LAPAROSCOPIC APPENDICECTOMY VERSUS OPEN APPENDICECTOMY AT KENYATTA NATIONAL HOSPITAL

A DISSERTATION SUBMITTED IN PART FULFILMENT FOR THE DEGREE OF MASTER OF MEDICINE (SURGERY) UNIVERSITY OF NAIROBI

BY:

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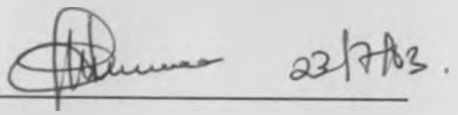
DECLARATION

Candidate:

This dissertation is my original work and has not been published elsewhere or presented for award of a degree in any other University.

Signed:  22/7/13.

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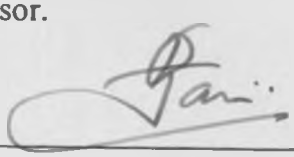
This dissertation has been submitted for examination with my approval as the University supervisor.

Signed: 

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DEDICATION

This book is dedicated to my wife Sophia and two children Mwero and Kaingu for their unconditional love and patience.

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I would like to express my sincere gratitude to my supervisor Prof. P.G. Jani for his guidance and assistance during the entire period of the study and preparing the manuscript.

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Finally, I would like to thank all those who helped me directly or indirectly in preparing this dissertation.

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SUMMARY

A retrospective 4 year study was conducted at KNH between 1998 and 2002 to determine the outcome of laparoscopic appendicectomy compared to open appendicectomy.

A total of 75 patients' files who underwent surgery within the study period were perused. Thirty-two patients (42.7%) underwent laparoscopic surgery (LA) and 43 patients (57.3%) underwent open appendicectomy (OA).

Of the 75 patients, 44 were males while 31 were females. Out of the 44 male patients, 18 male patients underwent LA while 26 underwent OA surgery. Out of the 31 female patients, 14 patients underwent LA while 17 underwent OA surgery. Age ranged from 6 years to 70 years with a mean of 28.8 years.

Duration of surgery was obtained in 60 of the patients in the study, the mean duration of surgery for LA was 1.63 hours and for GA was 1.04 hours.

The mean hospital stay for patients undergoing LA was 3.26 days while in patients undergoing OA it was 5.1 days.

Laparoscopic Appendicectomy appeared to have relatively fewer complication rates with one patient having abdominal distension. Three patients (6.7%) in the OA group had mild sepsis.

ABBREVIATIONS

ABD X.ray	-	Abdominal X-ray
DM	-	Diabetes Mellitus
ECG	-	Electrocardiogram
HIV	-	Human Immunodeficiency Virus
IVU	-	Intravenous Urography
KNH	-	Kenyatta National Hospital
LA	-	Laparascopic Appendicectomy
Lap	-	Laparascopy
LFTs	-	Liver Function Test
OA	-	Open Appendicectomy
PTB	-	Pulmonary Tuberculosis
PUD	-	Peptic Ulcer Disease
Prim Infert.	-	Primary Infertility
SEC Infertility	-	Secondary Infertility
UT fibr	-	Uterine Fibroids

INTRODUCTION

Appendicitis

The vermiform appendix is considered by most to be a vestigial organ, its importance in surgery due only to its propensity for inflammation, which results in the clinical syndrome known as acute appendicitis. Acute appendicitis is the most common cause of an "acute abdomen in young adults. Appendicitis is sufficiently common that appendicectomy is the most frequently performed urgent abdominal opration. Despite extraordinary advances in modern radiographic imaging and diagnostic laboratory investigations, the diagnosis of appendicitis remains essentially a clinical diagnosis.

It is estimated that 16% of the population in western countries undergo appendicectomy for presumed appendicitis, although in the past 30 years the incidence has fallen dramatically in these countries [1,2]. No reason has been established for these changes in the incidence of acute appendicitis.

Acute appendicitis is relatively rare in infants and becomes increasingly common in childhood and early adult life, reaching a peak incidence in the teens and early 20s. The condition seldom occurs in patients over 65 years.

Pathogenesis

The inflammatory process can be catarrhal or obstructive in nature. Catarrhal inflammation is thought to arise secondary to bacterial invasion of the lymphoid tissue on the surface of the appendix wall and because

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Pathogenesis

The inflammatory process can be catarrhal or obstructive in nature. Catarrhal inflammation is thought to arise secondary to bacterial invasion of the lymphoid tissue on the surface of the appendix wall and because

there is no luminal obstruction, it seldom progresses to gangrane. The obstructive form of the disease, which is caused by the presence of faecoliths in more than 70% of patients, can rapidly proceed to gangrane and perforation [1].

Diagnosis

History

The classical features of acute appendicitis begin with central colicky abdominal pains which is associated with anorexia, nausea and usually one or more episodes of vomiting which follow the onset of pain. Anorexia is useful and constant clinical feature, particularly in children.

As the parietal peritoneum becomes affected, the pain becomes more constant and shifts to the right iliac fossa. This pain is aggravited by movement. The patient may experience diarrhoea, especially if the appendix is in the pelvic or retroileal position and dysuria when it lies adjacent to the bladder.

