Determination of the Outcomes of Laparoscopic Appendecectomies at the University Teaching Hospital, Zambia

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Abstract

Introduction: Several studies have demonstrated the superiority of Laparoscopic appendicectomy (LA) in managing acute appendicitis. Acute appendicitis has been managed solely by open appendicectomy at the University Teaching Hospital (UTH). This was the first study that looked at the management of acute appendicitis by laparoscopy at UTH. This study aimed at determining the outcomes of laparoscopic appendicectomy at UTH.

Materials and Methods: This was a prospective cohort study that included patients that were diagnosed with acute uncomplicated appendicitis. All patients admitted between August 2015 to March 2016 were included in the study. Variables analyses were patient's data (age, gender, previous surgery, White Blood Cell (WBC) count, symptoms, signs, symptoms), operating time, intra/post operative complications, and length of stay.

Results: A total of 9 laparoscopic appendicectomies were performed during the study period. The patients had an average age of 31.8 years and were predominantly female (70%). One case was converted to open appendicectomy and was not included in the laparoscopic data group. The mean operative time for the procedure was 75.5 min (range 50-110min) and the length of stay was on average 2.3 days (range 2-3 days). The patients in the study had no complications noted during the follow-up period. No patient developed an intra-abdominal abscess during the study period.

Conclusion: Laparoscopic appendicectomy for uncomplicated acute appendicitis resulted in good surgical outcomes in this institution compared to the regional statistics as a reference point. It may be preferred in patients presenting with uncomplicated appendicitis or where the diagnosis is equivocal. Laparoscopic appendicectomy is recommended, especially for young female patients in our setting.

Key words: *Laparoscopic Appendicectomy, Post-operative Outcomes, University Teaching Hospital, Zambia*

Introduction

Since its introduction by McBurney [1], appendicectomy has been the treatment of choice for acute appendicitis for most surgeons. It soon became one of the most frequently performed surgical procedures [2]. The introduction of laparoscopic appendicectomy has dramatically changed the field of surgery. The idea of minimal surgical trauma, resulting in significantly shorter hospital stay, less post-operative pain, faster return to daily activities, and better cosmetic outcome, has made laparoscopic surgery for acute appendicitis very attractive [3]. It is evident that avoiding a laparotomy incision results in less operative pain and less need for analgesia in the patient [4]. Other advantages of laparoscopic appendicectomy include decreased wound infection, the ability to explore the entire peritoneal cavity for diagnosis of other conditions and effective peritoneal toileting without the need for extending the incision. The advent of the minimal access technique of laparoscopy marked the dawn in the surgical care of patients [5].

Also noted is a significant reduction in postoperative adhesion formation following minimal access surgery compared to the commonly advocated 'open' procedures [6]. For the surgeon, the brilliant and magnified views that modern equipment provides, allows the precise definition of anatomy and pathology, and with a newer generation of instruments, constantly being developed and re-developed, facilitate accurate surgery [7]. These generic advantages apply equally to any intra-abdominal operation that would otherwise, require a laparotomy [6]. The panoramic view of laparoscopy aids accurate diagnosis. Video laparoscopy allows surgical assistants, anesthesiologists and nurses to view what the surgeon is doing and actively participate in the procedure. Laparoscopic appendicectomy combines the advantages of diagnosis and treatment in one procedure with the least morbidity [8].

Laparoscopy is not the standardised procedure for managing uncomplicated acute appendicitis at the UTH. Since its introduction in 2011, only 15 cases have been performed, all of which have been cases of chronic appendicitis. This procedure has not been performed on cases of acute appendicitis; hence, the intraoperative and post-operative outcomes (for example, the duration of the operation, the LOS (length of stay) of the patient etc.), of this procedure on cases of acute appendicitis are unknown. The complications (for example, bleeding, wound infection, abscess formation) developed post-operatively are unknown. We have not accumulated any data on what the outcomes would be. Consequently, we cannot determine the benefits of the procedure to the patient. Therefore, it is essential to determine the outcomes of performing LA on patients presenting with acute appendicitis at UTH.

Materials and Methods

This was a prospective cohort study. The study was conducted at the University Teaching Hospital, in Lusaka, Zambia. This study was conducted in the Department of General Surgery in the laparoscopic unit. All surgical patients who were diagnosed with acute uncomplicated appendicitis, underwent laparoscopic appendicectomy and met the eligibility criteria, were sampled.

