Laparoscopic Surgery in a Developing Country in East Africa: An Audit at the Initial Part of a Surgeons’ Learning Curve

Richard Wismayer¹,²*

¹Department of Surgery, Masaka Regional Referral Hospital, Masaka, Uganda.
²Department of Surgery, Habib Medical School, IUIU University, Kampala, Uganda.

Author’s contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Background: In many surgical conditions, laparoscopic surgery has been used for surgical access. In the West, laparoscopic cholecystectomy is the gold standard treatment for cholecystitis. On the other hand controversy has been generated with laparoscopic appendicectomy due to the cost, time consuming nature of the procedure, together with many trocar sites which in all approximate to the length of an open appendicectomy incision. The purpose of this study is to audit the initial laparoscopic units experience in a developing country in East Africa.

Methods: This was a retrospective study conducted in the Department of Surgery. All patients that consented to laparoscopic cholecystectomy and laparoscopic appendicectomy over the initial period of 13 months were included in this study.

Results: A total of thirty (30) patients consented to having laparoscopic surgery; Ten (10) patients consented to laparoscopic cholecystectomies with a male:female ration of 1:2.33 and twenty (20) patients consented to laparoscopic appendicectomies with a male:female ratio of 1:1.2. The mean operating time was 58.5 minutes for laparoscopic cholecystectomy and 40.45 minutes for laparoscopic appendicectomy. The duration of post-operative admission ranged from 3 days to 5
days with a mean duration of 4.2 days for laparoscopic cholecystectomy and from 2 days to 5 days with a mean of 2.65 days for laparoscopic appendicectomy. No complications were reported apart from spinal headache in 2 patients (2.6%) out of the total laparoscopic procedures. There were no readmissions over the one month of follow up.

**Conclusions:** Laparoscopic cholecystectomy and laparoscopic appendicectomy allows for early discharge and is safe. In Uganda, the low incidence of cholecystitis compared to the higher incidence of appendicitis, supports the adoption of laparoscopic appendicectomy compared to cholecystectomy for hand and eye coordination training. The surgeons’ initial cases of laparoscopic procedures have demonstrated an adequate level of safety which supports laparoscopic appendicectomy to acquire the basic laparoscopic surgery skills.

**Keywords:** Laparoscopic; appendicectomy; cholecystectomy.

**1. INTRODUCTION**

In many surgical conditions, laparoscopic surgery has been used for surgical access. The advantages of laparoscopic surgery include an early return to normal lifestyle, shorter hospital stay and a reduced postoperative analgesia requirement. Other benefits of laparoscopic surgery include better cosmesis and reduced complications from prolonged bed rest [1,2,3]. One of the commonest intra-abdominal surgical emergency is appendicitis [2,3,4,5]. In 1983 the first laparoscopic appendicectomy was successfully carried out by Kurt Semm on the 13th September 1980, a German gynaecologist [5,6].

In East Africa, laparoscopic appendicectomy has been controversial due to the fact that the three trocar sites which approximate to the length of an open appendectomy incision together with its time consuming nature and cost. However, recently encouraging results from hospitals in developing countries are being reported [7,8]. Less complications post-operatively have been reported with laparoscopic appendicectomy compared to open appendicectomy in particular less wound infections (1.8% versus 1.2%) however the incidence of pelvic abscess appears to be slightly higher with laparoscopic appendicectomy [9,10,11].

In developed countries in the West the gold standard treatment of cholecystitis has been laparoscopic cholecystectomy. The first laparoscopic cholecystectomy was carried out by Professor Erich Muhe of Boblingen, Germany on the 12th September 1985. The German Society rejected Muhe after performing the first laparoscopic cholecystectomy however he eventually received the German Surgical Society Anniversary Award in the year 1992 [12,13].

Early cholecystectomy within 72 hours of symptoms of cholecystitis is routinely practised in the West which results in a shorter hospital stay without any increase in complications or conversion rates [14,15,16,17]. In East Africa, laparoscopic cholecystectomy is performed in a few regional referral hospitals which are referred from primary health centres. However, in our environment there are challenges which result in delays in carrying out laparoscopic cholecystectomy. These include absence of on-site endoscopic retrograde cholangiopancreatography (ERCP) services which result in a delay or no preoperative clearance of bile duct stones. A delay in obtaining preoperative ultrasound scan and availability of theatre time are other challenges experienced.

