

ROLE OF ULTRASONOGRAPHY IN PREDICTING TECHNICAL DIFFICULTIES DURING LAPAROSCOPIC CHOLECYSTECTOMY

Lalit Singh, Mohit Singh, SAA Rizvi

Department of Surgery, J.N. Medical College, Aligarh Muslim University, Aligarh (UP) -202002. India

Abstract: This prospective study was conducted on 75 patients undergoing laparoscopic cholecystectomy in JNMC Hospital, Aligarh between Nov 2002 and Apr 2004. Patients with choledocholithiasis were excluded. Findings at time of surgery, level of difficulty faced by the operating surgeons and outcome of surgery were recorded. Ultrasonographic and per-operative findings were compared with respect to the level of difficulty (Easy or Difficult) encountered in laparoscopic surgery and requirement of conversion. In 75 cases: 34 (44%) had easy and 41 (56%) had difficult laparoscopic surgery. 9 (12%) cases required conversion. Common causes of difficulty during laparoscopic dissection were intra-peritoneal adhesions and hepatomegaly. Common causes of conversion were intra-abdominal adhesions and presence of multiple calculi in gall bladder. Preoperative ultrasonography identified multiple gallstones and hepatomegaly in all (100%) cases. However ultrasonography was not much helpful in identifying Intra-abdominal adhesions (34.78% accuracy of detection). Hence, a difficult laparoscopic cholecystectomy can be predicted based on preoperative ultrasonography findings.

Keywords: Laparoscopic cholecystectomy, Ultrasonography, Gall stones.

INTRODUCTION

Laparoscopic cholecystectomy is the gold standard treatment for symptomatic cholelithiasis. However, in many patients conversion is required, either because of technical difficulties or intra-operative complications; usually resulting from dense adhesions, inflammation and abnormal anatomy. Some preoperative variables may help to predict the risk of conversion or a difficult operation.

Ultrasonography is the most widely available, affordable, non-invasive and reliable radiological investigation for evaluation of patients prior to surgery. It can tell about the anatomy of common bile duct, anatomy of Calot's triangle, about the presence of adhesions in peritoneal cavity, about the no. and size of stones in gall bladder, and about the presence of stones in common bile duct, if any. It can also tell about the gall bladder wall thickness, and any peri-cholecystic edema.

METHODS

This prospective study has been conducted on 75 patients with the diagnosis of cholelithiasis admitted in the surgical wards of JNMC Hospital, Aligarh between Nov.2002 and Apr.2004 who were subjected to laparoscopic cholecystectomy as a treatment for the same. Patients with choledocholithiasis were excluded from the study. In all patients, findings at the time of surgery, the level of difficulties faced by the operating surgeons and the outcome of surgery were recorded. The ultrasonographic findings, per-operative findings & complications of all patients were tabulated and then the entire data was evaluated with respect to the level of difficulty (easy or difficult) encountered in laparoscopic dissection and the requirement of conversion (required or not), using 'Stepwise Binary Logistic Regression Model using SPSS 10 Software system'. The model was tested by 'Hosmer & Lane Shaw Test' and was found to fulfill the criteria of 'Goodness of Fit'. This means that the model predicted the outcome variables accurately.

RESULTS

1. In 34 (44%) patients laparoscopic dissections was easy, and in 41 (56%) patients some form of difficulties were encountered while doing laparoscopic dissection.
2. The common causes of difficulty encountered during laparoscopic dissection in our study were intra-peritoneal adhesions and hepatomegaly.
3. In 9 (12%) cases, conversion to open procedure was required.

Correspondence: Dr. Lalit Singh, MIG-31, Avantika-2, ADA Colony, Ramghat Road, Aligarh-202002. (UP). Phone: 09871672828 e- mail: drlalitsingh@yahoo.com

- Common causes of conversion identified in this study are intra-abdominal adhesions and presence of multiple calculi in gall bladder, in that order. Other factors found to be significantly affecting the risk of conversion are poorly visualized Calot's triangle, presence of accessory Rt. hepatic artery and hepatomegaly in that order.
4. Per operatively, in 26 (34%) patients adhesions were found, of which pre-operative USG could detect the adhesions in 8 (10.7%) patients only. That constitutes 30.76% of the patients, which actually had adhesions. Thus the diagnostic significance of USG for detection of intra-operative adhesions is not much.
 5. Multiple gallstones were found to be significantly responsible for conversion. Preoperative USG gives a good account of no. of gallstones. Out of 9 patients requiring conversion, 6 (66.66%) were having multiple gallstones and preoperative USG could detect that in all these patients. Similarly the other significant predictor of conversion i.e. hepatomegaly was correctly diagnosed by preoperative ultrasonography in all 12 (100%) cases. As we can interpret from table 1, ultrasound could detect with very high accuracy the size of the gall bladder (88%), gall bladder wall thickness (86.67%), no. of gall stones (100%) and common bile duct diameter (94.45%). However ultrasonography was not much helpful in identifying intra-abdominal adhesions (34.78% accuracy of detection). Also the findings of long cystic duct, presence of accessory right hepatic artery and of aberrant branch of Right hepatic duct could not be suspected on the basis of ultrasonography.

