



Mini-cholecystectomy versus laparoscopic cholecystectomy: a retrospective multicentric study among patients operated in some Eastern Libyan hospitals

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ABSTRACT

Objective: This study was conducted to analyze the difference between Mini-Cholecystectomy (MC) and Laparoscopic Cholecystectomy (LC) in terms of feasibility and postoperative outcomes to determine if MC could be accepted as a good alternative procedure to LC.

Material and Methods: A retrospective comparative study of 206 consecutively operated patients of chronic cholecystitis (138 LC and 68 MC), in Al-Jalaa, Ajdabiya and Almrq Teaching hospitals between January 2014 and December 2015 was performed. All cases within the two groups were balanced for age, sex, co-morbidities, ultrasound and intraoperative findings. Exclusion criteria were acute cholecystitis, preoperative jaundice, liver cirrhosis, suspicion of malignancy, previous upper abdominal surgery and pregnancy.

Results: Mean age of the patients in the study was around 37 years. Female patients represented 88.84%. Intraoperative complications occurred in about 2% of the patients with bleeding in three cases (one in MC, two in LC) and injury to the bile ducts occurred in one case who underwent LC. Operative duration was longer in LC (mean values 64 minutes for LC and 45 minutes for MC). Rate of conversion to classical cholecystectomy in LC was 5% while it was 0% in MC. Only one case of wound infection was registered in the LC group. Postoperative hospital stay was insignificantly longer for LC versus MC (1.97 days for MC and 2.63 days for LC).

Conclusion: Mini-cholecystectomy is a feasible technique, which can be considered as a good alternative method for gallbladder removal for surgeons who have no experience with laparoscopic techniques and in peripheral hospitals where LC is not available.

Keywords: Laparoscopic cholecystectomy, mini-cholecystectomy, chronic cholecystitis, gall bladder stones

INTRODUCTION

Gallbladder diseases are considered as of the most common digestive system disorders. In spite of many trials with medical treatment, surgical intervention remains the only curative way. Cholecystectomy is the commonest abdominal surgical procedure worldwide (1). Gallbladder diseases are one of the commonest causes of admissions to surgical departments worldwide and also the commonest of the major procedures performed in daily elective surgery lists. Some literature has reported that about 77% of all operations performed at their hospital were cholecystectomies, with a female to male ratio of 4:1 (2).

First open cholecystectomy was performed by Karl Langenbuch in July 1882 (3). Before that time, and in fact even for many years afterwards, patients with symptomatic gallstone disease were treated only with ineffective medical remedies or occasionally by cholecystostomy to drain the gallbladder. The first cholecystectomy in the western hemisphere was performed four years later by Justus Ohagein, Minnesota USA. Hans Kehr of Halberstadt and Berlin was an early pioneer in biliary surgery. In 1901, he published a remarkable book describing more than 500 operations for gallstones, including 96 common bile duct operations. Kehr died of sepsis caused by a hand infection incurred after digital exploration of the common bile duct (4).

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Up to the 1980s, the conventional large subcostal incision in cholecystectomy was the standard surgical approach for treatment of gallbladder diseases, which was associated with early and late postoperative complications along with prolonged postoperative pain and hospital stay (5). Therefore, this was followed by the development of the minimally invasive surgical procedures for gallbladder disease including Mini-cholecystectomy (MC) and Laparoscopic cholecystectomy (LC). Currently, LC is the gold standard operation worldwide.

MC was first described by Dubois and Berthelot (6) in France, at the beginning of the 1980s, stating that the conventional large subcostal incision in cholecystectomy can be replaced by a much smaller incision, giving a shorter convalescence (7,8). This was preceded by more than a decade of interest among devoted specialists before being introduced into surgical practice.

On 1985, Erich Mühe in Böblingen Germany, performed the first laparoscopic cholecystectomy (3). Favorable results were reported at the same time as LC was introduced into the United Kingdom in 1990. Then it rapidly became the dominant procedure for gallbladder surgery worldwide and followed by a smoother postoperative course than the conventional method (9-11).

