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A PRACTICAL CHOICE OF A SAFE MINIMAL ACCESS SURGERY FOR CHOLECYSTECTOMY

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Introduction: *Upper abdominal surgery is associated with severe postoperative pain and a concomitant vulnerability to a troublesome postoperative period. Laparoscopic cholecystectomy is thought to result in less postoperative pain compared with open cholecystectomy. The incision used for open cholecystectomy has been getting smaller over the past decade, with an attendant reduction in postoperative morbidity. This minimal trauma procedure had a good safety record. Before mini-cholecystectomy could be established in surgical practice, laparoscopic removal of the gallbladder was introduced and rapidly became popular despite early concerns about its safety.*

Objective: The purpose of this study was to assess laparoscopic cholecystectomy and mini-cholecystectomy; comparing feasibility, operative time, postoperative pain, analgesic requirement and complications.

Patients and Methods: This work was conducted in the general surgical department in Ain Shams University Hospitals in the period between December 1999 and January 2002. In this prospective study 50 patients with acute (n=5, 10%) and Symptomatic chronic (n=45, 90%) cholelithiasis were operated upon, 25 laparoscopic cholecystectomy and 25 mini-cholecystectomy. A four port technique was used for laparoscopic procedures and an incision less than 10 cm for the open surgery.

Results: Compared with mini-cholecystectomy, laparoscopic cholecystectomy took significantly shorter operative time (46 min versus 69 min, P<0.001), was associated with lower pain scoring (P<0.001) and less postoperative morphine consumption in the first and second postoperative days (23 mg versus 40 mg and 3 mg versus 12 mg, P<0.001). Laparoscopic cholecystectomy has no significant difference over mini- cholecystectomy in operative and postoperative complications. Both techniques showed no significant difference in hospital stay or in the period to return to full activity.

Conclusion: This study confirms that the operative time, postoperative pain and its sequelae are significantly reduced by the laparoscopic technique. A safe mini- cholecystectomy needs special instruments and illumination that may not be available in some hospitals. However, the latter approach can be applied if laparoscopy is not available and if safety is questioned the mini-scar should be converted to a formal right subcostal incision.

Keywords: Cholecystectomy - Laparoscopy - Pain

INTRODUCTION

Gallstones are a major cause of morbidity worldwide, and cholecystectomy is the most commonly performed abdominal surgery in medicine. Gallstone-induced complications have a limited and overlapping pattern of clinical presentation. (1)

Two-thirds of gallstones are asymptomatic, found incidentally on imaging studies or postmortem examination. (2) Nonspecific symptoms (indigestion, dyspepsia, intolerance of fatty food, abdominal bloating, belching) are not indicative of cholelithiasis, but are commonly reported by patients with gallstones. (3)

Patients with silent gallstones have an estimated 1% to 4% per year risk of developing specific clinical symptoms. (4) Migration of gallstones can cause obstruction of the neck

of the gallbladder or the cystic duct and subsequent elevation of pressure inside the gallbladder, causing sharp abdominal pain. Intermittent episodes of such pain owing to spontaneous release of an obstruction are called biliary colic. The term "biliary colic" is actually a misnomer because most patients report a constant, not a colicky type, pain. [5]

Once an episode of the so called biliary colic has occurred, there is a high risk of repeated pain attacks. Cohort studies with follow-up of patients with symptomatic gallstones indicate a 38 to 50 percent incidence rate of recurrent biliary pain per year. [6] Patients with symptomatic gallstones are more likely to develop biliary complications. The risk of developing biliary complications is estimated to be 1 to 2 percent per year. Therefore, patients with frequent, recurrent episodes of biliary colic should be offered an elective surgical treatment. [7]

Changes in surgical technique, retrospectively recognized as being advantageous, have often been preceded by more than a decade of interest among devoted specialists before being introduced into surgical practice at large. During the 1980s and in the early 1990s, it was shown that the conventional large subcostal incision in cholecystectomy could be replaced by a much smaller incision, giving a shorter convalescence. [8,9] This conclusion was later supported by results in other randomized controlled trials. [10,11] When laparoscopic cholecystectomy (LC) was introduced in the late 1980s, it rapidly became the dominant procedure for gallbladder surgery in the industrialized world. The main reason was that the new method was followed by a smoother postoperative course than conventional cholecystectomy. [12,13] LC has been found to take a longer time to perform and to cause less postoperative pain than small-incision cholecystectomy, or mini-laparotomy cholecystectomy (MC), whereas divergent results have been obtained with respect to hospital stay and convalescence. [14,15] It was therefore considered of interest to compare these two techniques and their outcome in a sector of the Egyptian population presenting to our University Hospitals.

