The differences of the post-operative intervals to resume oral fluid, soft diet, and the post-operative length of hospitalization were statistically evaluated by the Student's *t* test. The statistical significance was p value < 0.05.

RESULTS

Eight consecutive laparoscopic cholecystectomies (LCs) were compared with 8 open cholecystectomies (OCs) and 26 open cholecystectomies concomitant with splenectomy (OCs + S).

In all groups, thalassemia was the most common underlying disease leading to gall stones which required cholecystectomy. Symptomatic gallstone was the main indication of cholecystectomy in LCs as was OCs. In the open cholecystectomy concomitant with splenectomy, cholecystectomy was mainly conducted to remove asymtomatic gallstones. The information of underlying diseases and indications of cholecystectomy are revealed in Table 1.

Forty of all 42 cases revealed gall stone(s) in the ultrasonographic finding of gall bladder. One case of OCs had acalculous cholecystitis and one case of OCs + S had only bile sludge. Common bile duct dilatation was found in four patients, two in the OCs group and the other two in the OCs + S group. Two cases of OCs+S were suspected to have bile duct stones by pre-operative ultrasonography. Intraoperative cholangiogram was performed in one LCs, one OCs, and three OCs + S respectively. Each LCs and OCs who required an intraoperative cholangiogram, had no bile duct stone. Of three OCs + S patients who had intraoperative cholangiogram done, one case with a history of obstructive jaundice had a normal cholangiogram, whereas, the other two showed questionable intraoperative cholangiograms. From these two cases, bile duct stone was missed in one case and a retained common duct stone was found later, whereas, the common bile duct was explored and no bile duct stone was found in another one. Drains were inserted in two OCs and one OCs + S.

All LCs had no complications and the average intervals to resume oral fluid and soft diet were 1.13 and 1.38 days respectively. LCs had more advantages than OCs and OCs + S; LCs could resume earlier oral fluid ($p < 0.05$) and an earlier soft diet ($p < 0.05$) than the OCs and OCs + S. The average post-operative length of hospitalization of

Table 1. The information of underlying diseases and indications of cholecystectomy.

	LCs (n = 8)	OCs (n = 8)	OCs + S (n = 26)
Male / Female	4/4	2/6	11/15
Age ± SD (years)	10.4 ± 4.1	9.3 ± 5.7	8.8 ± 3.0
Weight ± SD (Kgs)	29.8 ± 9.0	26.5 ± 18.6	21.7 ± 5.1
Underlying diseases			
Thalassemia	7	5	24*
Hereditary spherocytosis	0	0	2
Miscellaneous	1**	3***	0
Splenectomy before cholecystectomy	4	2	0
Indication of cholecystectomy			
Uncomplicated cholecystectomy			
Asymtomatic gall stone	0	1	17
Abdominal pain with jaundice	3	3	3
Abdominal pain without jaundice	3	1	1
Interval cholecystectomy	1	1	2
Complicated cholecystectomy			
Acute cholecystitis	1	1	0
Acute cholangitis	0	0	1
Asymtomatic CBD stone	0	0	1
Obstructive jaundice	0	0	1
Miscellaneous	0	1****	0

* 2 thalassemia with AIHA
** No underlying disease
*** Included acute myeloblastic leukemia, delayed development caused?, Staphylococcal liver abscess S/P drainage
**** Source of pyogenic Staph liver abscess (2 months)

LCs was 3.00 days which was statistically significantly less than OCs and OCs + S. Fifteen per cent of all open cholecystectomies (5/34) had complications. Two OCs patients had post-operative complications. One had post-operative sepsis and the other required prolonged enteral feeding from severe malnutrition. Three OCs + S also had some morbidity. One each developed paralytic ileus, acute cholangitis and retained common duct stone. The average intervals to resume oral fluid and soft diet of the OCs were 2.63 and 3.38 days respectively compared to the average intervals to resume oral fluid and soft diet of OCs + S which were 2.42 and 3.35 days respectively. These data indicated that concomitant splenectomy had a minimal effect on the recovery period of open cholecystectomy.

