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Early Outcome of Open Versus Laparoscopic Cholecystectomy for Symptomatic Gallbladder Stone Disease in A Resource-Limited Setting: A Retrospective Review

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Abstract

Background
Gallbladder diseases requiring surgery are a common condition among general surgical practice. Cholecystectomy is thus commonly practiced/practice with laparoscopic cholecystectomy (LC) as the gold standard. Seven years now, LC has slowly developed at Muhimbili National Hospital (MNH) but proportional numbers of patients still receive open cholecystectomy. This study was therefore undertaken to assess and compare the outcomes of the two methods of surgical treatment in a resource-limited setting in order to provide evidence based data for informed change in surgical care of patients with symptomatic gallbladder stone disease.

Methods
A retrospective chart review of patients who had cholecystectomy from February 2012 to February 2017 was carried out. Medical records in the operating room were searched and case notes retrieved. Information regarding demography, operative time, post-operative stay, complications, and mortality was extracted. Between groups comparison of variables was done using chi square test, where p value of greater than 0.05 indicated similarity between the two groups. An independent sample t test was used to compare the operative time, hospital stay and for post-operative complications.

Results
This retrospective study reviewed 182 cases for the period of 6years. The patients undergone laparoscopic cholecystectomy or or open cholecystectomy. The hospital stay was significantly shorter in the LC group compared to open cholecystectomy (OC) group with mean hospital stay of 2.15± 1.165 days and 3.82±2.25 days respectively (p< 0.001). The mean operative time for LC was longer 109.78±40.38 minutes compared with patients in the OC group 79.78±27.23 minutes (p < 0.001). No significant differences were observed in complications and mortality between the two groups.

Conclusion
LC and OC are comparable procedures for the treatment of gallstone disease in terms of morbidity and mortality although LC had significantly shorter hospitals stay. However, the operative time was longer in LC group. At MNH, LC should be a procedure of choice and further study on cost-effectiveness of LC should be conducted.

Key words: *Gall stones, Laparascopy Gallstones, Laparoscopy Cholecystectom.*

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Introduction

Gallbladder stone diseases is the commonest biliary pathology affecting predominantly females globally (1). In general about 20% of adults develop gallstone and more than 20% of those who have gall stones end up with complications (2). Open and laparoscopic cholecystectomy remains the most common surgical treatment for the condition and since the introduction of laparoscopy into general practice in 1980s, the surgical treatment of gallstones has changed and therefore elective laparoscopic cholecystectomy has almost replaced the open procedure (3).

Laparoscopic cholecystectomy (LC) is now the gold standard for the treatment of symptomatic and uncomplicated gallbladder stone disease (4). At MNH this form of treatment was not available until 2012. Open cholecystectomy (OC) remained the most practiced approach due to limited medical equipment and qualified human resources. However; laparoscopic surgery is considered safe and effective in low and middle-income countries (5). The benefits of LC over OC are well documented and accepted worldwide (6). LC is safe and is associated with short hospital stay, quick return to work, superior cosmetic results, and comparable morbidity to the open method (7, 8). Most of these data come from developed countries where approximately 80% of all cholecystectomies are done laparoscopically (9)

Tanzania is a resource-limited country with a less than optimal health care system and only a small number of government and private health facilities are offering LC. The observed constraints on health care infrastructure, training opportunities and expertise, make this kind of service to be of limited application. Unlike other regions of the world very little has been reported on LC in Tanzania. Only one study has reported the surgical outcomes of laparoscopic cholecystectomies LC in our settings (10).There is no local study done to establish outcomes of LC over OC, therefore the information about operative time, hospital stay, conversion rate, complication and mortality rate are not available. This study assessed and compared the outcomes of the two procedures and recommended the better surgical option for patients with symptomatic gallbladder stone disease in our environment.

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Materials and Methods

Study setting and data collection

This study was carried out at Muhimbili National Hospital (MNH) in Dar es Salaam, Tanzania. It was a retrospective study design conducted between February 2012 and March 2017. The hospital receives patients from all over the country and serves as a teaching hospital for Muhimbili University of Health and Allied Sciences (MUHAS). It introduced Laparoscopy in 2012 with one operating room equipped with laparoscopy facilities capable of performing basic procedures. Prior to this period, open cholecystectomy was the mainstay of care. Therefore, patients are slotted to either OC or LC depending on surgeon's preference with one team predominantly favoring either one. This allowed easy recruitment of LC and OC arm with little ethical challenges of randomization. Ethical approval to conduct the study was obtained from MUHAS Institutional Review Board (IRB).