During the first 6 hours there is rarely any alteration in temperature or pulse rate. Later slight pyrexia (37.2 - 37.7° C) with corresponding increase in the pulse rate to 80 - 90 is usual.

Examination

The diagnosis rests more on thorough clinical examination of the abdomen. The cardinal features are those of an unwell patient with low grade pyrexia, localised abdominal tenderness, muscle guarding and rebound tenderness. Inspection of the abdomen may show limitation of respiratory movement in the lower abdomen. Palpation of the abdomen will detect muscle guarding over the point of maximum tenderness,

classically McBurneys point. Deep palapation of the left iliac fossa may cause pain in the right iliac fossa (Rovsing's sign). Occasionally an inflammed appendix lies on the psoas muscle and the patient will lie with right hip flexed for pain relief (the psoas sign).

Spasm of the obturator internus is sometimes demonstrable when the hip is flexed and internally rotated, this manouvre will cause pain in the hypogastrium. (the obturator sign).

Scoring Systems

The amalgamation of symptoms and signs in appendicities has led to diagnostic scoring systems that aim to reduce negative appendicectomy rates without increasing perforation rates. The Alvarado score is quoted figure 1[1].

Alvarado scoring system for diagnosing Appendicitis:

Scoring feature	**Points (if present)**
• Migration of pain to right lower quadrant	1
• Anorexia	1
• Tender in right lower quadrant	2
• Rebound Tenderness	1
• Temperature (> 37.3°C)	1
• White cell count (>10,000 X 10 11/L)	1

Action

<4 = Exclusion; 5-6 = monitoring; > 7 = operation.

Investigation: The diagnosis of acute appendicitis is essentially clinical. A full blood count and urinalysis should be performed in all cases. A white cell count reveals a polymorphic leucocytosis in most patients with appendicitis.

Urinalysis may show pus or blood in the urine but this does not exclude appendicitis. In women of reproductive years it is wise to carryout a pregnancy test. The specificity and sensitivity of plain abdominal radiographs are poor. Abdominal ultrasound examination is a useful diagnostic tool, particularly in children with a diagnostic accuracy of appendicitis in excess of 90%. It can often be useful in excluding gynaecological differential diagnosis in women [1].

Types of Appendicitis

(1) Acute appendicitis

(2) Recurrent appendicitis

Some inflammed appendices resolve spontaneously without surgical intervention, only to recur later. The diagnosis and therefore the incidence are hard to confirm, but recurrent appendicitis may occur in 6.5% of patients [1]. The time involved can range from months to years. These patients may represent a subgroup with catarrhal inflammation who are not prone to perforation. Chronic appendicitis perse, does not exist. Patients labelled thus are usually examples of the recurrent form of the disease.

ERATURE REVIEW

aroscopic surgery is being applied increasingly as an alternative to ventional surgery [3,4,5,6,7]. Laparoscopic surgery has the advantage of ced trauma for the patient and a shorter hospital stay but presents a e complicated technique for the traditional surgeon.

tive or emergency open appendicectomy (OA) has been a safe, ctive operation for acute appendicitis for more than a century. Burney described the right lower quadrant incision that bears his name 894 [8] laparoscopic appendicectomy (LA) was first described by m, a German Surgeon in 1983 [9]. Laparoscopic appendicetomy has gained the same widespread popularity as laparascopic ecystectomy. This is because the early post operative recovery ng to quicker hospital discharge, which led to the worldwide ptance of laparoscopic cholecystetomy, has not been universally seen L.A. [10]. Moreover, in the majority of the published series of LA, seems to be a trend towards an increased incidence of intra-minal abscesses. However, laparoscopy is superior to the "watch wait" policy where the diagnosis of appendicitis is questionable. her more, since a large incision can be avoided using the LA nique in obese patients, the incidence of post operative morbidity can duced considerably.

erg A and colleagues did a prospective randomised study to are the outcome of laparoscopic and open appendicectomy in nts with suspected acute appendicitis [11]. The outcome of 500 nts was reported, 244 in the laparoscopic group and 256 in the open . In their results, patients having laparoscopic appendicectomy ered more quickly than those having open surgery. Also it showed

that postoperative pain was less for LA. Operating time was significantly longer in the laparoscopic group (60 min v 35 min, $p < (0.01)$, hospital stay and complications did not differ between the groups.

Charoonratana V and colleagues did an open study to assess the feasibility and morbidity of laparascopic appendicectomy [12]. In their study they looked at 31 patients who presented with a clinical diagnosis of acute appendicitis and underwent laparascopic appendicetomy through three abdominal punctures. Main outcome measure included duration of operation, amount of analgesia, length of hospital stay and morbidity. The mean duration of operation was 47 minutes, median (range) length of stay in hospital was 2 days [3-7], and there were no complications, during or after the operation. They concluded that laparoscopic appendicectomy is safe, the stay in hospital is short, patient recovered quickly with little pain and the cosmetic results are good.