In order to answer the question whether the slower ability to resume oral diet was due to the higher complication rates of OCs and OCs + S, all patients who had any post-operative complications had to be excluded. When all complicated patients were excluded, it was found that the average intervals to resume oral fluid and oral diet of OCs and OCs + S were 2.17, 2.83 and 2.17, 3.09 days respectively, which were all statistically more significant than LCs. The data revealed that open cholecystectomy (whether combined with splenectomy or not) had a slower recovery. This phenomenon did not belong to the higher complications but from the procedure itself.

Average post-operative lengths of hospitalization of LCs, OCs and OCs + S were 3.00, 8.38 and 4.85 days respectively. When all complicated cases were excluded, average post-operative length of hospitalization of LCs, OCs and OCs + S were 3.00, 5.33 and 4.43 days respectively. LCs required

Table 2. Post-operative results and complications.

	LCs (n = 8)	OCs (n = 8)	OCs + S (n = 26)
Postoperative interval to resume diet			
All cases (mean ± SD) (days)	(n = 8)	(n = 8)	(n = 26)
Liquid diet	1.13 ± 0.35	2.63 ± 1.30*	2.42 ± 2.28*
Soft diet	1.38 ± 0.52	3.38 ± 1.69*	3.35 ± 2.21*
Uncomplicated cases (mean ± SD) (days)	(n = 8)	(n = 6)	(n = 23)
Liquid diet	1.13 ± 0.35	2.17 ± 0.98*	2.17 ± 2.06*
Soft diet	1.38 ± 0.52	2.83 ± 0.98*	3.09 ± 2.09*
Length of hospitalization			
All cases (mean ± SD) (days)	3.00 ± 0.76	8.38 ± 5.95*	4.85 ± 2.88*
Uncomplicated cases (mean ± SD) (days)	3.00 ± 0.76	5.33 ± 1.63*	4.43 ± 2.48*
Complications	(n = 0)	(n = 2)	(n = 3)
Prolonged enteral feeding	0	1	0
Sepsis and febrile neutropenia	0	1	0
Paralytic ileus	0	0	1
Postoperative cholangitis	0	0	1
Retained CBD stone	0	0	1

* $p < 0.05$ comparing to corresponding data of LCs group

less post-operative hospitalization than OCs and OCs + S with statistical significance. The details of post-operative results of each category are classified in Table 2.

DISCUSSION

Cholecystectomy is not a common operation in paediatric populations. Although much of the literature emphasizes the advantages of laparoscopic cholecystectomy which include a less painful post-operative period with a faster recovery and a shorter hospitalization, there has been no comparison with the standard cholecystectomy[1,4,5,7].

In the present study, statistical comparison showed that LC was superior to OC in regard to diet resumption. LC patients resumed oral fluids and a soft diet on 1.13 and 1.38 days respectively, whereas OCs and OCs + S could resume oral fluids on 2.63 and 2.42 days and tolerated a soft diet on 3.38 and 3.35 days respectively. In our study, LCs had the same percentage of acute cholecystitis compared to OCs. It implied that the faster post-operative diet resumption of LC was derived from the procedure itself and not from its less complicated condition. OCs and OCs + S had more complication rates than LCs. In order to answer whether the faster intervals to resume diet of LCs might be derived from its lower complication rate, further detailed study is needed on all uncomplicated cases. It was found that LCs still resumed a soft diet faster than OCs and OCs + S (1.38 *vs* 2.83 and 3.09 days respectively) when five cases who had complications were excluded. Faster diet resumption of LCs was also revealed in Lugo-Vicente's series[8].