Operating log records was searched for all patients who had cholecystectomy for any indication. Once registration numbers were identified, case notes were pulled from the medical records. Data regarding demography, type of surgery (LC vs OC), operative time, post-operative stay, complications, and mortality was extracted. The information was entered in data collection excel spreadsheet and later transferred into SPSS computer software version 22.0 for analysis. First, a between groups analysis was performed where by a p-value of greater than 5% meant that they were comparable. Further, independent student 't' students' t-test (two sided) for comparing the operative time, and hospital stay while Chi- square test was employed for complications and a p-value of <0.05 was considered significant. Results were summarized in tables.

Results

During the period under review, 182 patients who patients who underwent cholecystectomy were identified with OC to LC ratio of 1:1. The conversion rate from LC to OC was reported in 3 (3.3%) of the patients. The two approaches were similar regarding the mean age, comorbidity, and ASA status score except for sex and payment categories where more LC patients were female and privately paying (Table 1).

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Table 1: Between groups comparison of distribution of categorical variables

Characteristics		Laparoscopic no (%)	Open no (%)	P-Value
Age	(Mean)	44.52±15.19	43.10±15.19	0.55
Sex	M:F	1:5.5	1:2	0.00
Category	Public	26 (28.57)	63 (69.23)	0.00
	Private	65 (71.42)	28 (30.77)	
Co-morbidities	Sickle cell disease	18 (19.78)	19 (20.87)	0.85
	Hypertension	5 (5.49)	3 (3.30)	0.47
	Diabetes mellitus	3 (3.30)	5 (5.49)	0.47
	HIV	3 (3.30)	2 (2.20)	0.65
ASA	I	58 (63.74)	59 (64.84)	0.88
	II	28 (30.77)	28 (30.77)	1.00
	III	5 (5.50)	4 (4.4)	0.73

There were no statistically significant differences in occurrence of complications between the two approaches. Surgical site infection 3(3.29%) was more common in OC, and pulmonary embolism 2(2.20%) more common in LC (Table 2)

Table 2: Comparison of types of complications between OC and LC

Complications	Open N (%)	Laparoscopic N (%)	P-Value
Surgical site infection	3 (3.29%)	2 (2.19%)	0.65
Bleeding	0.00	1 (1.09%)	0.32
Bile leak	0.00	1 (1.09%)	0.32
Respiratory infection/atelectasis	3(3.29%)	3 (3.29%)	1.00
Contamination	0.00	1 (1.09%)	0.32
Embolism	0.00	2 (2.20%)	0.16

The mean operative time for LC was longer 109.78±40.38 minutes compared with patients in the OC group 79.78±27.23 minutes ($p< 0.001$). The mean postoperative hospital stay was significantly shorter for LC 2.15±1.165 days compared with OC 3.82±2.25days ($p< 0.001$). There were no statistically significant differences in complications and mortality between these two approaches. However, the attributable risk (AR) of developing a complication was 33%, higher in LC when compared to OC ($p> 0.05$) (Table 3).

Table 3: Association between variables with type of cholecystectomy

Variable	Type of Approach		Risk ratio	P-Value	Confidence interval
	OC	LC			
Mean operative time (minute)	79.78±27.23	109.78±40.38	-	0.000	0.09 - 0.17
Mean hospital stay(days)	3.82±2.25	2.15± 1.17	-	0.000	0.18 - 0.08
Post-op complications	6(6.59%)	8(8.79%)	1.33	0.16	-
Mortality	0	2(2.2%)	0	0.16	-

Discussion

This study has provided insight into the outcome of OC versus LC in the treatment of symptomatic gallbladder stone disease in resource limited setting at Muhimbili MNH in Tanzania**.** However, being a complex tertiary and university teaching hospital, the results might not echo the practice in other hospitals. The findings are unlikely to influence reflect the practice in other hospitals since MNH plays the role model by virtue of being the oldest medical teaching institution in the country.