The entry point was based upon the diagnosis of appendicitis, which was made in the emergency department and

their eligibility for LA (see inclusion/ exclusion criteria).

Age, gender, and all necessary demographic details were recorded. Patients were asked to participate in this study after a clinical diagnosis of acute uncomplicated appendicitis was made and if they were suitable for laparoscopy. The eligible patients were informed of the risks and benefits of the operation and were asked to sign a detailed informed consent in their respective native language after the decision to operate was made and after fully informed consent was obtained. The patients were free to reject participation in the study, and they could opt out of the research at any point if they so wished. The patients were looked after like any other patient, and no additional benefits were given to them that would influence their decision to coerce them to participate in the study.

The preoperative assessment was used to determine the patient's suitability for the surgical procedure. A baseline Full Blood Count (FBC) was performed on all patients being operated on. Only patients that were admitted between 06:00hrs and 14:00hrs on weekdays were considered for laparoscopy. This period considered the time in which the main operating theatre (Phase 3) was operational. After obtaining consent, the patient was taken over, managed and followed up under the laparoscopic unit. The patients were then prepared for the laparoscopic procedure. The laparoscopic surgery was performed in Phase 3 Theatre and a qualified laparoscopic surgeon performed all laparoscopic surgeries.

Operative time was taken as the time between the first incision and the application of the last stitch to the wound. Conversion from laparoscopic to open surgery was done at the surgeon's discretion (that is if a complication arose or if continuation of the procedure using laparoscopy proved challenging). All removed appendices were sent for histological examination.

All routine post-operative procedures, monitoring and medications were given according to the set protocol. Hospital stay was recorded and defined as the number of post-operative days spent in the hospital. Day 0 was defined as the day of operation. Post-operative complications were recorded both in the hospital during admission and during follow-up. Wound infection was defined as oedema and redness around the wound or purulent discharge from the wound. Strict criteria were followed for the reintroduction of nutrition. When the bowel sounds were present, the patients were started on a clear liquid diet and advanced to a regular diet once the liquid diet was tolerated and flatus was noted. Patients were discharged when they were afebrile for 6 hours and would have resumed their regular diet.

Patients were followed up three times only: one week, one month, and two months after the surgical procedure. Patients were seen in the surgical clinic and checked for any complications (wound infection, intra-abdominal abscess formation, etc.). Re-admissions to the hospital and their causes were also recorded. The exit point would be determined when the patient was discharged from the clinic.

This study began in August 2015 and ended in March 2016. The study began after approval was received by the ethics committee (ERES CONVERGE).

Results

A total of nine patients presented with signs and symptoms consistent with acute uncomplicated appendicitis, and they underwent laparoscopic appendicectomy (LA) during the seven months. There were a total of three male patients and six female patients that were enrolled for laparoscopic appendicectomy. It was noted that more females were enrolled in the study than males.

The majority of the patients undergoing LA were in the age range of 21 to 30 years, followed by those in the range 31 to 40 years. Two patients presented at the extremes of the age group. One patient was 18 years old, while the other was 58 years old, as seen in Figure 4. Patients in the 21 to30 years age range contributed 44%, while those in the 31 to 40 years contributed to 33%. No patient was presented in the third decade of his or her life. The mean age was 31 years.

The symptoms the patients presented in the study included right iliac fossa (RIF) pain, vomiting, fever, and anorexia, as shown in Table 2. All the patients undergoing LA presented with RIF pain. Patients who presented with vomiting were 67%, while 56% of the patients presented with anorexia. Fever was noted in only 22% of the patients. These were the major symptoms the patients presented with, which were captured.

Patients in the study had symptoms whose duration ranged from 1 to 9 days. The majority of the patients presented with symptoms of 1 day duration, which accounted for 55% of the patients, while 33% of the patients presented with a 2 days history of symptoms. One patient presented with symptoms with a prolonged duration of 9 days, accounting for 11% of the total patients. The majority of the patients presented during the acute phase of the illness.

Additionally, the majority of the patients in this study presented with an appendix that appeared to be inflamed on gross appearance, contributing to 78% of the patients. One patient presented with a perforated appendix, while another presented with an appendicular abscess, accounting for 11% of the patients.