The most serious complications of laparoscopic cholecystectomy are bile duct leaks and bile duct injuries with an incidence of between 0.38% to 0.5% [18]. Anatomical variations as well as anatomical distortion due to inflammation are risk factors for common bile duct injury. Prior to ligation of the cystic duct and cystic artery a critical view of safety is needed and together with the use of intraoperative cholangiography, these measures tend to minimise the risk of common bile duct injury.

This study was an audit on the experience of the laparoscopic unit and challenges faced with laparoscopic procedures in the first 13 months in a regional referral hospital setting in East Africa.

**2. METHODOLOGY**

This was a retrospective study conducted by the Department of Surgery of our hospital from December 2018 to December 2019. All patients above 10 years of age with a clinical diagnosis of acute appendicitis or symptomatic gallstones (acute/chronic cholecystitis, biliary colic or
gallstone pancreatitis) and who consented voluntarily to have laparoscopic surgery were included in the study. Other causes of acute abdomen that were diagnosed with diagnostic laparoscopy and had an open procedure were excluded.

The clinical case files of patients were reviewed for intra-abdominal findings, post-operative complications, duration of surgery and duration of admission. The duration of admission was calculated from the days of operation to the day of discharge from hospital. The operative time was calculated from the time of wound incision to the time of wound dressing. All patients undergoing laparoscopic appendicectomy and laparoscopic cholecystectomy had perioperative antibiotics consisting of 2g iv ceftriaxone and iv metronidazole 500mg at induction of anaesthesia. The analgesia postoperatively given was opioid analgesia in the first day after surgery and a combination of paracetamol and non-steroidal inflammatory drugs afterwards.

2.1 Approach Used for Laparoscopic Appendicectomy

The laparoscopic approach first consisted of placing a 10mm subumbilical port for the laparoscope and a diagnostic laparoscopy carried out after creating a pneumoperitoneum with carbon dioxide. Then under vision two 5mm ports in the suprapubic region and left iliac fossa were placed.

The appendix was first identified and the mesoappendix was coagulated with forceps diathermy and divided with laparoscopic scissors. Two vicryl Roeder’s knots were placed at the base of the appendix and the appendix was divided between the knots. Any adhesiolysis if necessary was carried out with monopolar scissors. Any suction/irrigation of serosanguinous peritoneal fluid was then carried out. All ports were removed under direct vision and the pneumoperitoneum was then released. The rectus sheet fascia was closed with nylon no.1 suture and skin of the 10 mm port and two 5 mm ports were closed with vicryl no.2/0 subcuticular suture.

2.2 Approach Used for Laparoscopic Cholecystectomy

For a laparoscopic cholecystectomy a 10mm subumbilical port was placed and a pneumoperitoneum was created via an open approach. The gallbladder was visualised and the fundus of the gallbladder was retracted upwards and towards the right shoulder. The critical view of safety was identified and the anterior and posterior leaves of peritoneum were dissected from Calot’s triangle to expose the cystic duct and cystic artery. The cystic duct was ligated and divided with endoclips and scissors and the cystic artery was ligated and divided with endoclips and scissors. The gallbladder was then dissected from the liver bed using hook diathermy. Haemostasis was ensured by coagulating the liver bed with hook diathermy. The serosanguinous fluid was suctioned/irrigated and eventually the pneumoperitoneum was released. The rectus sheet was closed with nylon no.1 and all skin wounds were closed with subcuticular vicryl no.2/0.

The follow up period was for one month for both laparoscopic appendicectomy and laparoscopic cholecystectomy. The procedures were performed by one surgeon who had a surgical resident, intern doctor or medical student as assistant. The surgeon had trained with a few years’ experience in laparoscopic surgery.

3. RESULTS

A total of thirty (30) procedures; Twenty (20) were laparoscopic appendicectomy and ten (10) were laparoscopic cholecystectomies.

3.1 Results for Laparoscopic Appendicectomy

Amongst the 20 patients that presented with acute appendicitis; 9 were male and 11 were female giving a male:female ratio of 1:1.2 who consented to have laparoscopic appendicectomy surgery in the study period. The operations were mainly done on elective operating theatre lists. At induction of anaesthesia all patients undergoing laparoscopic appendicectomy had ceftriaxone and metronidazole intravenously. The age of patients for laparoscopic appendicectomy ranged from 22 years – 65 years with a mean age of 39.65 years. Not all female patients had a preoperative ultrasound prior to surgery and all patients had a diagnostic laparoscopy prior to laparoscopic appendicectomy. A grossly inflamed appendix was found in 18 out of 20 cases (90%). Other findings included ruptured ovarian cysts and peritoneal adhesions in two female patients. The duration of surgery ranged from 24 minutes to 60 minutes. The mean duration of surgery was
Table 1. Demographics, duration of surgery and outcomes of laparoscopic appendicectomies