Even though this was not a randomized study, the natural preference of the attending surgeons still provided opportunity of equal distribution of variables between the two groups except for the sex and payment category. This provided strength in considering a comparative analysis between the two groups. Even though patients do not need to pay extra to get LC, still the LC group was biased to receiving majority of the privately paying patients. Given that the two teams were located in two different surgical units in the same department makes it difficult to explain this observation. It was important that patients at informed consent process for surgery should receive full information including available surgical options, which we think was not the case.

In this series, for every 30 patients undergoing LC, one would be converted to open approach. This was on the lower side compared with within the range of that reported from other sites of between 2-15% (9, 11, 12). Conversion from LC to OC is considered neither a failure nor a complication of LC but an attempt to avoid serious complication by acting judiciously, brevetting to a ‘safe’ 100 year old, established technique (13). The reason for conversion in these two cases (39 and 43 years old females) was extensive adhesion and inability to define anatomy due to prior history of laparotomy. In other studies the reported,

most common reasons for conversion to OC are difficult dissection, inability to define the anatomy and inflammation, which is in agreement with our study. However, other most predictive factors in these previous studies were the male gender, advanced age, significant co-morbidities such as restrictive lung diseases and anemia (Hb<9g/dl)), which was not the case in our study. Therefore, influence of age on conversion rate remains controversial (9, 14). This is significant improvement given the learning curve that had to be taken into account with the small volume of cases done in five years.

We have demonstrated from this study that the mean operative time for LC was 30 minutes longer than with OC. This corresponds to the findings of other studies on cholecystectomies (15-17). In another study, they found no significant difference in operative time among the two procedures (15, 18). The reasons for the long operating time in this study were not investigated, however, this could be attributed to the learning curve effect since MNH is a university teaching hospital and lack of constant supply of laparoscopic surgical clips. But also to add to this operating time is that there are students to learn the technique during any operating time. The longer operating time adds costs to the hospitals since patients do not pay for operating time in our set up. Efforts to address operating time but taking efforts to maximize safety are needed.

The LC patients had a shorter hospital stay compared to those who underwent OC. The OC patients stayed twice longer when compared to the open LC approach. This is similar to findings from other studies (7, 12). Furthermore, LC did not signifiantly add to complications compared to the open group. The slightly high complications observed are comparable to other reports given the physiological changes associated with pneumoperitonuem and pots entry (19-21). Even after the learning curve, Strasberg and colleagues have demonstrated that complications with LC remains slightly higher (19, 22).(22).. Furthermore, the overall mortality in each group was comparable, in agreement with other studies (6, 15, 18).

The comparable complications rate and mortality means that LC can be safely performed even in resource limited settings LICs. Even though the study design did not allow following up how early the two treatment groups returned to work, it is expected that LC group had quick return, because of short postoperative hospital stay and smaller surgical wound. Therefore, in spite of heavy initial investment and training, LC is safe and efficient way of treating gallbladder diseases at MNH. The arrangement of the two surgical firms for

preference over one approach works well with residents training as more OC is performed in the peripheral hospitals where conditions are sub optimal with no near future dreams of LC. However, patients must have the right to choose between OC and LC given fair information when being treated in centers where the latter is available. Many public hospitals fear the cost of LC but this has not been well reviewed in these settings. A study is needed to prove whether it is actually cost effective to both hospitals and families

Conclusion

This study has provided initial evidence on the safety and efficiency of LC over OC in a low resource setting. These two procedures are comparable for the treatment of gallbladder stone disease in terms of operating time, time of hospital stay, morbidity and mortality, we observed the longer operating time but short hospital stay for LC as compared to short operating time and longer hospital stay for the OC. This study has provided an insight on safety and practice of LC and OC and therefore gives clinicians the opportunity to predict the operative outcome based on the procedure of choice.

Abbreviations

IRB	Institutional Review Board
LC	Laparoscopic Cholecystectomy
MNH	Muhimbili National hospital
MUHAS	Muhimbili University of Health and Allied Sciences
OC	Open Cholecystectomy

Competing Interests

The authors declare that they have no competing interest.

Authors' contributions

All authors contributed equally towards the accomplishment of this work and have all read and approved the final version of the manuscript.

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