The duration of the surgery of the patients ranged from 50 to 110 minutes. According to the graph above, two patients had their procedure done within 60 minutes, accounting for 22%. The majority of the patients had their procedures done within 90 minutes, accounting for 67% of the patients. One patient had a prolonged procedure lasting approximately 120 minutes, contributing to 11% of the patients. The average time of the procedure for all the patients was 80.6 minutes.

In this study, 66% of the patients who underwent LA had stayed in hospital for 2 days while 34% had a length of hospital stay of 3 days. None of the patients were discharged on the same day of the surgical procedure, and no patient spent more than 3 days in the hospital after the surgery.

There were no complications recorded in all the 9 patients enrolled in this study during the entire course of their hospital stay until they were discharged from their

clinic reviews, accounting for 100% of the patients. One patient was converted from laparoscopic appendicectomy to open appendicectomy, accounting for 10%.

Discussion

Laparoscopy is a significant advancement that has changed the field of surgery and has become the preferred approach for managing most surgical conditions. The potential benefits for LA regionally and globally have made us utilise this procedure to manage acute uncomplicated appendicitis here at UTH. As this is the first study of its kind, we analysed the outcomes of this procedure on patients presenting with acute appendicitis. The outcomes of LA were measured primarily using the duration of the surgical procedure, the length of hospital stay of the patient, and the post-operative complications like wound infection, intra-abdominal abscess formation and port site hernias.

In our study, more women than men were recruited because of the early health-seeking behaviour and low pain threshold compared to men, which caused them to seek medical help earlier. Therefore, they had a higher chance of presenting with uncomplicated appendicitis than men. In a study done by Richard *et al.,* [9], 49.9% were males while 50.1% were females. In another study, a larger number of female patients were selected for the laparoscopic approach than the male patients [10]. However, in a study done by Rajab *et al.,* [11], more male (60%) patients underwent LA compared to female (40%) patients for the entire duration of his study.

The ages of the patients in this study ranged from 18 to 58 years, with the mean age of presentation being 31.8 years. Most of the patients were in the third decade of life. One patient presented with appendicitis and was above 50 years old. The findings in these research activities are similar, revealing the common age groups affected by appendicitis. The mean age of presentation in a study done by Richard *et al.,* was 35.5 years, which was slightly higher than other studies [9]. In his study, Adewale *et al.,* [10] had patients in the laparoscopy group aged between 15 to 51 years with a mean age of 29 years. In his study, Rajab *et al.,* [11] had similar results with a mean age of 28 years.

Only patients who presented within 24 to 48 hours of the onset of symptoms were considered because of the lower rate of complicated appendicitis within this period. In this study, 56% of the patients with acute appendicitis had a duration of symptoms of less than 24 hours, one of whom presented within 2 hours of the onset of symptoms, and 33% presented within 48hours. One of the patients presented with a history of symptoms with a duration of nine days at 11%. This patient had signs and symptoms of uncomplicated appendicitis, was on antibiotics, and had no RIF mass clinically and radiologically. Hence, the patient was enrolled in the study. These findings show that the earlier the patient presents, the less likely he is to have a complicated form of appendicitis. Hence, in both studies above, most of the patients had a short duration of symptoms, and most of them had uncomplicated appendicitis,

which was similar to our findings. In a study done by Mwero [12], the majority of his patients presented with symptoms of the duration of less than a week. In his study, Antonio *et al.,* [13] had 85% of the procedures involving uncomplicated appendicitis and only 15% with complicated appendicitis.

The most common symptom of the presentation was a pain in the abdomen (99.1%), which was the main reason for seeking medical intervention. All of the patients in this study presented with right iliac fossa pain. Vomiting was present in 66% of the patients, anorexia was present in 22% of the patients, and fever was present in 22% of the cases. The other symptoms, like nausea, were not included due to inadequacies in the history taking.

In both the studies above, the patients presented with the common symptoms of acute appendicitis, which was as expected. Rajab *et al.,* [11] had comparable results with 94% of the patients presenting with abdominal pain, 51% with nausea, 49% with vomiting, 24% with fever, 91% with tenderness, and 97% presenting with guarding.

The duration of the operation ranged from 50 to 110 minutes with a mean of 75.5 minutes for all the procedures. One of the factors that can be attributed to the increase in duration was due to the use of the extracorporeal knot ligation for the appendicular stump. Metallic clips used in more developed countries would have reduced the duration; however, they are very costly to procure. The setup of the laparoscopic unit in the theatre did not take much time because everything necessary was present in the theatre, and the theatre crew was very well conversant with the setup and use. The procedure took the longest to perform because the appendix was perforated, and it took time to locate the base, ligate, and excise the appendix.