In the present study, the mean length of hospitalization of all cases after LCs was significantly shorter than OCs and OCs + S (3.00 *vs* 8.38 and 4.85 days respectively). Some arguments were raised that it might be the effect of higher complication rates of OCs and OCs+S. When all complicated cases of OCs (n=2) and OCs + S (n=3) were excluded, it was found that the average length of hospitalization of uncomplicated cases after LCs was significantly shorter than that of OCs and OCs + S (3.00 *vs* 5.33 and 4.43 days respectively). These data indicated that LC was superior to OC in regard to length of stay which was the same as previously published in comparative studies[8-12]. Although the average operative cost per LC was significantly more expensive than for OC, the ultimate cost of LC was significantly less than OC, because the total period of hospitalization was much shorter[9,10].

Laparoscopic cholecystectomy decreased pain after surgery. The average post-operative parenteral analgesia required for LC was significantly less than for OC[9,10].

When LC was first introduced for cholecystectomy in children, it was contraindicated to remove the gall bladder with complications of cholelithiasis such as common duct obstruction and gallstone pancreatitis[4]. At that time, an intraoperative cholangiography and a procedure to explore the common bile duct and to remove CBD stone during LC were difficult. Until endoscopic retrograde cholangiopancreatography (ERCP) in children had been developed, LC could be performed although choledocholithiasis was suspected (a dilated CBD noted on ultrasound, elevated alkaline phosphatase, elevated total bilirubin of more than 5 mg/dL, history of pancreatitis, choledocholithiasis detected on ultrasound, either singly or in combination). These patients should undergo ERCP to confirm whether CBD stone was present and endoscopic sphincterotomy and stone extraction could be accomplished, before LC was planned[8,11,12,13].

Because ERCP in children also requires general anesthesia, the single-stage, intraoperative, combined laparoscopic-endoscopic approach has been developed to manage cholecysto-choledocholithiasis[3,14]. Bile duct stone was treated by intraoperative endoscopic retrograde sphincterotomy. If complete clearance of the ductal stones was not achieved endoscopically, two alternative strategies were available: management by laparoscopic transcystic common duct stone extraction[15] or an additional post-operative endoscopic procedure[3,14]. Routine intraoperative cholangiography is not an essential part of laparoscopic cholecystectomy in the presence of an efficient and safe ERCP service[16].

In the present study, 9 laparoscoopic cholecystectomies were attempted, however, one had to be converted to open cholecystectomy from uncontrolled bleeding. This patient eventually had a good outcome. There was no major morbidity or mortality in the LC group. OCs and OCs + S had much higher complication rates. One OC had post-operative sepsis and another one required prolonged enteral feeding. One each of OC + S had post-operative paralytic ileus, post-operative cholangitis and retained common duct stone respectively. Although the indications of cholecystectomy of LCs and OCs were nearly the same, LCs had a lower complication rate. Laparoscopic cholecystectomy was more successful because of its low intraoperative or post-operative complications[2,4,5,7,9,10].

In this preliminary study, laparoscopic cholecystectomy is a preferred method of cholecystectomy in children because it decreases ileus after surgery, shortens hospitalization with a minimal complication rate. However, this study has a limited number of patients and further study is still required to conclude the benefits of LC.