PATIENTS AND METHODS

This prospective study was conducted in Ain Shams University Hospitals in the period between December 1999 and January 2002. Sixty-eight patients were prospectively randomized to undergo small incision cholecystectomy or laparoscopic cholecystectomy. Patients were included in the study if the admitting diagnosis was symptomatic cholelithiasis or acute calcular cholecystitis confirmed by ultrasonography.

All the patients were subjected to the following routine preoperative investigations: - complete blood count (CBC), liver function tests (ALT, AST, alkaline phosphatase, total and direct bilirubin, albumin and prothrombin time), urea and creatinine and serum electrolytes. Exclusion criteria were obstructive jaundice, pregnancy, cirrhosis of the liver, suspected or proven malignancy, and previous upper gastrointestinal tract surgery.

Surgical Procedures

General endotracheal anesthesia was uniform for both procedures with insertion of a nasogastric tube. A third generation cephalosporin was routinely administered intravenously with induction of anesthesia then one gram IV every 12 hours after the operation for the next two postoperative days. Laparoscopic cholecystectomy was performed with standard four-trocar technique, and pneumoperitoneum was created with the open method. Carbon dioxide was used in insufflation of the peritoneal cavity to 15 mmHg. The gallbladder was removed via the umbilical port. The peritoneum was washed out with saline and a suction drain was left in the subhepatic space at the end of the procedure. Any patient in this group whose operation was converted to open technique for any reason was excluded from the study

Small-incision cholecystectomy was done through a high transverse trans-rectal incision, which opens the peritoneum over the junction of the cystic duct, and common bile duct giving the best exposure. The median incision length was 7 cm (range from 5 to 9 cm). The length of the incision was tailored to the individual patient and kept to the minimum necessary to allow safe and adequate access to the gallbladder. Standard instruments were used. The rectus muscle was cut by diathermy. Dissection was started in Calot's triangle and proceeded antegradely towards the fundus of the gallbladder (rather than a fundus first dissection). The cystic duct and artery were ligated with a 0 synthetic absorbable suture. A suction drain was left in the subhepatic space. Any patient in whom the incision of his operation was extended beyond 10 cm was excluded from the study.

Total operating time was measured from the first skin incision to the last stitch placed for both techniques. The nasogastric tube was removed in the theater after the recovery of the patient.

Postoperative management

Postoperative pain control was carried out using diluted intravenous morphine (10 mg in 10 ml saline). A maximum dose of 10 mg /hour was allowed. The total administered dose of morphine was recorded in the first and second postoperative days. On the third postoperative

day patients were given oral analgesics on demand. Twenty four hours after the operation patients were shown an ordinal 4-point pain score (none, mild, moderate, severe) and were asked to record the pain they experienced on sitting up from the lying position and on coughing for 48 hours.

All patients were ambulated on the night of surgery. Each patient received routine postoperative pulmonary care, which included intensive coughing and deep-breathing exercises on an every 8-hour basis until discharge from the hospital.

Oral intake of fluids was prohibited in the first 24 hours postoperatively, and resumed whenever, intestinal sounds were audible. Drains were usually removed 24 hours after operation. All patients were encouraged to resume full activity as soon as they felt they were fit enough. Hospital stay (postoperative nights) and the time of return to full activity were recorded. Follow-up was done at out patient clinic to remove the skin sutures after one week of discharge and every two weeks for six weeks.

Statistics

Statistical analysis was performed by using the t test, ANOVA with the Scheffe's modification, and chi-squared analysis. $P \leq 0.05$ was accepted as statistically significant

RESULTS

Preoperative

Only 50 out of the 68 patients were included in this study. Upper abdominal operations (n=4), hepatocellular failure (cirrhosis n=3), non-calcular obstructive jaundice (n=1), focal hepatic lesion (colonic metastasis n=1) and first trimester pregnancy (n=1) were the reasons for exclusion from the present series. The patients were divided into two groups and subjected to mini-cholecystectomy (n=29) and laparoscopic cholecystectomy (n=29).

Operative

Conversion from laparoscopic to open cholecystectomy (n=4) and from small-incision to formal right subcostal (n=4) was indicated. These patients were also excluded from the study.

All 50 patients tolerated the surgical procedure well, and no significant intraoperative anesthetic or surgical complications occurred, except for three cases in which minimal spillage of bile from the gallbladder occurred during laparoscopic cholecystectomy and two cases during small-incision cholecystectomy.

No significant differences were noted in patients' demographics and extent of biliary tract disease for patients undergoing either laparoscopic cholecystectomy or open (small-incision) cholecystectomy (Table 1).

In the small-incision cholecystectomy group, the median incision length was 7 cm (range 5 to 9 cm). Operations were significantly longer in the small-incision cholecystectomy group, with a mean operating time 69 minutes compared with 46 minutes in the laparoscopic group (Table 2).