Recently, there are some surgical modalities under development with promising results in the industrial world. In Single Incision Laparoscopic Surgery (SILS), the approach is through the umbilicus with a single trocar and multiple ports that allow a safe cholecystectomy (12). However, Natural orifice trans luminal endoscopic surgery (NOTES) and Da Vinci surgical system (Robots) carry a high economic cost.

All these methods have the tendency to perform cholecystectomy with acceptable cosmetic results without visible scars and with decreased postoperative pain and a short hospital stay.

The aim of this study was to assess and analyze the difference between MC and LC in the surgical management of chronic cholecystitis in terms of feasibility and post-operative outcomes to determine if MC could be accepted as a good alternative procedure to the standard LC.

MATERIAL and METHODS

A multicentric retrospective comparative study was conducted on 206 consecutively operated patients of chronic gallbladder diseases (138 LC and 68 MC), in three University teaching hospitals between January 2014 and December 2015. All patients were diagnosed as having chronic gallbladder disease requiring elective cholecystectomy. The diagnosis was made after taking detailed history and clinical examination of their disease and was supported by radiological and laboratory investigations carried out to confirm the diagnosis and help in rolling out the presence of exclusion criteria that could affect the results of the study by creating patient bias.

All patients were operated by well-trained surgeons in both techniques, the surgeons were chosen according to their experience and career. All cases under the study in the two groups were balanced for age, sex, co-morbidities, ultrasound and intraoperative findings. Patients with acute cholecystitis, preoperative jaundice, liver cirrhosis, suspicion of malignancy, previous upper abdominal surgery and pregnancy were excluded from the study. The included data was collected directly from patient's files.

Mini-cholecystectomy operation was performed under general anesthesia, patient in supine position. Single shot of prophylactic antibiotics was also given during the induction of anesthesia in all cases (ceftriaxone 1000 mg). The operation utilized a mini-laparotomy approach, it was defined as a small right sub-costal, midline or right para median incision of maximum 5 cm in length. Using sharp dissection, the skin, subcutaneous tissue, and anterior rectus sheaths were incised at the same wound axis followed by the separation of the rectus muscle from the sheath and retracted medially. The posterior rectus sheath and peritoneum were also incised with scissors. Then the peritoneal cavity was entered to the right of the falciform ligament. Two to three long and slim retractors were placed deep in the incision and positioned opposite to each other. The aim of these retractors was to extend the wound and open an enough approach to allow for gallbladder retraction. An abdominal gauge was inserted into the abdominal cavity and positioned deep between the retractors to push off the stomach and greater omentum on the right and for downward pushing of the right colonic flexure and loops of small bowel. After good operative exposure and isolation of the operative field from the rest of the adjacent abdominal organs, the surgeon could clearly see the inferior surface of the liver and gallbladder. Dissection of the structures in the triangle of Calot did not differ from the traditional open technique other than the necessity of remote operating and the inability to place the whole hand into the abdomen. While in Laparoscopic cholecystectomy was performed through three or four trocars, the first one was introduced using veress needle or the open technique.

We chose intraoperative outcomes as the intraoperative complication rate, operative duration, number of surgeons participating in the intervention and the rate of conversion to conventional procedure as determinants to assess feasibility. Postoperative complications and duration of hospital stay were the factors chosen for assessing postoperative outcome.

Conversion in LC means the removal of the tower of the laparoscopic aside, and complete the rest of the operation through large traditional subcostal incision as an open technique. However, in MC, it means an extension of the small incision to a large subcostal incision to complete the rest of the operation.

Approval of the publication of this study was obtained from the Ethics Committee in each hospital. Since these hospitals are teaching hospitals, informed consents to use the patient's data in academic activities and research are routinely signed by patients within the files during the time of admission and hospital stay.