Herman BP and Otte JB reviewed 4190 cases of laparascopic appendicectomy and their aim was to evaluate current data on laparascopic and open appendicectomy in order to establish a new gold standard in surgery [13]. The analysis compares surgical technique, operating time, pathological findings, major and minor complications, postoperative pain and costs. They argued that the strongest arguments against LA are the increased rate of major complications, the increase of overall cost and the negative effect of the learning curve. The arguments in favour of LA are the significant reduction of minor complications, the shortening of the post operative hospitalisation and of the time to resume full activity. The authors reached a conclusion that LA might emerge as the first choice for appendicetomy.

Laparoscopic Appendicectomy

Historical perspective

Attempts at minimally invasive therapy for afflictions of the gastrointestinal tract date back to the time of Hippocrates, who described non-invasive remedies for conditions such as intestinal obstruction, rectal prolapse and haemorrhoids [14]. Hippocrates also detailed the use of speculum or primitive anascope, for examining haemorrhoids. Early endoscopists were hampered by the lack of a satisfactory light source. Thus until the nineteenth century, physicians relied on sunlight reflected by mirrors or focussed through flasks of water [15]. In the early 1800's physicians began using candles or paraffin lamps for illumination; however the idea of "a magic lantern into the human body" was for the most part scorned and ridiculed [16].

The first experimental laparoscopy was performed in Berlin in 1901 by the German surgeon George Kelling; who used a cystoscope to peer into the abdomen of a dog after first insufflating it with air [17]. Kelling was an early advocate of the ability of minimally invasive surgery to avoid unnecessary laparotomy and decrease hospital stays. The first human laparoscopy was performed in Sweden by Jocobens in 1910 to investigate ascites. Diagnostic laparoscopy enjoyed some popularity in the early twentieth century, but early laparoscopists were limited by a lack of technology [18].

The first laparoscopes had a light source at the distal end and pneumoperitoneal was achieved by means of air insufflations through the scope. Initially, intra abdominal thermal injury, along with bowel and vascular injuries posed the most significant problems. In 1929, Kalk advocated a second puncture site for the establishment of

pneumoperitoneum and described several diagnostic and therapeutic laparoscopic procedures and devised a sophisticated lens system. He has been called by some the "father of modern laparoscopic surgery" [15]. Fibre optic technology and closed circuit video laparoscopy evolved in the 1950s. Kurt Semm became a powerful advocate of laparoscopy and was responsible for the development of numerous laparoscopic instruments including an automatic air insufflation device, an electrocoagulation and an aspiration/irrigation system. In addition, he is accredited with performing the first laparoscopic appendicectomy in 1983 [9].

Laparoscopic Appendicectomy

Laparoscopic appendicectomy combines the advantages of diagnosis and treatment in one procedure. The usual preoperative preparation is necessary and prophylactic antibiotics are given on induction of general anaesthesia. The patient must consent to an open operation should it be needed.

Procedure

Placing the Canulae

The patient lies flat on the operating table and the bladder is emptied after Induction of general anaesthesia. After creating the pneumoperitoneum using the Veress needle or open technique around the umbilicus, an 11mm port and endoscope are placed through the incision and the diagnosis is confirmed. Two further ports are needed on either side of the abdomen and should be in relation to the position of the appendix. An 11mm port is placed in the right iliac fossa and a 5.5 mm port in the left iliac fossa.

Operation technique

Any local adhesions are gently divided and the tip of the appendix is grasped and drawn into the port in the right iliac fossa. The appendix mesentery is occluded with a bipolar diathermy or ligature around the appendicular artery and then divided. The base of the appendix is secured with a Roeder knot and then occluded beyond the ligament with bipolar diathermy. The appendix is divided across the burnt area and is removed through the right iliac fossa port. It is not necessary to bury the appendix stump. Free peritoneal fluid and pus can be sucked away and the peritoneal cavity washed although it is important not to flood infected fluid into the pelvis or the subphrenic spaces. It is easy to place a drain, to the appendix stump if necessary and the pneumoperitoneum is then released and the ports removed.

Complications

Complications of laparoscopic surgery can be divided into two categories:

A) Those which are specific to the procedure itself or result from anaesthesia and are common to all operations.

B) Those which are unique to laparoscopy. Table 1

A) 1. Reactional haemorrahage

This is due to failure to occlude the appendicular artery properly.

2. Stump appendicitis

Appendicitis is now commonly diagnosed and treated using laparoscopic techniques. Laparoscopic appendicectomy has the potential to result in incomplete removal of the appendix stump and subsequent risk of stump appendicitis [19]. This article reported such a case requiring laparotomy 5 months after the original appendicectomy.

C) Complication from Needle and Trocar Insertion

Veress needle insertion and trocar insertion may cause injury to the intestines, stomach and bladder or major vascular structures. The rate is higher for insertion of the needle and primary trocar, as this is done blindly.

