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Research Article

Index Admission Laparoscopic Cholecystectomy, Our Experience After the Inception of Acute Care Surgery Program

Muhammad Aakif*, Zeeshan Razzaq, James Byrne, Hamid Mustafa, Mudassar Majeed, Ata-Ullah Khan, Mumtaz Bughio, Fuad Aftab, Muhammad Amir Zaheer, Akbar Amin Achakzai, Hugo Jacobus Prins, Mark Anthony Corrigan, Henry Paul Redmond, Mohammed Yasser Kayyal

Department of Surgery, Cork University Hospital, Wilton, Cork, Ireland

***Corresponding author:** Muhammad Aakif. Department of Surgery, Cork University Hospital, Wilton, Cork, Ireland.

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Abstract

Background

Gallstones are very common and frequently present as acute cholecystitis in up to 20% of patients with symptomatic disease, with wide variation in severity. Laparoscopic Cholecystectomy (LC) has become the gold standard for the treatment of symptomatic disease. Although multiple studies have confirmed its safety, LC at index admission is still not widely practiced in Ireland. We present our experience of a cohort of patients who underwent index admission laparoscopic cholecystectomy at Cork University Hospital since the start of the acute care surgery program in May 2017.

Aim

To determine the feasibility and safety of laparoscopic cholecystectomy at index admission.

Methods

All adult patients who presented to an acute surgical assessment unit (ASAU) with symptomatic gall stone disease and underwent early laparoscopic

cholecystectomy at index admission were included. The duration of this prospective cohort study was 27 months (May 2017 to July 2019). Patient demographics, indication for surgery, postoperative complications, and conversion rates were recorded. Besides, the timing of imaging, imaging findings, and length of hospital stay was also noted.

Results

A total of 233 patients underwent laparoscopic Cholecystectomy at index admission for various indications. The median age was 50 years with a range between 16 - 88. The male to female ratio was 1: 1.78. 142 (61%) patients had acute cholecystitis, while the other indications were CBD obstruction (15.5%), biliary colic (11%), and acute biliary pancreatitis (10.5%). 93 (40%) patients had pre-op MRCP while 41 (17.6%) underwent pre-op ERCP. All except 3 patients undergoing ERCP had pre-procedure MRCP. 2 patients had intra-operative cholangiograms. Overall morbidity was 4.7%. In terms of complications, 3 (1.3%) patients had bile leak and only 1 (0.85%) had re-operation. There were 1 common bile duct injury and only 1 conversion to open surgery. There was no mortality in this case series. The average length of hospital stay was 5 days. (Range 2 to 14 days).

Conclusions

Index admission laparoscopic cholecystectomy for acute cholecystitis, choledocholithiasis, biliary colic, and acute biliary pancreatitis, has been a safe and cost-effective treatment option in our hospital. A safe practice can be ensured by adherence to a pathway and a multidisciplinary, consultant-led service. Index admission laparoscopic cholecystectomy should be the standard practice to reduce disease-related morbidity and morbidity otherwise.

Key Words: Acute cholecystitis; Index admission laparoscopic cholecystectomy; Acute care surgery

1. Background

Gallstones are very common and in the western world, approximately 10-15% of the adult population is affected by this disease. The third American National Health and Nutrition Examination Survey have reported that 6.3 million men and 14.2 million women aged between 20 to 74 in the United States have gallbladder disease [1-4]. Gall stone disease is also a major health burden across Europe and cumulative incidence has been reported as 0.6% per year with an overall prevalence of 9% in females and 10% in males [5]. Female gender, obesity, elevated non HDL cholesterol, and gall bladder polyps have been identified as the main risk factors for gallstones. The majority of patients present with complications related to gall stones in the form of biliary colic, acute cholecystitis, acute pancreatitis, and jaundice related to the migration of gall stones into the common bile duct. Gallstones present as acute cholecystitis in up to 20 % of patients with symptomatic disease, with wide variation in severity [6]. Laparoscopic cholecystectomy (LC) has become the gold standard for the treatment of symptomatic disease. There have been extensive studies on the management of acute cholecystitis in the emergency setting. More recently, Tokyo guidelines and World Society of Emergency Surgery (WSES) guidelines now recommend early cholecystectomy during the index admission but only within a limited time of admission and grade of severity [7,8]. Early cholecystectomy seems to have lower morbidity and mortality, a lesser rate of conversion to open and shorter hospital stay if performed within 7-10 days of onset of symptoms [9].