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REFERENCES

1. Kasirajan K, Obermeyer RJ, Kehris J, Lopez J, Lopez R. Microinvasive laparoscopic cholecystectomy in pediatric patients. J Laparoendosc Adv Surg Tech 1998; 8: 131-5.
2. Holcomb GW 3rd. Laparoscopic cholecystectomy. Semin Laparosc Surg 1998; 5: 2-8.
3. Rescorla FJ. Cholelithiasis, cholecystitis, and common bile duct stones. Curr Opin Pediatr 1997; 9: 276-82.
4. Holcomb GW 3d, Olsen DO, Sharp KW. Laparoscopic cholecystectomy in the pediatric patient. J Pediatr Surg 1991; 26: 1186-90.
5. Ware RE, Kinney TR, Casey JR, Pappas TN, Meyers WC. Laparoscopic cholecystectomy in young patients with sickle hemoglobinopathies. J Pediatr 1992; 120: 58-61.
6. Davidoff AM, Branum GD, Murray EA, et al. The technique of laparoscopic cholecystectomy in children. Ann Surg 1992; 215: 186-91.
7. Vinograd I, Halevy A, Klin B, Negri M, Bujanover Y. Laparoscopic cholecystectomy: treatment of choice for cholelithiasis in children. World J Surg 1993; 17: 263-6.
8. Lugo-Vicente HL. Trends in management of gallbladder disorders in children. Pediatr Surg Int 1997; 12: 348-52.
9. Jawad AJ, Kurban K, el-Bakry A, al-Rabeeah A, Seraj M, Ammar A. Laparoscopic cholecystectomy for cholelithiasis during infancy and childhood: cost analysis and review of current indications. World J Surg 1998; 22: 69-73.
10. Kim PC, Wesson D, Superina R, Filler R. Laparoscopic cholecystectomy *versus* open cholecystectomy in children: which is better? J Pediatr Surg 1995; 30: 971-3.
11. Tagge EP, Othersen HB Jr, Jackson SM, et al. Impact of laparoscopic cholecystectomy on the management of cholelithiasis in children with sickle cell disease. J Pediatr Surg 1994; 29: 209-12; discussion 212-3.
12. Al-Salem AH, Qaisaruddin S, Al-Abkari H, Nourallah H, Yassin YM, Varma KK. Laparoscopic *versus* open cholecystectomy in children. Pediatr Surg Int 1997; 12: 587-90.
13. Al-Salem AH, Nourallah H. Sequential endoscopic/laparoscopic management of cholelithiasis and choledocholithiasis in children who have sickle cell disease. J Pediatr Surg 1997; 32: 1432-5.
14. Basso N, Pizzuto G, Surgo D, et al. Laparoscopic cholecystectomy and intraoperative endoscopic sphincterotomy in the treatment of cholecystocholedocholithiasis. Gastrointest Endosc 1999; 50: 532-5.
15. Carroll BJ, Phillips EH, Daykhovsky L, et al. Laparoscopic choledochoscopy: an effective approach to the common duct. J Laparoendosc Surg 1992; 2: 15-21.
16. Madhavan KK, Macintyre IM, Wilson RG, Saunders JH, Nixon SJ, Hamer-Hodges DW. Role of intraoperative cholangiography in laparoscopic cholecystectomy. Br J Surg 1995; 82: 249-52.

การศึกษาเปรียบเทียบระหว่างการผ่าตัดตัดถุงน้ำดีด้วยวิธีการส่องกล้องกับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติในผู้ป่วยเด็ก

รวิศ เรืองตระกูล, พ.บ., มงคล เลาหเพ็ญแสง, พ.บ.*,*
อัครพล มุ่งนิรันดร์, พ.บ., ชนา สาทรกิจ, พ.บ.**

บทนำ: ในผู้ป่วยผู้ใหญ่นั้น เป็นที่ยอมรับกันทั่วไปแล้วว่าการผ่าตัดตัดถุงน้ำดีด้วยวิธีการส่องกล้องเป็นวิธีการผ่าตัดตัดถุงน้ำดีที่ดีที่สุด อย่างไรก็ตาม การผ่าตัดวิธีนี้ยังไม่ได้รับการพิสูจน์อย่างแน่ชัดว่าให้ผลการรักษาที่ดีกว่าวิธีการตัดถุงน้ำดีด้วยวิธีปกติในผู้ป่วยเด็ก เนื่องจากจำนวนผู้ป่วยเด็กที่ได้รับการตัดถุงน้ำดีมีจำนวนน้อยมาก ประกอบกับผู้ป่วยเด็กมักจะฟื้นตัวหลังการผ่าตัดได้เร็วกว่าผู้ใหญ่