Table I

I Needle and Trocar Insertion

- Vascular injury
- Visceral injury
  - stomach
  - bowel
  - bladder

II Pneumoperitoneum

- Acidosis
- Arrhythmias

- Extra peritoneal insufflation
- Pneumothorax
- Gas embolism

III Wound

- Hernia
- Infection
- Tumor recurrences

I) Vascular Injury

The most life threatening laparoscopic complications are those to the large retroperitoneal blood vessels. In one such report 2 cases of serious vascular injury were reported in children occuring during laparoscopic appendicectomies [20]. A survey of 77,604 lap cholecystectomies identified 36 (0.05%) injuries to the aorta, inferior vena cava or iliac vessels [21]. The mortality in these patients was 8.8%. In a collected series of 16 major vascular injuries, mortality was 13% [22]. These cases stress the potential risk of major accidents with lap surgery. To avoid serious complications from these injuries, early recognition and prompt treatment are critical. Thus, the Veress needle should be aspirated after insertion to identify bright red (arterial) blood. In this circumstances, the needle should be left in place and immediate laparotomy should be undertaken [23].

II Gastrointestinal Injury

Clinically significant stomach or intestinal injury from needle or trocar insertion has been reported in approximately 0.01 to 0.4% of patients [23,24]. A large number of these injuries may, however, go unrecognised because of the ability of the stomach and intestines to heal small injuries.

Undetected bowel injury is a major contributor to post operative mortality. Such patients present with sepsis or peritonitis, intra abdominal abscess or fistulas occur at a later date.

III Genitourinary Injury

There are few data on the incidence and aetiology of genitourinary injury during laparoscopy. Bladder injuries generally occur during trocar insertion and an indwelling catheter helps minimise this complication. Ureteral injury is usually a consequent of a thermal burn, ligation or laceration caused by inadequate exposure or poor dissection. This injury can be avoided by preoperative placement of ureteric stents, which facilitate identification of the ureters. All ureteral injuries should be explored promptly at open surgery [23].

Complications of Pneumoperitoneum

i) Cardiovascular

Absorbed CO_2 leads to hypercarbia and acidosis. This may cause myocardial irritability as manifested by an increased rate of cardiac dysarrhythmias most notably ventricular ectopy. The mechanical effects of increased intra-abdominal pressures cause variable changes in the cardiac output.

ii) Extraperitoneal Insufflation

This commonly occurs because of improper positioning of the Veress needle, result in preperitoneal insufflation and subcutaneous emphysema.

Subcutaneous emphysema rarely results in serous sequalae. Intra abdominal structures such as the omentum and mesentry may also be inadvertently insufflated increasing their chance of being injured and obscurring visualization.

iii Pneumothorax

This may occur during upper abdominal procedures when injury occurs to the diaphragm, resulting in a sudden collapse of the lung on the affected side. Occasionally, however, pneumothorax may develop without diaphragmatic injury, possibly as a result of retroperitoneal dissection of CO_2. This may have a more subtle onset manifest by increased ventilatory pressures and arterial desaturation. Treatment in either instances is by the insertion of a thoracostomy tube.

iv) Gas Embolism

Reports of gas embolism are unusual. The aetiology is presumably-venous injury combined with high insufflation pressures. Signs of gas embolus include circulatory collapse, an abrupt increase in end-tidal CO_2, a so-called mill-wheel cardiac murmur and flash pulmonary oedema. Cardiac arrhythmias may occur and ECG alterations including awidened QRS complex may be evident [25]. Treatment consists of placing the patient in Trendelburg position with the left side down (the Durant position) to prevent gas from entering the pulmonary outflow tract, aspiration of the gas with a central venous catheter and external cardiac massage to fragment large bubbles [23,26].

Wound complications

i) **Hernia**

This has been reported to occur in 0.1 to 0.3% of patients [24]. The larger the diameter of the canular used, the more likely the possibility of herniation. Wound infection is a predisposing factor. It is generally recommended that fascial defects from cannular 10 mm or larger be sutured.

ii) **Wound infection**

This is an unusual occurrence and depends on the operation performed. Procedures such as diagnositic laparoscopy have extremely low rates approximately 0.12% [24]. The use of a bag or another device to remove the specimen may decrease the incidence of infection [27]. This difference has been most notable in appendicectomies in which bag retrieval is used, with several series reporting zero incidence of wound infection.

iii) **Tumour Recurrence**

Abdominal wall recurrences after resection of colorectal and gall bladder cancers or diagnostic evaluation of ovarian and gastric cancers has been reported [28,29]. To some extent these recurrences appear to be analogous to wound infections and occur at the site where the specimen is removed. Extreme care must be exercised in removing malignancies through lap incisions, with a low threshold for enlarging incisions or retrieval of specimens in a protective bag.

AIM AND OBJECTIVES

Major

To review the outcome of Laparoscopic appendicectomy versus open appendicectomy at Kenyatta National Hospital.

Minor

1. Determine the number of patients who underwent Laparoscopic appendicectomy.

2. Describe patient profile for those undergoing surgery

3. Compare the two procedures with respect to
   a) length of operation
   b) intra operative and post operative complication
   c) hospital stay

STUDY DESIGN

This is a 4-year guasi experimental retrospective study at Kenyatta National Hospital from April 1998 to April 2002. The study involved the retrieval of patient's files who underwent Laparoscopic appendicectomy and open appendicectomy. Study patients were identified from main theatre operation register and their case notes retrieved from the medical records department with the assistance of two resident clerks.