Still, a major dilemma remains unsolved; that is the risk of major complications associated with this approach of early cholecystectomy, for example, common bile duct injury. A relatively large population-based study from Sweden showed that the risk of common bile duct injury is doubled for patients with acute cholecystitis in early cholecystectomy [10]. Other studies have reported a wide range of conversion (4.9-20%) from laparoscopic to open cholecystectomy despite the increase in surgical expertise during early cholecystectomy [11]. However, most of these studies are underpowered and hence there is no conclusive evidence to date with regards to increased risk of bile duct injury and conversion to open surgery in early laparoscopic cholecystectomy. Based on this background, we planned to conduct a prospective cohort study at Cork University Hospital, Ireland after the inception of the acute care surgery program in May 2017. The study aimed to assess the feasibility and safety of index admission laparoscopic cholecystectomy in our program for various indications in symptomatic gall stone disease regardless of the timing of presentation and severity of the disease.

2. Methods

This was a prospective cohort study undertaken from May 2017 until July 2019 at Cork University Hospital Cork (CUH). CUH started its acute care surgery program in May 2017 and a dedicated team consisting of experienced consultants and trainees was assigned to run the service. A separate pathway was devised for all patients presenting with symptomatic gallstone related issues. These patients were directly sent from the emergency department to the acute surgical assessment unit and then fast-tracked for imaging, admission, and then emergency surgery accordingly. We have the availability in our setup to get each relevant specialty on board early in managing complex patients with obstructive jaundice secondary to choledocholithiasis. In such patients, radiology (for imaging techniques including MRCP and interventions e.g. PTC) and gastroenterology (for ERCP) are involved early in their specialist roles. All adult patients above the age of 16 years with proven gall stone disease on ultrasound and MRI, undergoing index admission early laparoscopic cholecystectomy have been included. Patients who did not undergo surgery because of personal preference to opt for interval delayed surgery have been excluded. Data were collected prospectively and recorded on excel sheets including patients demographics, presenting symptoms, imaging is done preoperatively including findings of relevant imaging modalities i.e. ultrasound, CT, MRCP; and whether patients went through preoperative ERCP or not. Besides, we also recorded the patient's date of admission and date of discharge and thus their total length of hospital stay. We have documented complications following surgery including bile leak, common bile duct injury, hematoma formation, and other related complications like post ERCP pancreatitis, bleeding, retained stones, re-admission rate, and lower respiratory tract infections. We also documented if patients underwent postoperative imaging of the biliary tree for any reason.

3. Results

A total of 233 patients underwent laparoscopic Cholecystectomy at index admission for various indications from May 2017 till July 2019. The median age for laparoscopic cholecystectomy was 50 years (Range 16-88 years). 148 patients were females (63.5 % of the cohort). The male to female ratio was 1:1.78.

(Table 1). The overall morbidity was 4.7%. In terms of complications, 3 (1.3%) patients had a bile leak and 1 (0.43%) had re-operation. One patient had a post-op hematoma which was drained percutaneously. One patient had their procedure abandoned because of bradycardia upon induction of anesthesia. There was 1 (0.43%) common bile duct injury, 1 conversion to open surgery and no 30 days mortality was reported. (Table 2). The average time between the onset of symptoms and surgery was 5 days (Range 2 - 15). The average length of hospital stays varied from 3 days (range 1-7) for biliary colic patients to 9 days (range 4-14) for patients with choledocholithiasis. The overall average length of hospital stay was 5.6 days (Range: 2-14 days) (Table 3). The patient's preoperative diagnosis and histology were matched and results analyzed accordingly depending on imaging as in some cases normal gall bladder wall thickness was reported but was proved to be acute cholecystitis on final histology. We did not find any incidental gall bladder malignancies on final histology results. 1% of patients had either polyps or adenomyomatosis on histology.