<table>
<thead>
<tr>
<th>Proc No.</th>
<th>Procedure</th>
<th>Age</th>
<th>Sex</th>
<th>Morbidity</th>
<th>Duration of surgery</th>
<th>Postoperative complications</th>
<th>Duration of admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lap. App.</td>
<td>45</td>
<td>M</td>
<td>Nil</td>
<td>60 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
<tr>
<td>2</td>
<td>Lap. App.</td>
<td>24</td>
<td>M</td>
<td>Nil</td>
<td>45 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
<tr>
<td>3</td>
<td>Lap. App.</td>
<td>55</td>
<td>F</td>
<td>Nil</td>
<td>40 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
<tr>
<td>4</td>
<td>Lap. App.</td>
<td>65</td>
<td>M</td>
<td>Nil</td>
<td>60 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
<tr>
<td>5</td>
<td>Lap. App.</td>
<td>60</td>
<td>F</td>
<td>Nil</td>
<td>60 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
<tr>
<td>6</td>
<td>Lap. App.</td>
<td>32</td>
<td>F</td>
<td>Nil</td>
<td>40 min</td>
<td>Spinal headache</td>
<td>3 days</td>
</tr>
<tr>
<td>7</td>
<td>Lap. App.</td>
<td>35</td>
<td>F</td>
<td>Nil</td>
<td>45 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
<tr>
<td>8</td>
<td>Lap. App.</td>
<td>38</td>
<td>F</td>
<td>Nil</td>
<td>50 min</td>
<td>Spinal headache</td>
<td>5 days</td>
</tr>
<tr>
<td>9</td>
<td>Lap. App.</td>
<td>40</td>
<td>M</td>
<td>Nil</td>
<td>45 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
<tr>
<td>10</td>
<td>Lap. App.</td>
<td>25</td>
<td>M</td>
<td>Nil</td>
<td>45 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
<tr>
<td>11</td>
<td>Lap. App.</td>
<td>31</td>
<td>F</td>
<td>Nil</td>
<td>40 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
<tr>
<td>12</td>
<td>Lap. App.</td>
<td>34</td>
<td>M</td>
<td>Nil</td>
<td>40 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
<tr>
<td>13</td>
<td>Lap. App.</td>
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<td>M</td>
<td>Nil</td>
<td>35 min</td>
<td>Nil</td>
<td>2 days</td>
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<tr>
<td>14</td>
<td>Lap. App.</td>
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<td>F</td>
<td>Nil</td>
<td>45 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
<tr>
<td>15</td>
<td>Lap. App.</td>
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<td>F</td>
<td>Nil</td>
<td>30 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
<tr>
<td>16</td>
<td>Lap. App.</td>
<td>52</td>
<td>F</td>
<td>Nil</td>
<td>35 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
<tr>
<td>17</td>
<td>Lap. App.</td>
<td>42</td>
<td>F</td>
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<td>35 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
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<td>18</td>
<td>Lap. App.</td>
<td>48</td>
<td>F</td>
<td>Nil</td>
<td>30 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
<tr>
<td>19</td>
<td>Lap. App.</td>
<td>34</td>
<td>F</td>
<td>Nil</td>
<td>25 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
<tr>
<td>20</td>
<td>Lap. App.</td>
<td>29</td>
<td>M</td>
<td>Nil</td>
<td>25 min</td>
<td>Nil</td>
<td>2 days</td>
</tr>
</tbody>
</table>

Proc No. = Procedure number  
Lap. App. = Laparoscopic Appendicectomy

Table 2. Demographics, duration of surgery and outcomes of laparoscopic cholecystectomies