Table 1 Comparison of per operative and deagnortie ultrasound findings in gall bladder dision

Feature	Per-operative Finding	Finding on USG	Diagnostic accuracy of USG	
GB Size	Normal	46	45	88%
	Contracted	20	24	
	Distended	9	6	
GB Wall Thickness	Normal/ Thin Walled (<4 mm)	55	50	86.67%
	Thick Walled (>4 mm)	20	25	
No of stones in GB	Single	21	21	100%
	Multiple	54	54	
CBD diameter	Normal (<7mm)	71	67	94.45%
	Dilated (>7mm)	4	8	
Adhesions around Calot's Δ	Detected	23	8	34.78%
	Not Detected	52	67	
Accessory Rt Hepatic Artery	Detected	1	0	0%
Long Cystic Duct	Detected	1	0	0%
Aberrant branch of Rt Hepatic Artery	Detected	1	0	0%

DISCUSSION

We found a conversion rate of 12% in our study, whereas the conversion rates reported in previous studies vary from 1.2% to 35%. This conversion rate is comparable to that reported by McLoughlin et al¹ and Liu et al², who reported conversion rates of 10.41% and 9% respectively. But this conversion rate of ours is higher than that reported by Southern Surgeons Club³ and Cuschieri et al⁴, who published very low conversion rates of 4% and 5.3% respectively. On the other hand Zucker et al⁵ and Kiviluoto et al⁶ have reported comparatively higher conversion rates of 27% and 16.5, respectively. We noted an overall complication rate of 16% in our study with major complications requiring conversion occurring in 4 (5.33%) cases Table 2. Our major complication rate was very similar to that of Koo et al⁷ and of Southern Surgeons Club³, who reported major complication rates of 5.5% and 5.1%.

Table 2: Complications encountered during laparoscopic dissection

Complication	No. of patients	Outcome
Lost stones and Bile leak in peritoneal cavity	8	Improved on Conservative treatment
Superficial Wound Infection	2	Improved on Conservative treatment
Prolonged bile leak in post-operative period	2	Controlled by itself
Excessive Bleeding from the Liver bed	2	Conversion done and managed on table
Injury to Acc. Rt Hepatic artery	1	Conversion done and managed on table
Injury to aberrant branch of Rt hepatic Duct	1	Conversion done and managed on table

In our study no CBD injury was noted. Zucker et al⁵ also did not report any CBD injury from their case series. Many other workers have reported low rates of CBD injury. Cuschieri et al⁴ reported CBD injury in only 0.32% of their cases. Koo et al⁷ found that the overall complication rate and incidence of CBD injury was 5.5% and 0.2% respectively. Overall complication rate in our study is higher than those reported by other workers. The reason for that is that the surgeons in our institution are still in the learning phase of for laparoscopic surgery.

Our study revealed that presence of intra-abdominal adhesions was the most significant reason for conversion of surgery. Kama et al⁸ also made similar observations. In our study pre-operative USG could detect the adhesions in 34.78% cases only. Rattner et al⁹ also concluded that value of ultrasonography in detecting intraabdominal adhesions was not much. We found multiple gallstones to be an important reason for conversion. Small stones can often cause obstruction in Hartman's pouch, hence proper retraction is not maintained. Around 70% of our entire study population had multiple Gallstones and they were identified correctly by the pre-operative USG. It has previously been observed that single large stones tend to pose difficulty in grasping the gall bladder, thus causing difficulty in surgery but Sakuramoto et al¹⁰ observed that number of gallstones does not correlate with technical difficulty during surgery.

In our study patients with hepatomegaly posed problems in laparoscopic dissection. This is because it is difficult to put the epigastric port in correct place and because of the limited mobility of the dissecting forceps, put in,

through the epigastric port. This confirms the findings noted by Dararkah¹¹. Increased gall bladder wall thickness (>4 mm) has been reported to be a significant predictor of difficult laparoscopic surgery by Kama et al⁷. Thickness of gall bladder wall on pre-operative USG represents the present inflammation or fibrosis due to repeated previous attacks of acute illness. Such inflamed tissue is difficult to handle and dissect and thus surgery becomes difficult. However our analysis did not find this factor to be important, an observation is in agreement with that of Chen et al¹², who found that although thickness of gall bladder wall can be demonstrated very well on pre-op USG, its not very significant predictor of conversion. Abnormal and aberrant anatomy of Calot's D is always associated with problems in dissection. In our study, presence of accessory right hepatic artery was found to be having significant association with conversion. Carmody et al¹³ also made the same observation.