	Male		**Female**		**Total**
	85(46.5%)		148(63.5%)		233
Age	<30 yrs =1		<30 yrs =25		
	30-60yrs=72		30-60yrs=102		
	>60 =12		>60 yrs =21		
ASA Grade	I	50	I	110	
	II	23	II	25	
	III	10	III	7	
	IV	2	IV	5	
Mean duration of symptoms before surgery	6 days		4 days		

Table 1: Patient's demographics

The majority of the patients 142 (61%) had acute cholecystitis as the indication for index admission laparoscopic cholecystectomy. 15.4% presented with choledocholithiasis and underwent ERCP and their ducts were cleared before surgery. 10% of patients presented with biliary colic. 11.5% had acute biliary pancreatitis.

Diagnosis	**Male**	**Female**	**Total**	**Percentage**
Acute cholecystitis	48	94	142	61%
Acute biliary pancreatitis	9	18	27	11.50%
Choledocholithiasis	11	25	36	15.40%
Biliary colic	5	18	23	10%
Adeomyomatosis	0	3	3	1.28%

Table 2: Indications for the laparoscopic cholecystectomy

100% of patients had pre-operative ultrasound (US) scans while 28.5% had a pre-operative CT scan as part

of their workup. 40% of patients had pre-op MRCP out of which less than half (17.6%) required an ERCP procedure. Only 3 patients required ERCP with CBD stent placement. 2 patients had intra-operative cholangiogram.

Investigations	Male	Female	Total(n=233)	Percentage
USS abdomen	85	148	233	100%
MRCP (Preoperative)	33	60	93	39.60%
ERCP(Preoperative)	13	28	41	17.60%
CT Abdomen Pelvis	24	45	69	28.50%
Peroperativecholagiogram	1	1	2	0.80%
MRCP(Postoperative)	4	1	5	2.10%
ERCP Postoperative	2	1	3	1.20%

Table 3: Investigations performed

Biliary Complications	% (n=)
Bile Leak	1.3% (n=3)
Haematoma	1.3% (n=3)
Retained Stones	0.86% (n=2)
CBD injury	0.43% (n=1)
Conversion to Open	0.43% (n=1)
Re-operation	0.43% (n=1)
Total	4.7 % (n=11)

Table 4: Surgery related complications

Diagnosis	Average LOS (days)	Range (days)
Acute cholecystitis	5.5	Feb-14
Choledocholithiasis	9	Apr-14
Acute Pancreatitis	5	02-Oct
Biliary Colic	3	01-Jul
Average LOS for all Diagnosis	5.6 days	

Table 5: Length of stay

Our Results	% (n=)	Cochrane Review EC	Cochrane Review LC
Bile Leak	1.3% (n=3)	0.40%	0.90%
Hematoma	1.3% (n=3)	6.50%	5%
Retained Stones	0.86% (n=2)		
CBD injury	0.43% (n=1)		
Conversion to Open	0.43% (n=1)	19.70%	22.10%
Overall morbidity	**4.7% (n=11)**	**26.60%**	**28%**