<table>
<thead>
<tr>
<th>Proc. No.</th>
<th>Procedure</th>
<th>Age</th>
<th>Sex</th>
<th>Morbidity</th>
<th>Duration of surgery</th>
<th>Postoperative complications</th>
<th>Duration of admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lap. Cho.</td>
<td>42</td>
<td>M</td>
<td>Nil</td>
<td>70 min</td>
<td>Nil</td>
<td>4 days</td>
</tr>
<tr>
<td>2</td>
<td>Lap. Cho.</td>
<td>53</td>
<td>M</td>
<td>Nil</td>
<td>60 min</td>
<td>Nil</td>
<td>5 days</td>
</tr>
<tr>
<td>3</td>
<td>Lap. Cho.</td>
<td>64</td>
<td>F</td>
<td>Nil</td>
<td>45 min</td>
<td>Nil</td>
<td>4 days</td>
</tr>
<tr>
<td>4</td>
<td>Lap. Cho.</td>
<td>66</td>
<td>F</td>
<td>Nil</td>
<td>63 min</td>
<td>Nil</td>
<td>5 days</td>
</tr>
<tr>
<td>5</td>
<td>Lap. Cho.</td>
<td>54</td>
<td>F</td>
<td>Nil</td>
<td>60 min</td>
<td>Nil</td>
<td>4 days</td>
</tr>
<tr>
<td>6</td>
<td>Lap. Cho.</td>
<td>60</td>
<td>F</td>
<td>Nil</td>
<td>62 min</td>
<td>Nil</td>
<td>4 days</td>
</tr>
<tr>
<td>7</td>
<td>Lap. Cho.</td>
<td>58</td>
<td>F</td>
<td>Nil</td>
<td>60 min</td>
<td>Nil</td>
<td>4 days</td>
</tr>
<tr>
<td>8</td>
<td>Lap. Cho.</td>
<td>52</td>
<td>F</td>
<td>Nil</td>
<td>60 min</td>
<td>Nil</td>
<td>4 days</td>
</tr>
<tr>
<td>9</td>
<td>Lap. Cho.</td>
<td>64</td>
<td>M</td>
<td>Nil</td>
<td>60 min</td>
<td>Nil</td>
<td>5 days</td>
</tr>
<tr>
<td>10</td>
<td>Lap. Cho.</td>
<td>48</td>
<td>F</td>
<td>Nil</td>
<td>45 min</td>
<td>Nil</td>
<td>3 days</td>
</tr>
</tbody>
</table>

Proc. No. = Procedure number  
Lap. Cho. = Laparoscopic cholecystectomy

40.45 minutes. Oral intake postoperatively ranged from 0 to 3 days. The duration of admission from surgery to discharge ranged from 2 days to 5 days with a mean of 2.65 days. There was one conversion from laparoscopic appendicectomy to open appendicectomy due to an adherent appendix to the caecum and dense adhesions in the ileocaecal area. No patients had co-morbidities. There were two (2) patients (10%) that developed spinal headache out of the total number of laparoscopic appendicectomies, however none developed wound site infection or pelvic abscess Table 1. The follow up period was for 1 month post-operatively.

3.2 Results for Laparoscopic Cholecystectomy

Amongst the 10 patients that presented with acute cholecystitis; 3 patients were male and 7
patients were female giving a male:female ratio of 1:2.33 who consented to have laparoscopic cholecystectomy surgery in this study period. The operations were mainly done on elective operating theatre lists. At induction of anaesthesia all patients undergoing laparoscopic cholecystectomy had ceftriaxone and metronidazole intravenously. The age of patients for laparoscopic cholecystectomy ranged from 42 years – 66 years with a mean age of 56.1 years. The duration of surgery ranged from 45 minutes to 70 minutes. Mean duration of surgery was 58.5 minutes. An inflamed gallbladder was visualised in all cases with acute uncomplicated cholecystitis. The duration of admission from surgery to discharge ranged from 3 days to 5 days with a mean duration of 4.2 days. There were no conversions to open cholecystectomy Table 2. No patients developed post-operative complications following laparoscopic cholecystectomy. The follow up period was for one month.

4. DISCUSSION

In the recent years the duration of admission with laparoscopic appendicectomy declined dramatically. However, it is the clinical status of the patient and the pathological status of the appendix that determines the hospital stay duration rather than whether an open or laparoscopic approach to surgical access is used [19]. There are advantages with both laparoscopic appendicectomy and open appendicectomy [20]. Early recovery, shorter hospital stay, less postoperative analgesia and less wound scaring are associated with a laparoscopic appendicectomy compared to an open appendicectomy [21]. In developed countries, laparoscopic appendicectomy has been declared the gold standard treatment for acute appendicitis. In East Africa, the incidence of appendicitis is increasing and therefore there is an exigency for international standards to be adopted rapidly taking in to account the resource constraints of poor developing countries.