The relevant data was then extracted from the case notes using a pre-designed proforma questionnaire (Specimen of which is annexed as appendix 1) by the author. The obtained data was then entered into computer and analyzed using SPSS version 10.0 and is presented in tabular, chart and text form. This was done in consultation with a statistician.

ETHICAL CONSIDERATION

- The information obtained from the patient file was treated with the confidentiality it deserved. The information obtained was not put to any other use apart from the dissertation.
- The data collection was started after approval by the Kenyatta National Hospital Ethical and Research Committee.

STUDY LIMITATION

- The study was limited to Kenyatta National Hospital and therefore the outcome of the study cannot be wholly representative of what happens in the whole country.
- The study was limited by the ability to trace patient files within the hospital.

- Documentation of the necessary information within the patients files is inadequate or missing and therefore information sort may not be 100% representative.

Study Justification/Rationale

Laparoscopic surgery is currently at its initial stages at KNH and there are no formal comparison studies done to evaluate if there is any significant outcomes between the laparoscopic and open procedures. In undertaking this study, therefore is to compare the two procedures in terms of complications, immediate or short-term, hospital stay, and costs, patients' profile, so as to have a reference database which will serve as a basis for improvement or refinement of these procedures at KNH.

INCLUSION AND EXCLUSION CRITERIA

- Only patients who presented with the diagnosis of acute appendicitis and underwent surgery.

- Excluded patients who had appendicular abscesses or peritonitis or those who had previous lower abdominal surgery.

- Files that had incomplete information were excluded.

SAMPLE SIZE

Sample size for each group will be calculated from the formula:

$$n \text{ per group} = \frac{2(Z_\alpha + Z_\beta)^2 \sigma^2}{\delta^2}$$

Where,

σ	=	Standard Deviation
n	=	Sample per group
Z_α	=	The standard normal deviate for α
	=	1.96 when α is 0.05
Z_β	=	The standard normal deviate for β
	=	1.282 when β is 0.10
δ	=	The effect size or the difference regarded as scientifically or clinically important was taken to be 14%.
		The total minimum sample size for both groups is 86.

DATA MANAGEMENT AND ANALYSIS

- Data was entered into computer using EPI info and was exported to SPSS version 10.0 for analysis.

- For continuous variables non-parametric test was used.

- For categorical factors comparison of the two groups was done using relative risk. χ^2 was computed.

- Level of significance was taken as ≤ 0.05

- Variables that were analyzed included length of hospital stay and duration of surgery.

RESULTS

A total of 75 patients underwent surgery in the study period. Thirty two patients (42.67%) had laparascopic Appendicectomy (LA) and 43 patients (57.33%) had open appendicectomy (OA).

Age and Gender distribution

There were a total of 44 male patients and 31 female patients in the study as shown in the table below.

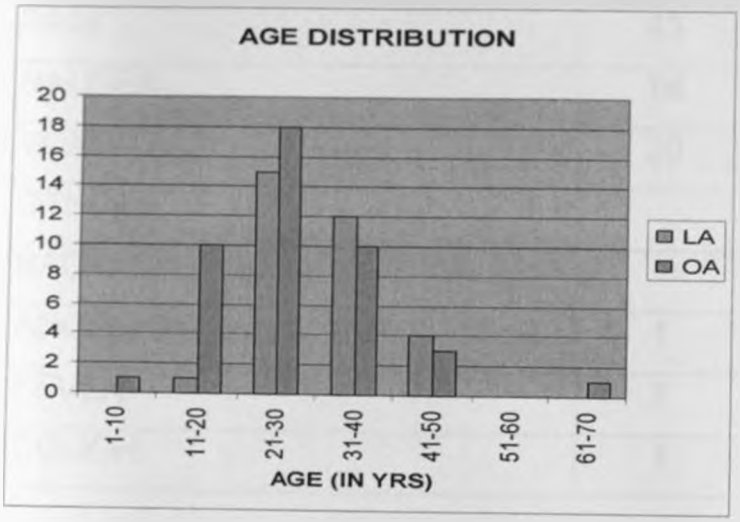
Table 2: Gender distribution

GENDER DISTRIBUTION	OA	LA	TOTAL
MALE	26	18	44
FEMALE	17	14	31

Out of the 44 male patients 18 patients underwent LA surgery and 26 patients OA surgery. Out of the 31 female patients, 14 patients under LA surgery and 17 OA surgery.

Majority of the patients undergoing either OA or LA were in the age groups between 21-30 yrs, followed by 31-40 years group as shown in the Figure below.

FIGURE 2



They contributed to 44% and 29% respectively. Patients in the age group 11-20 contributed to 14.7% while in the age group 41-50 contributed to 9.3%.