Postoperative

The mean length of hospital stay was 3.6 days for small-incision cholecystectomy and 3.5 days for laparoscopic cholecystectomy (no statistically significant difference). In addition, no statistically significant difference was found between the mean period for patients to return to full activity in the laparoscopic group (4.2 weeks) in comparison with that of small-incision group (3.8 weeks) (Table 2).

Patients in small-incision group experienced significantly more pain than those in the laparoscopic group at both 24 and 48 hours after the operation as measured by the ordinal 4-point pain scores (Table 3). Patients' morphine consumption was also significantly greater in the small-incision group during both the first and second postoperative 24 hours (Table 4). All patients undergoing laparoscopic cholecystectomy took no pain medication beyond the first postoperative week, while 8 patients (32%) undergoing small-incision cholecystectomy required pain medication through the first two postoperative weeks.

Postoperative complications included minor chest infection, which occurred in 3 patients (12%) in the small-incision group, compared with one patient (4%) in the laparoscopic group (statistically insignificant).

The non-pulmonary complications included ileus, which occurred in 5 patients (20%) after small-incision cholecystectomy and in 3 patients (12%) after laparoscopic cholecystectomy, two cases of wound infection after small-incision cholecystectomy and 2 patients (8%) of shoulder pain after laparoscopic cholecystectomy (statistically insignificant) (Table 5).

Table (1): *Patient Demographics and Extent of Biliary Disease.*

	Laparoscopic cholecystectomy	*Small-incision cholecystectomy*	*P value*
Patient demographics			
Number (n)	25	25	NS
Gender (male:female)	6:19	4:21	NS
Mean age (SD)	39.5 (±13.2)	41.3 (±14.1)	NS
Median age (range)	37 (17-67)	38 (21-65)	
Extent of biliary disease			
Symptomatic cholelithiasis	22	23	NS
Acute cholecystitis	3	2	NS
Other systemic Diseases			
Hypertension	3	2	NS
Diabetes	2	1	NS

NS, Not significant; *SD*, Standard deviation.

Table (2): *Operating time, Hospital stay (post- operative nights) and Time needed to return to full activity in the two groups.*

	Laparoscopic cholecystectomy (n=25)	*Small-incision cholecystectomy (n=25)*	*P value*
Operating time			
Mean (SD)	69 (±24.6) min	46 (±19.8) min	P< 0.001
Median (range)	65 (27-140) min	40.2 (18-112) min	
Hospital stay (post- operative nights)			
Mean (SD)	3.5 (±2.1) nights	3.6 (±2.3) nights	P=0.74
Median (range)	3.0 (1- 5) nights	3.0 (1-6) nights	
Time needed to return to full activity			
Mean (SD)	3.8 (±1.9) weeks	4.2 (±2.6) weeks	P=0.15
Median (range)	3.0(1-6) weeks	3.0(1-6) weeks	

Table (3): *Postoperative Ordinal Pain Scores in the Two Groups.*

	Laparoscopic cholecystectomy (n=25)	*Small-incision cholecystectomy (n=(25)*	*P value*
Ordinal pain score in the 1st postoperative 24 hours	Number of patients	Number of patients	
None	2	0	
Mild	6	4	Chi-squared
Moderate	13	8	=18, 2 *df*,
Severe	4	13	P<0.001
Ordinal pain score in the 2nd postoperative 24 hours			
None	8	1	
Mild	10	6	Chi-squared
Moderate	4	12	=23, 3 *df*,
Severe	3	6	P<0.001

Table (4): *Patient s Morphine Consumption over the First 2 Postoperative Days in the Two Groups.*

	Laparoscopic cholecystectomy (n=25)	*Small-incision cholecystectomy (n=25)*	*P value*
Mean consumption in the 1st 24 hours in mg (SD)	23 (±9)	40 (±11)	P<0.001
Mean consumption in the 2nd 24 hours in mg (SD)	3 (±5)	12 (±7)	P<0.001

Table (5): *postoperative Complications in the Two Groups.*

	Laparoscopic cholecystectomy (n=25)	*Small-incision cholecystectomy (n=25)*	*P value*
Pulmonary complications			
Minor chest infection	1(4%)	3(12%)	NS
Non-pulmonary complications			
Ileus	3(12%)	5(20%)	NS
Shoulder pain	2(8%)	0	NS
Wound infection	0	2(8%)	NS

DISCUSSION

Minimal access surgery is surgery intended to cause the least anatomical, physiological and psychological trauma to the patient. The rapid advancements in this type of surgery since the late 1980s have seen the dawning of an age of surgical technological innovation. Much of the morbidity associated with a conventional cholecystectomy arises from the abdominal wall wound which is needed to provide sufficient exposure. [16] Before small-incision cholecystectomy or mini-cholecystectomy could be established in surgical practice, laparoscopic cholecystectomy was introduced and rapidly became popular. Laparoscopic cholecystectomy, an extension of minicholecystectomy with a completely new concept into abdominal surgery, was popularized by Dubois et al [17] and Reddick and Olsen. [18] The procedure was popularized in community practice and gained acceptance in the academic centers. Now, laparoscopic cholecystectomy is one of the most common general operations and has gained worldwide acceptance as the surgery of choice for symptomatic gallstone disease. This minimal trauma procedure had a good safety record and short hospital stay. Both mini-cholecystectomy [10] and laparoscopic cholecystectomy [13] have been shown to offer advantages over conventional large-incision cholecystectomy for patients with chronic and acute cholecystitis.