Continuous variables were presented as mean, range and standard deviation, Student t-test was applied to calculate the difference between the means. 2 x 2 tables were made for binary variables and χ^2 test or Fisher's exact was applied when appropriate. Differences were considered to be significant when p-value was lower than 0.05 ($p < 0.05$). All statistical procedures were made by SPSS Software v21.

RESULTS

A total of 206 patients were included into the study, among them 68 patients underwent MC while 138 underwent LC. Total mean age was 37 years with a range of 15-75 years. Mean age in both groups was 36 years for those who underwent MC and 37 for those who underwent LC ($p = 0.983$).

Female gender was predominant with 183/206 (88.8%) female and 23/206 (11.2%) males. Gender distribution in both groups was nearly the same of the total population with no significant difference ($p = 0.82$). In the MC group, females accounted for

91% (62/68) while males for 9% (6/68). In contrast, 88% (121/138) of the patients in the LC group were females and 12% (17/138) were males. Total patient basic characteristics is shown in Table 1.

Fourteen (21%) patients in the MC group had a co-morbidity while it was evident in 41 (29%) of the LC group ($p = 0.61$). Furthermore, hypertension was diagnosed in 9 (13%) and in 21 (15%) of the MC and LC groups, respectively. Diabetes was diagnosed in 9 (13%) and in 20 (14%) in the MC and LC groups respectively. Cardiac disease was present in five patients observed only in the LC group. Statistical analysis shows no significant difference between the two groups as shown in Table 1.

Assessment of feasibility: the results of the univariate analysis showed that there is no significant difference between both techniques in terms of intra-operative complication rate, operative duration and the number of required surgeons while the rate of conversion to conventional sub-costal incision was significantly lower in the MC group. The results of univariate analysis of intra-operative outcomes is shown in Table 2.

Post-operative outcomes: the analysis showed that there is no significant difference between both techniques neither in post-operative complication rate nor in hospital stay time. The results of the univariate analysis of post-operative outcomes is shown in Table 3.

Table 1. Patient basic characteristics according to the performed procedure

	MC	LC	p
Number of cases	68	138	
Age			
Mean \pm SD	36.1 \pm 10.16	37.6 \pm 11.04	0.983
Gender			
Male (%)	6 (8.8)	17 (12.3)	
Female (%)	62 (91.2)	121 (87.7)	0.454
Total co-morbidity (%)	14 (20.6)	41 (29.7)	0.164
Hypertension (%)	9 (13.2)	21 (15.2)	0.705
Diabetes mellitus present (%)	9 (13.2)	20 (14.5)	0.807
Cardiac diseases (%)	0 (0)	5 (3.6)	0.173

Table 2. Results of the univariate analysis of intraoperative outcomes

	MC	LC	p
Number of cases	68	138	
Participating surgeons (mean \pm SD)	2.1 \pm 0.24	2.6 \pm 0.54	0.395
Intraoperative complications rate (%)	1 (1.5)	3 (2.2)	0.598
Rate of conversion (%)	0 (0)	9 (6.5)	0.032
Operative duration in minutes (mean \pm SD)	44.9 \pm 6.44	63.8 \pm 23.7	0.291

Table 3. Results of the univariate analysis of postoperative outcomes

	MC	LC	p
Number of cases	68	138	
Postoperative complications rate (%)	0 (0)	1 (0.7)	0.673
Hospital stay in days (mean \pm SD)	1.97 \pm 0.55	2.63 \pm 0.79	0.367

DISCUSSION

MC, associated with very minimal rate of complications, is a minimally invasive cholecystectomy technique reported as a safe method in many studies worldwide (5,6,8,13). Many randomized controlled trials have compared both techniques with results in favor of LC in terms of short hospital stay and earlier return to work while operative duration was in favor of MC (1,13-15). In contrast, some other studies have shown no significant difference between MC and LC regarding these variables but they have confirmed the associated long operative duration with LC (16). A meta-analysis of randomized controlled trials in 2007 by Sanjay Purkayastha et al. showed no significant difference between MC and LC except for operative duration and hospital stay (17).