Symptoms

The symptoms patients presented in this study included pain, nausea, vomiting, fever, anorexia, and coughing as shown in the table below:

TABLE 3

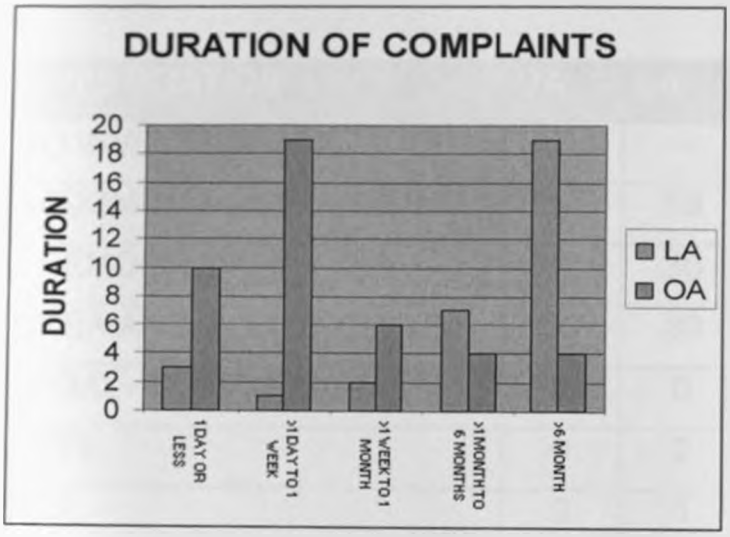
PRESENTING COMPLAINT	OA	LA	TOTAL
PAIN	43	32	75
NAUSEA	14	17	31
VOMITTING	20	6	26
OTHERS			
BACKACHE		2	2
ANOREXIA	1	0	1
FEVER	7	0	7
COUGH	1	0	1

All patients undergoing either LA or OA presented with right iliac fossa pain. Patients who presented with nausea undergoing LA were 53.13% while 31.11% undergoing OA presented with nausea. Vomiting was present in 18.75% patients undergoing LA while 44.44% of the patients undergoing OA had vomiting. Fever was noted in patients undergoing OA (15.55%).

Symptom Duration

Patients in the study group had symptoms whose duration ranged from less one day to greater than 6 months.

FIGURE 3



Majority of patients had symptoms duration of between one day and one week. Those with symptoms durations of less than one day were 9.4% for LA group and 23.3% for OA group. Thirty one point one percent of patients in the LA group and 44.2% of patients in the OA group had symptom duration of between 1 day - 7 days . Those with symptom duration of between 1 week and 1 month were 6.3% in the LA group and 14% in the OA group. Those with symptom duration of between 1 month and 6 months were 21.9% in the LA group and 9.3% in the OA group. Those with symptom duration greater than 6 months were 59.4% in the LA group and 9.3% in the OA group.

Investigations

Among the investigations carried out for patients in the study preoperatively are shown in the table below. Some patients were not investigated at all.

TABLE 4

INVESTIGATION	OA	LA	TOTAL
NO INVESTIGATION	7	-	7
ABDOMINAL ULTRASOUND	8	13	21
HAEMOGRAM	32	30	62
UREA AND ELECTROLYTES	30	30	60
WIDAL	1	0	1
LFTS	0	2	2
IVU	0	1	1
RBS	0	3	3
CA++	0	1	1
AMYLASE	0	1	1
ABD X-RAY	1	0	1
URINALYSIS	4	2	6

Full blood count was done in 93.8% of the patients undergoing laparascopic appendicectomy and 74.4% of those undergoing open appendicectomy. Urea and electrolytes was due in 93.8% of patients undergoing LA and 69.8% of those undergoing OA. Abdominal ultrasound was performed in 40.6% of patients undergoing LA and 18.6% of patient undergoing OA. Urinalysis and microscopy was performed in 6.3% of patients undergoing LA and 9.5% of patients undergoing OA. Other investigations carried out in small numbers of patients included widal tests, liver function tests, intravenous urography, random blood sugar, serum calcium, amylase and plain abdominal radiograph.

The table shows different investigations that were carried out preopratively for patients with appendicitis in the study. Full blood count was done in 82.67% of all the patients, 93.75 % of the patients undergoing LA and 74.42% of those undergoing OA had this investigations done. Urea and electrolytes was done in 60 patients (80%) – 93.75% of LA and 69.77% of OA patients. Abdominal ultrasound was done in 21 patients (40.625% of LA and 18.61% of OA). Dialysis and microscopy was performed in 6 patient (8%). Other investigations carried out in a small number of patients included widal tests, liver function tests, intravenous urography, random blood sugar, serum, calcium, serum anylase and plain abdominal X-rays.

Preoperative Comorbidities

Majority of the patients had no associated co-morbidities 77.3%.