In the present series 50 patients with chronic cholecystitis (n=45, 90%) and acute cholecystitis (n=5, 10%) were eligible for either mini-cholecystectomy or laparoscopic cholecystectomy. The mean operating time of laparoscopic group was 46 min versus 69 min in small-incision group. Our finding that laparoscopic cholecystectomy takes shorter time to do is not in agreement with other studies as in Majeed et al. series[15] (65 min vs 45 min) McMahon et al. study [19] (71 min vs 57 min) and McGinn and his colleagues study [14] (74 min vs 50 min). These authorities used special instruments and illuminations in their mini-cholecystectomeis, a privilege that was wanting in our operations. This made the access and manipulations more lengthy and cumbersome. Extra care was needed when dissecting the Calot's triangle and when ligating the pedicle. The application of metal clips to the cystic duct and artery in the previously mentioned studies has definitely contributed to the easier, safer and consequently faster surgery.

One of the proposed benefits of laparoscopic surgery is short hospitalization and early return to full activity. [20,21] However, postoperative hospital stay after laparoscopic cholecystectomy in large series of laparoscopic cholecystectomies was 3-3.5 nights [14,22,23], although editorials in surgical journals [24] and media publicity have led to the impression that most patients undergoing laparoscopic cholecystectomy are "home the next day after surgery". In our study the hospital stay (post-operative nights) was nearly equal in both groups (3.5 nights in laparoscopic group versus 3.6 nights in small-incision group). Determinants of return to work are subjective and influenced by the attitudes of patients. In this study, patient with small-incision operation returned to work later than those who had the laparoscopic operation (4.2 weeks versus 3.8 weeks).

Patient in small-incision group experienced significantly more pain than those in the laparoscopic group at both 24 and 48 hours after the operation as measured by the ordinal 4-point pain scores. Analgesic (morphine) requirement after laparoscopic cholecystectomy was significantly less than that needed after small-incision cholecystectomy (23 mg versus 40 mg in the first post-operative 24 hours and 3 mg versus 12 mg in the second postoperative 24 hours). The results of the present study confirm the findings of McMahon et al. [19,25] that significantly less analgesia is required after laparoscopic cholecystectomy compared with mini-cholecystectomy. All patients undergoing laparoscopic cholecystectomy took no pain medication beyond the first postoperative week, while 8 patients (32%) undergoing small-incision cholecystectomy required pain medication through the first two postoperative weeks.

There was no significant difference in the postoperative complication rate between the two groups. The complication rates were in accordance with findings of previous randomized trials. [7,14,15] There was no statistically different complication rate in either group. Most reports in literature have focused on the clinical benefits of laparoscopic surgery, such as, less patient discomfort, less postoperative pain, shorter hospitalization, improved cosmesis and faster return to full activity. [20,2] It has been postulated that less wound discomfort might result in better postoperative pulmonary function after laparoscopic cholecystectomy. [26] However, this benefit might be offset, at least in theory, by the effects of longer operation and anesthesia and the effects of the carbon dioxide pneumoperitoneum. The latter can lead to diaphragmatic pain and splinting of the diaphragm, resulting in basal lung collapse. [27]

Pulmonary complications in this work, included minor chest infection, which occurred in 3 patients (12%) in the small-incision group compared with one patient (4%) in the laparoscopic group (the difference did not reach statistical significance). To determine whether laparoscopic cholecystectomy has advantage in decreasing incidence of postoperative pulmonary complications will require a larger study.

So far and until a larger cases are comparatively studied, it seems that laparoscopic cholecystectomy takes precedence over the open mini- cholecystectomy approach.

CONCLUSION

In conclusion, laparoscopic cholecystectomy appears to be superior to the small-incision cholecystectomy because it results in shorter operative time and less postoperative pain. This means that, less postoperative analgesics, convalescence and pulmonary impairment occurs. On the other hand, small-incision cholecystectomy has the disadvantage of the need for special instruments and illumination. To determine whether these advantages of laparoscopic cholecystectomy are translated into an unequivocal conclusion will require a larger study. The mini-cholecystectomy procedure, however, can be regarded as a good alternative in case of unavailability of equipments and facilities for laparoscopic cholecystectomy.

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