This study showed comparable results between both techniques, which is in concordance with the literature. Intra-operative complications as an important cause of morbidity associated with cholecystectomy as well as the primary cause of conversion to classical operation were comparable in both techniques with no statistical significance ($p= 0.598$). This is actually related to the minimal rate of intra-operative complications observed in our study, which might be a result of the improvement in surgical training programs in our hospitals.

Total operative duration from the moment of skin incision to wound closure was longer in the LC group by 19 minutes (mean duration was 45 and 64 minutes for MC and LC respectively). Setting up and testing laparoscopic equipment as well as practicing the open access method to obtain pneumoperitoneum usually adds about 15 minutes to the procedure time (16). These factors play an important role in prolonging operative duration. Statistically, there was no significant difference between both groups ($p= 0.291$).

Restricted operative field in MC needs less participating surgeons, which is normally around two, except in case of complication or conversion when the number increases according to the situation. Four ports LC which is the most used technique in our hospitals requires three surgeons as operator, camera man and the last for holding gallbladder fundus. In spite of the introduction of three port LC by some surgeons, which requires less participating surgeons (two surgeons), mean number of surgeons is still a little bit higher than that of MC (around 2.5). This difference of means between both techniques is not statis-

tically significant ($p= 0.395$), which suggests that MC and LC has relatively the same requirements regarding human resources.

Conversion in LC means the removal of the tower of laparoscopic aside and completing the rest of the operation through large traditional subcostal incision as an open technique. However, in MC, it means an extension of the small incision to large subcostal incision to complete the rest of the operation.

The rate of conversion to classical cholecystectomy is higher in LC than in MC. Studies have reported that conversion rate in LC varies between 15-35 % (18,19). In the current study, nine cases in the LC group were converted to classical cholecystectomy. Uncontrolled bleeding, adhesions and instrumental failure were the main causes. In the MC group, there were no cases of conversion to classical technique, and subsequently statistical analysis showed significant difference in favor of MC ($p= 0.024$). This could be explained by the three-dimensional view offered by MC over two dimensional view in LC, which gives more orientation of the anatomy and more ability to perform safer dissection. Furthermore, LC requires much more sophisticated instruments than MC, which is vulnerable to mechanical failure as what happened in two cases in LC.

Nevertheless, the selection of cases for MC and LC tends to affect these results; thin patients have much more chance to undergo MC as no mush dissections needed either at the level of the anterior abdominal wall or at the level of cystic duct while obese patients undergo LC that add more difficulty as the hepatic hilum is usually impeded in fatty tissue. The lack of information about weight and height in patients' files prevent us from studying the effect of obesity in relation to both techniques.

This study was not large enough to compare the incidence and significance of post-operative complications with only one case of wound infection occurred in the LC group. Lujan et al. (20) have reported that post-operative complication rates is around 14% in LC and 23% in the MC. Statistically, our study showed no significant difference in the postoperative complications rate between the two groups ($p= 0.673$).

Postoperative hospital stay in the present study was a little bit longer for LC versus MC (the means of postoperative period were 1.97 days for MC and 2.63 days for LC). In contrast, longer hospital stay in MC is reported in the literature with signif-

icance (1,14); however another study (15) has shown that the difference is not of significance. Longer hospital stay observed in our study might be related to the difference in postoperative protocol which differs from one surgeon to the other. Statistical analysis in this study showed no significant difference between MC and LC ($p= 0.367$). From our experience in this study we can conclude that, mini-cholecystectomy is associated with low rate of intra-operative complications, has short operative time, and associated with a very little chance to be converted to the classical technique. Moreover, it is associated with good post-operative recovery with short hospital stay. This study calls for further studies with larger groups in multiple centers to evaluate properly the advantages of both techniques.