TABLE 5

PRE-OP CO-MORBIDITIES	LA	OA	TOTAL
ASTHMA	0	1	1
BACKACHE	1	0	1
CHRONIC CYSTITIS/PTB	1	0	1
DM	1	0	1
GASTRO-ESOPHAGEAL DISEASE	1	0	1
HTN	1	0	1
PTB/HIV	0	1	1
PUD	4	4	8
SEC INFERTILITY	1	0	1
UT FIBR/PRIM INFERT	1	0	1
NONE	21	37	58

The most prevalent co-morbidity was peptic ulcer disease which accounted for 12.5% of patients in LA group and 9.3% of patients in O.A. group. The other co-morbidities seen included asthma, diabetis mellitus, chronic cystitis, pulmonary tuberculosis, hypertension, uterine fibroid and gastroesophageal reflux disease.

Preoperative diagnosis

Patients in the study either presented with acute appendicitis or recurrent appencitis.

TABLE 6

PRE-OP DIAGNOSIS	LA	OA	TOTAL
ACUTE APPENDICITIS	4	33	37
RECURRENT APPENDICITIS	28	10	38

Patients presenting with acute appendicitis undergoing LA were 12.5% while those undergoing OA were 76.74%. Patients presenting with recurrent appendicitis undergoing LA were 87.5% while those undergoing OA were 23.26%.

Duration of surgery

Duration of sugery was obtianed in 60 of the patients in the study. Most of the procedures took between 30 minutes and 2 hours operation time. In one patient the operation time was 3 $^{1}/_{2}$ hours.

TABLE 7

Duration of Surgery in hrs.	Type of surgery		Total
	LA	OA	
>= 0.5<1	3	9	12
>=1<1.5	7	17	24
>=1.5<2	9	2	11
>=2 <2.5	9	2	11
>=2.5	2	0	2
Total	30	30	60

Cross tabulation of 5 rows in hours and 2 columns of the type of surgery (LA or OA)

Pearson $\chi^2 = 18.076$

$P < 0.05$ ($P = 0.001$)

Duration of surgery is significant statistically between the two methods.

Two patients in the OA had the procedure done in 30 minutes, while no patient in LA was in this category. Twenty one point nine percent of patients in LA procedure took less than 1 hour while 35.6% of patients in OA took same duration. 40.6% patients in LA had the procedure due in more than 1 1/2 hours but less than 2 hours while 7% in OA took the same duration. In LA group 6.3% of the patients took more than 2 hours.

Histological Diagnosis

Histological report of the appendicectomy specimens were obtained for 52 patients in the study.

TABLE 8

HISTOLOGICAL DIAGNOSIS	LA	OA	TOTAL
NORMAL APPENDIX	7	3	10
ACUTE APPENDICITIS	18	19	37
RECURRENT APPENDICITIS	1	1	2
SCHISTOSOMIASIS OF THE APPENDIX	0	1	1
A.LUMBRICOIDES IN APPENDIX	0	1	1
TUBERCULOUS APPENDICITIS	0	1	1

Normal appendicitis was found in 21.9% of patients in the LA and 7% in the OA.

A histological diagnosis of acute apendicitis was distributed as follows 56.3% of LA and 44.2% of OA. Recurrent appendicitis were 3.1% LA and 2.3% OA. Schistosomiasis of the appendix occured in 2.2% of OA, tuberculous appendicitis occured in 2.22% of OA and ascaris lubricoids noted in 2.2% of OA group.

Hospital Stay

Sixty five percent of the patients who underwent LA had a hospital stay of less than 3 days while 37% of the patients who underwent OA had the same duration of stay in hospital.

TABLE 9 : HOSPITAL STAY.

DURATION OF STAY IN HOSPITAL (DAYS)	Type of surgery		TOTAL
	OA	LA	
1-3	16	21	37
4-6	18	10	28
7-9	3	1	4
10-12	4	0	4
13 & >	2	0	2

Cross tabulation of 5 rows (days) and 2 columns of the type of surgery was computed.

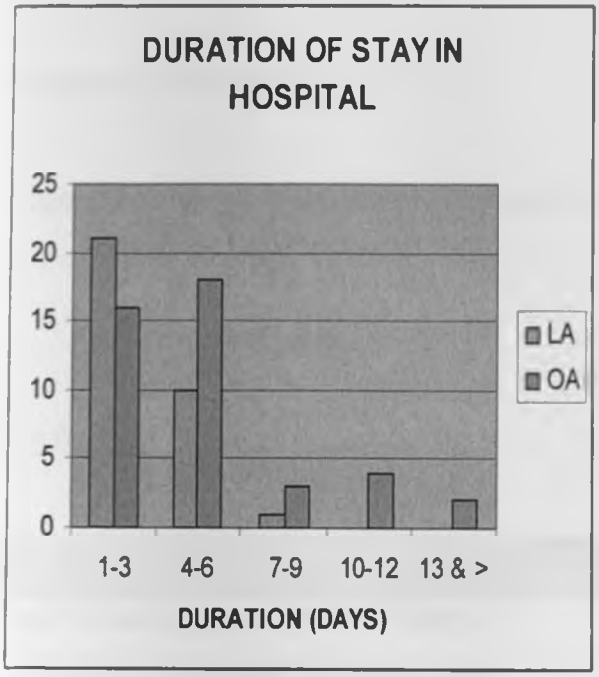
Pearson $\chi^2 = 8.532$

$P > 0.05$ ($P = 0.074$).