Table 6: Comparison of our complications with the published data

4. Discussion

The timing of laparoscopic cholecystectomy (LC) i.e. either early or delayed as definite surgical management of acute cholecystitis has been controversial and a matter of debate for many years now. Most of the literature available to date has demonstrated that early LC has many benefits including shorter hospital stay and reduced morbidity. Delay of laparoscopic cholecystectomy after the diagnosis of biliary colic or acute cholecystitis may increase the probability of recurrent emergency admissions while awaiting elective delayed cholecystectomy [12]. Clinical practice varies significantly worldwide and hence the observed differences regarding the timing of surgery have not yet been resolved [9]. The latest Tokyo guidelines from 2018 have strongly suggested early LC within 72 hours of the onset of symptoms as a safe and effective practice. 7 Similarly, the World Society of Emergency Surgery (WSES) in their 2016 guidelines have advised up to 10 days time period to be safe to operate in the context of early LC. Overall, the systematic review and meta-analysis of randomized controlled trials which the WSES used for these guidelines included clinical data from five of these six trials demonstrating no significant difference in the complication rate or conversion to open cholecystectomy between early and delayed laparoscopic cholecystectomy. Also, hospital stay was statistically shorter by 4 days in the early laparoscopic cholecystectomy group compared to the delayed laparoscopic cholecystectomy group [8]. In our study, the average time between the onset of symptoms and surgery was 5 days with a range from 2-15 days. In our experience, young male patients pose a significant risk towards complications because of their general trend of late presentation compared to females and also the severity of the disease making it technically challenging to operate and thus increasing the risk of complications. In our cohort 3 patients had bile leak and all of them were males with an average age of 42 years. Two of them had gangrenous gall bladders and necrotic cystic ducts and in one patient there was the displacement of clips of the cystic duct. One patient was taken back to the theatre for laparoscopic washout and drainage. All three patients had post-operative ERCP and stenting of their common bile ducts. Stents were removed 6-8 weeks later in our institute. One patient had common bile duct injury, which was identified per-operatively and a hepatobiliary surgeon's advice was taken and a drain was left in. Postoperatively, the patient underwent ERCP and stenting and common bile duct healed spontaneously with no further complications. We have compared our results with a Cochrane review published a few years ago on early laparoscopic cholecystectomy and have found a significant difference in complications between studies included in that review and our findings (Table 4). Our conversion from laparoscopy to open surgery was 0.43% as compared to 19-22% in the Cochrane review. Our overall morbidity was 4.7% which was significantly less than 26-28%. In our opinion, there is significant heterogeneity in the studies included in the Cochrane review. Many studies are relatively older and most setups lack dedicated emergency surgery services [13]. A study was done by Lau et al in 2006 also showed that early laparoscopic cholecystectomy is cost-effective as compared to delayed as it reduces the length of hospital stay [15]. Bile duct injury is the main and most feared complication of laparoscopic cholecystectomy as it

results in crippling biliary situation [16].

5. Conclusion

Index admission laparoscopic cholecystectomy for acute cholecystitis, choledocholithiasis, biliary colic, and acute biliary pancreatitis, has been a safe and feasible treatment option in our hospital. It reduces the rate of morbidity associated with delayed surgery and the patient's anxiety. A safe practice can be ensured by adherence to a care pathway and a multidisciplinary, consultant-led service. Index admission cholecystectomy service can be provided safely to reduce disease-related morbidity and multiple re-admissions in patients awaiting interval surgery.

Abbreviations

LC(Laparoscopic cholecystectomy), ASAU (Acute surgical assessment unit), ERCP (Endoscopic retrogradecholangiopancreatogram), MRCP (Magnetic resonance cholangiopancreatogram), CBD (common bile duct),WSES (world society of emergency surgery), PTC(percutaneous transhepatic cholangiogram), CT (computed tomogram), CUH (cork university hospital), USS (ultrasound scan)

Declarations

Ethical approval

Study approved by the research committee and all participants agreed to be part of the research

Consent for publication

All participants agreed for publishing the research work

Availability of supporting data

All data is available for counter verification

Competing interests

None

Funding

None

Authors contributions

All authors did participate in the study at different levels MYK, MC came with the main idea of the study, data collection was done by MA and JB, Data was analyzed by MA, ZR, and HM. Initial manuscript was written by MA, MM, and AUK, Manuscript was further edited by ZR, MB, FA, MAZ, AAA and HJP, Final proofreading was done by HPR

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