CONCLUSION

Mini-cholecystectomy is a feasible technique and can be considered as a good alternative method for gallbladder removal for the surgeons who have no experience with laparoscopic techniques and in the peripheral hospitals where laparoscopic cholecystectomy is not available.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of research department and medical affier office in each hospital included in this study.

Informed Consent: Because of all the hospitals included in this study are teaching hospitals, written informed consent for use the data in academic activities was obtained from patients who participated in this study as a routine at admission time.

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**ORJİNAL ÇALIŞMA-ÖZET**

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Mini-kolesistektomiye karşı laparoskopik kolesistektomi: bazı Doğu Libya hastanelerinde ameliyat edilen hastaları içeren retrospektif çok merkezli bir çalışmaAimen Almahjoub¹, Osama Elfaedy², Salah Mansor¹, Ali Rabea¹, Abdugadir Abdulrahman³, Almontaser Alhussaen⁴¹ Bingazi Üniversitesi Al-jaala Eğitim Hastanesi, Genel Cerrahi Bölümü, Bingazi, Libya² St. Lukes Hastanesi, Genel Cerrahi Bölümü, Kilkenny, İrlanda³ Ajdabiya Üniversitesi Ajdabiya Eğitim Hastanesi, Genel Cerrahi Bölümü, Ajdabiya, Libya⁴ Bingazi Üniversitesi Almrğ Eğitim Hastanesi, Genel Cerrahi Bölümü, Almrğ, Libya**ÖZET**

Giriş ve Amaç: Bu çalışmada mini-kolesistektomi (MC)'nin, laparoskopik kolesistektomi (LC)'ye iyi bir alternatif yöntem olarak kabul edilip edilemeyeceğinin belirlenmesi amacıyla MC ve LC arasındaki farklılıklar fizibilite ve postoperatif sonuçlar açısından incelenmiştir.

Gereç ve Yöntem: Ocak 2014-Aralık 2015 tarihleri arasında Al-Jalaa, Ajdabiya ve Almrğ Eğitim hastanelerinde 206 ardışık kronik kolesistit hastası (138 LC ve 68 MC) hastası retrospektif olarak karşılaştırıldı. İki gruptaki tüm olgular yaş için ve eşzamanlı hastalıklar için ve ultrason ve intraoperatif bulgu için dengelendi. Dışlama kriterleri akut kolesistit, preoperatif sarılık, karaciğer sirozu, malignite şüphesi, önceki üst abdominal cerrahi ve gebelik idi.

Bulgular: Çalışmaya alınan hastaların yaş ortalaması 37'dir Kadın hastalar tüm hastaların %88,84'ünü oluşturmaktadır. İntraoperatif komplikasyonlar üç olguda kanama olan hastaların %2'sinde (biri MC'de, ikisi LC'de) meydana gelmiştir, bir olguda LC'ye bağlı olarak safra kanallarında hasar meydana gelmiştir. Operasyon süresi LC'de daha uzundur (ortalama değerler LC için 64 dakika ve MC için 45 dakika). LC'de dönüşüm oranı %5 iken MC'de %0'dır. LC grubunda sadece bir yara enfeksiyonu vakası kaydedilmiştir. Postoperatif hastanede kalış süresi MC'ye karşı LC'de daha uzundur (MC için 1.97 gün ve LC için 2.63 gün).

Sonuç: Mini kolesistektomi kolay uygulanabilir bir tekniktir. LC'nin bulunmadığı periferik hastanelerde ve laparoskopik tekniklerle deneyime sahip olmayan cerrahlar için, MC safra kesesi çıkarılması için iyi bir alternatif yöntem olarak düşünülebilir.

Anahtar Kelimeler: Laparoskopik kolesistektomi, mini-kolesistektomi, kronik kolesistit, safra kesesi taşları

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