We found USG to be very good in detecting hepatomegaly and no. of calculi in gall bladder but its efficacy in detecting intra-abdominal adhesions was not good (only 35%). USG can find out with very high degree of accuracy the thickness of gall bladder wall, diameter of CBD, presence of any stone impacted in Hartman's pouch, peri-cholecystic edema and mobility of gallstones. Also, high resolution USG can detect intra-abdominal adhesions in up to 50% cases. Chen et al¹² have found USG findings to be of help in detecting potentially difficult cases. On the other hand, Carmody et al¹³ reported that pre-operative evaluation of gall bladder using USG had little value in screening for technical difficulties.

CONCLUSIONS

1. Presence of intra-abdominal adhesions, hepatomegaly and multiple gallstones on pre-operative USG are reliably significant preoperative predictors of difficult surgery and conversion.
2. Chances of difficult laparoscopic dissection and conversion can be reliably predicted by proper pre-operative abdominal ultrasonography of the patients.

REFERENCES

1. McLoughlin RF, Gibny RG, Mealy K, Hyland J. Radiological investigations in laparoscopic compared with conventional cholecystectomy – an early assessment. *Clinical Radiology*. 1992; 45: 267-270.
2. Liu CL, Fan ST, Edward CS, Lo MC, Cho KM. Factors affecting conversion of laparoscopic cholecystectomy to open surgery. *Arch. Surg.* 1996; 131: 98-101.
3. The Southern Surgeons Club. A prospective analysis of 1518 laparoscopic cholecystectomies. *The New England Journal of Medicine*. 1991; 324: 1073-1078.
4. Cuschieri A, Dubois F, Jean M, Mouret P, Becker H, Buess G, Trede M, Trtoidl H. The European experience with laparoscopic cholecystectomy. *Am. J. Surg.* 1991; 161: 385-387.
5. Zucker KA, Flowers JL, Bailey RW, Graham SM, Buehl J, Imbembu AL. Laparoscopic amangement of acusste cholecystitis. *Am. J. Surg.* 1993; 165: 508-514.
6. Kiviluoto T, Siren J, Luukkonen P, Kivilaasko E. Randomised trial of laparoscopic versus open cholecystectomy for acute and gangrenous cholecystitis. *Lancet*. 1998; 351: 321-325.
7. Koo KP, Richard CT. Laparoscopic cholecystectomy in acute cholecystitis: what is the optimal timing of operation? *Arch. Surg.* 1996; 131: 540-544.
8. Kama NA, Kologlu M, Doganay M, Reis E, Atli M, Dolapci M. A risk score for conversion from laparoscopic to open cholecystectomy. *Am. J. Surg.*, 2001; 181: 520-525.
9. Rattner DW, Ferguson C, Warshaw AL. Factors associated with successful laparoscopic cholecystectomy for acute cholecystitis. *Ann. Surg.* 1993; 217: 233-236.
10. Sakuramoto S, Sato S, Okuri T, Sato K, Hiki Y, Kakita A. Preoperative evaluation to predict technical difficulties of laparoscopic cholecystectomy on the basis of histological inflammation findings on resected gall bladder. *Am. J. Surg.*, 2000; 179: 114-121.
11. Daradkeh S. Laparoscopic cholecystectomy: What are the factors determining difficulty? *Hepato-Gastroenterology*, 2001; 48: 76-78.
12. Chen RC, Liu MH, Tu HY, Chen WT, Wang CS, Chiang LC, Chen PH. The value of ultrasound measurement of gall bladder wall thickness in predicting laparoscopic operability prior to cholecystectomy. *Clinical Radiology*. 1995; 50: 570-572.
13. Carmody E, Arensen AM, Hanna S. Failed of difficult laparoscopic cholecystectomy: Can preoperative ultrasonography identify potential problems? *J. Clin. Ultrasound* 1994; 22: 391-396.

CORRIGENDUM

Article - 'Darusentan : A promising drug for resistant hypertension' published in July –September, 2007 Issue (Vol. 20. No. 3) at page - 245, under **Drug Profile** Names of the authors may be read as 1) Dr. Bhupinder Singh Kalra and 2) Dr. Vandana Tayal, Deptt. of Pharmacology, Maulana Azad Medical College, New Delhi, India.

Omission is highly regretted.

Editor