The duration of operating time in this study was comparable globally/ regionally as similar results were observed in some of the studies. The mean operative time in a study done by Rasha *et al.,* [14] was 75.5± 28.8 minutes. In his study, Rajab *et al.,* [11] had a median operative time of 82 (range: 40-180) minutes. In Antonio *et al.,* [13] study, the mean ± standard deviation (SD) operative time was shorter than the others at 54.9±14.7 minutes. Other studies have reported various durations of operative time [15, 16]. This difference could be attributed to the difference in the level of the laparoscopist's skills.

Most of the patients had an appendix that appeared inflamed and was freely mobile. The patient who had a history of nine days duration of symptoms is the one who had an appendicular abscess intra-operatively. The abscess was drained, and lavage was done, and a drain was inserted. The patient was discharged three days later. The other patient had a perforated appendix that was adequately excised. The similarities in these results reveal the period in which the patient presented, signifying an uncomplicated form of appendicitis in most patients. The focus of our study was to capture patients with an uncomplicated form of appendicitis, and hence, we were enrolling patients with a concise duration of symptoms.

The Intraoperative findings of a study done by Adewale *et al.,* [10] included a grossly inflamed appendix in 62.2% of patients and a perforated appendix in (5.4%) patients. Another study done by Rajab *et al.,* [11] had gangrenous perforated appendix in 8% of patients, appendicular abscess in 2% of patients. In the Rajab *et al.,* [11] study, 16% of the patients had a grossly normal-looking appendix intra-operatively, and the histopathological results revealed that 19% of the appendices were normal.

Our findings agree with several studies that demonstrated a significantly short hospital stay for the laparoscopic approach. Antonio *et al.,* [13] noted that the hospital stay was significantly shorter in the laparoscopic group with a mean ± SD of 1.4 ± 0.6 days. In his study, Jian *et al.,* [17] recorded a slightly longer duration of hospital stay with a mean of 5.4 days. The average length of stay of the patients ranged from 2 to 3 days with a mean stay of 2.3 days. In line with the study's objectives, two critical parameters were used to compare the results of this study with those in the region and globally. It was noted that the results of this study compare well with the results of similar studies done in the region/globally, as noted above. These two parameters were the duration of the operating time and the length of hospital stay.

Only one patient was converted to open appendicectomy due to the difficulty encountered locating the appendix, which was located retrocaecally and adherent to the caecum. The surgeon made the decision, who decided to convert in the interest of time and the duration of anaesthesia. The conversion rate in this study was within an acceptable range and was close to the findings in the above studies. The conversion rate in this study would have been even lower had more patients been operated on. In a study done by Rasha *et al.,* [14], the conversion rate was 2.4%, nearly matching that reported in other studies [18]. On the other hand, Vahdad *et al.,* [19] observed a higher conversion rate of 24%, whereas Wang *et al.,* [20] reported no conversion in their study. We believe that the surgeon's experience plays an important role in determining the conversion rate [14].

Laparoscopic appendectomy markedly reduced the post-operative complication rate as observed in other similar studies [13, 14, 17, 21]. In a Cochrane review that consisted of 5000 patients, it was revealed that patients undergoing LA were half as likely to develop wound infection post-operatively; however, on the other hand, they were three times more likely to develop intra-abdominal abscess formation [22]. Other studies also showed an increased risk of intra-abdominal abscess after laparoscopic appendectomy [13, 14]. Only one post-operative complication was recorded in the study for all 9 patients operated on until they were finally discharged from the study. This low rate of complications was within the acceptable range as similar studies recorded very low complication rates among patients who had undergone LA. Additionally, the low number of patients that were enrolled in this study also contributed to this low complication rate.

No mortalities were recorded among the patients that were admitted during the course of this study. These results

are consistent with other similar studies carried out [9, 17].

Conclusions

The practice of laparoscopic appendicectomy in our environment is feasible despite the numerous and surmountable challenges. It may be used as a preferred technique in patients presenting with acute uncomplicated appendicitis or where the diagnosis is equivocal. Laparoscopic appendicectomy can be used especially for young female patients in our setting, who may present with gynaecological causes of RIF pain, where LA may be used for diagnostic purposes.

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