ข้อมูลและวิธีการวิจัย: ศึกษาย้อนหลังในผู้ป่วยเด็กที่ได้รับการผ่าตัดตัดถุงน้ำดีที่ โรงพยาบาลศิริราช กรุงเทพฯ ระหว่างปี พ.ศ. 2535 ถึง ปี พ.ศ. 2543 รวมทั้งสิ้น 42 ราย โดยได้จำแนกผู้ป่วยออกเป็น 3 กลุ่ม กล่าวคือ กลุ่มที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีการส่องกล้องจำนวน 8 ราย กลุ่มที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติจำนวน 8 ราย และกลุ่มที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติร่วมกับการผ่าตัดตัดม้ามออกจำนวน 26 ราย

ผลการวิจัย: ผู้ป่วยที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีการส่องกล้องสามารถกลับมารับประทานอาหารหลังการผ่าตัดโดยเฉลี่ย 1.38 วัน ในขณะที่ผู้ป่วยที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติ และผู้ป่วยที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติร่วมกับการผ่าตัดตัดม้าออกสามารถกลับมารับประทานอาหารหลังการผ่าตัดโดยเฉลี่ย 3.38 และ 3.35 วันตามลำดับ นอกจากนั้นผู้ป่วยที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีการส่องกล้องมีระยะเวลาที่อยู่ในโรงพยาบาลหลังการผ่าตัดโดยเฉลี่ย 3.00 วัน ในขณะที่ผู้ป่วยที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติ และผู้ป่วยที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติร่วมกับการผ่าตัดตัดม้ามออกมีระยะเวลาที่อยู่ในโรงพยาบาลหลังการผ่าตัดโดยเฉลี่ย 8.38 และ 4.85 วันตามลำดับ การผ่าตัดตัดถุงน้ำดีด้วยวิธีการส่องกล้องไม่มีผลแทรกซ้อนหลังการผ่าตัดแต่อย่างใด ในขณะที่ผู้ป่วยที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติ 2 ราย และผู้ป่วยที่ได้รับการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติร่วมกับการผ่าตัดตัดม้ามออก 3 รายมีผลแทรกซ้อนหลังการผ่าตัด

สรุป: ในการศึกษาเบื้องต้นนี้ พบว่าการผ่าตัดตัดถุงน้ำดีด้วยวิธีการส่องกล้องน่าจะเป็นวิธีที่เหมาะสมที่สุดในการตัดถุงน้ำดีในผู้ป่วยเด็ก เนื่องจากสามารถทำให้ผู้ป่วยสามารถกลับมารับประทานอาหารได้เร็วกว่า ตลอดจนทั้งมีระยะเวลาในการอยู่โรงพยาบาลที่สั้นกว่า และมีผลแทรกซ้อนน้อยกว่าการผ่าตัดตัดถุงน้ำดีด้วยวิธีปกติ แต่อย่างไรก็ตามจำนวนประชากรที่ใช้ในการศึกษามีจำนวนน้อยจึงจำเป็นจะต้องมีการศึกษาต่อไปในอนาคต

คำสำคัญ : ผ่าตัดตัดถุงน้ำดี, ผ่าตัดถุงน้ำดี, ผ่าตัดตัดถุงน้ำดีด้วยวิธีการส่องกล้อง, นิ่วในถุงน้ำดี, นิ่วน้ำดี, ถุงน้ำดี, เด็ก, ทารก, วัยรุ่น, มนุษย์, การศึกษาย้อนหลัง, ระยะเวลาในโรงพยาบาล, ผลการรักษา

รวิศ เรืองตระกูล, มงคล เลาหเพ็ญแสง,
อัครพล มุ่งนิรันดร์, ชนา สาทรกิจ
จดหมายเหตุทางแพทย์ ฯ 2545; 85: 172-178

* สาขาวิชากุมารศัลยศาสตร์, ภาควิชาศัลยศาสตร์, คณะแพทยศาตร์ศิริราชพยาบาล, มหาวิทยาลัยมหิดล, กรุงเทพฯ 10700