The results of this audit are fairly comparable with results from developed Western countries [22]. In one patient who had an operating time of 70 minutes having uncomplicated cholecystitis there was a power disruption. The time spent restoring and recalibrating the laparoscopic tower accounted for the long waiting time. The mean operative time duration was for 49 minutes in the first 10 cases of laparoscopic appendicectomy and 31.9 minutes in the last 10 cases of laparoscopic appendicectomy. In other centres the mean operating time has ranged from between 20 minutes and 37 minutes [21]. Our hospital is a high volume centre as it is a regional referral hospital. With the increased volume of cases seen in regional referral hospitals in Uganda, the operating in our laparoscopic unit will be on the decline.

The mean duration of admission in hospital was 2.65 days after laparoscopic appendicectomy. On the second postoperative day, 11 patients (55%) were discharged with adequate analgesia and none came back for readmission. Following laparoscopic appendicectomy none of the patients developed a pelvic abscess. Other centres have shown a postoperative pelvic abscess rate of 3.3% showing that the results from our hospital are better [23]. Only one patient undergoing laparoscopic appendicectomy required conversion to open surgery, despite some cases being complicated and requiring adhesiolysis. A relatively small number of cases were done during the study time period and this is part of the surgeons’ learning curve where the complications and conversions tend to be relatively higher. A conversion rate of up to 9% has been reported in busy high volume hospitals with laparoscopic appendicectomy [24,25]. Complications included spinal headache which was 2.6% in all the laparoscopic procedures which was comparable to that found in other studies.

In acute cholecystitis patients who have had a cholecystectomy within 72 hours from the onset of symptoms have had good results [26,27]. Delays in cholecystectomy are associated with recurrent symptoms whilst early cholecystectomy may result in more conversions to open surgery [28,29]. Early cholecystectomy has been associated with longer operation times, reduced total hospital stay and no difference in postoperative morbidity or conversion rates in a meta-analysis [17]. The majority of our patients fall in to the delayed laparoscopic cholecystectomy category due to the circumstances in our local health care system. In this study, only one patient with a diagnosis of acute cholecystitis presented in 72 hours whilst all the other patients had their laparoscopic cholecystectomy after 8 weeks of their acute episode. There were no complications reported and patients who presented with obstructive jaundice had an open cholecystectomy with CBD.
exploration rather than a laparoscopic cholecystectomy. The patients who had a laparoscopic cholecystectomy in this study either had uncomplicated cholecystitis or gallstone pancreatitis.

However, our unit has experienced challenges with laparoscopic surgery despite the good results achieved. Patient acceptance, nursing and anaesthetic staff, cost of consumables and an unreliable power supply are some of the challenges experienced. Laparoscopic surgery is expensive in a developing country and this required the acquisition of a power stabiliser to account for the power cuts experienced. In order to eliminate the use of titanium clips in laparoscopic appendicectomy, a diathermy using a reusable petelan’s forceps was used to coagulate the appendicular artery. In order to remove consumable expenses due to staplers and clips, Roeder’s knots were constructed by the surgeon and the appendix base was divided between the knots. Elimination of the appendix through a 10mm port essentially eliminates any need for a retrieval bag hence reducing the expenses of consumables. Although in all the laparoscopic cholecystectomies retrieval bags were used to retrieve the gallbladder from the abdomen which is costly.

Being a relatively new procedure a few patients have been apprehensive about undertaking a laparoscopic procedure and therefore prefer an open procedure. Training nurses on instrument handling was also extensive as many of these nursing staff had no experience with laparoscopy. Anaesthetists also had little experience handling these laparoscopic procedures and therefore they had to be trained.

5. CONCLUSIONS

In Uganda there is a relatively lower incidence of gallstone disease compared to developed countries. The initial cases which were mainly laparoscopic appendicectomies have demonstrated an adequate level of safety and therefore this may be the laparoscopic procedure of choice for the East African surgeon to acquire orientation and hand eye co-ordination skills due to the low incidence of cholecystitis in this part of the world [30]. In East Africa, surgeons need to develop techniques to reduce the cost of the consumables used in these procedures.

CONSENT

The author declares that written informed consent was obtained from all the patients that underwent laparoscopic procedures in this study.

ETHICAL APPROVAL

As per international standard or university standard ethical approval has been collected and preserved by the authors.

ACKNOWLEDGEMENTS

The author wishes to thank the Hospital Director and Senior Consultant Surgeon, Mr. Nathan Onyachi for his help in setting up the training environment necessary to carry out laparoscopic procedures. The author also thanks nursing staff, medical officers and anaesthetists who worked in the surgery theatres. Finally the author thanks the hospital administration for giving clearance to carry out research in laparoscopic surgery.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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