In this study there was no statistical difference in the duration of hospital stay in the two surgical methods.

Those who had hospital stay of between 4 to 6 days were 31% in LA and 42% in OA. In the LA only one patient stayed longer than 6 days while in OA, 21% of the patients stayed longer than 7 days.

FIGURE 4



Complications

There were no complications in 93.3% of all the patients who underwent sugery as shown in the table below:

TABLE 10

POST-OP COMPLICATIONS	LA	OA	TOTAL
ABDOMINAL DISTENSION	1	0	1
ABORTION	0	1	1
WOUND SEPSIS	0	3	3
NONE	31	39	70

Wound sepsis occured in 6.7% of patients undergoing OA.

Miscarriage occurred in 1 patient undergoing OA. Only one patient in LA developed complication due to ileus.

Outcome of surgery

Majority of the patients had their symptoms resolved after surgery in both LA and OA (97.3%).

TABLE 11

OUTCOME OF SURGERY	LA	OA	TOTAL
NO CHANGE IN SYMPTOMS	1	1	2
RESOLUTION OF SYMPTOMS	31	42	73
WORSENING	0	0	0
DEATH	0	0	0

Only two patients had no change in symptoms one in LA and one in OA (3.1% and 2.4% respectively).

DISCUSSION

A total of 75 patients underwent surgery for appendicular pathology between April 1998 and April 2002. All patients who underwent LA were included in the study. The targeted 43 patients for LA would not be achieved due to missing files. There were 44 male patients while female patients were 31. Of the 44 male patients, 18 patients underwent LA while 26 patients underwent OA. Fourteen female patients underwent LA, while 17 female patients underwent OA.

The patient ages ranged from 6 years to 70 years. Majority of the patients who underwent LA were in the age groups 21-30 yrs and it was the same for OA. In a review by Schreider LD; Zimmermann et al. they noted the average age for patients undergoing LA was 25.3 years, which compares well with the study [30]. The youngest patient in the study underwent OA. This is comparable to the result obtained in a study carried out by Paya K, Fakhari M et al in which LA was not performed in paediatric age group due to more difficulty technique, expected risk and suspected high rate of complication [31]. There were four patients with appendicitis in the age group >51 years in the study groups.

Patients in the study presented with various symptoms. All patients presented had right iliac fossa pain. Nausea was present in 41.3% of the patients and vomiting in 34.7%. Fever was present in 9.3%.

Anorexia is the most constant symptom of appendicitis although in the study 1.3% of patients presented with the symptom. This figure is lower and could be due to inaccurate history taking.

In the study, 17.3% of patients with acute appendicitis had symptom duration of less than 24 hours. Those with symptoms duration of between 1-7 days were 26-7%, while those with symptoms of between 1 week and one month were 10.7%. Those who presented with symptom duration of between 1 month and 6 months were 12% while those with symptoms of greater than 6 months were 30.7%. These represent patients with recurrent appendicitis.

The diagnosis of acute appendicitis is more often a clinical diagnosis. Baseline investigations normally performed include full blood count, urinalysis and urea and electrolytes. Other investigations done including abdominal ultrasound, plain abdominal radiography, and intravenous urography are done to rule out other differential diagnosis of appendicitis. In the study patients undergoing laparascopic apendicectomy were exhaustively investigated as most of them had been referred to the outpatient surgical clinic and there was enough time to do investigations before surgery.

Pre-operative co-morbidity was seen in 22.7% of the patients undergoing appendicectomy. The most prevalent for both OA and LA was peptic ulcer disease, which had been confirmed by either endoscopy or barium meal studies and patients had already been under treatment. This occurred in 9.3% and 12.5% respectively for LA and OA. Other co-morbidities included pulmonary tuberculosis, cystitis, diabetes melitus, gastroesophageal reflux disease, hypertension, secondary infertility and uterine fibroids. Patients undergoing LA were associated with coexisting medical problems and this is comparable to the findings of Maxwell J.G.; Robinson CL et al [32].

Seventy seven percent of the patients who presented with acute appendicitis underwent OA while 13.5% underwent LA. This is due to the fact that laparascopic apendicectomy is done as an elective procedure and performed by a consultant surgeon and currently the operations are being done once a week and therefore is not available for emergency surgeries. LA was performed in 87.5% of patients who presented with recurrent appendicitis while 23% of the patients with the appendicitis underwent OA. These findings compare well with those of Maxwell JC; Robinson CL [32] who noted that less severe disease appears to be used by surgeons as indications for LA.

Duration of operation was longer in the LA group compared to OA group and was statistically significant. The median operation time for the LA was 90-120 minutes while that of OA was 30-60 minutes. These finding are similar to those of Long KH; Bannon MP et al. [33]. In a review by Puser Jochanan G; Greenberg Dan, they noted/found that operation time was longer in OA group compared to LA but the difference was not statistically significant [34]. The long operating time could be attributed to our learning curve. Most of the personnel involved, the nurses and other support staff are not trained in laparascopic surgery and instrument handling. The instruments are expensive and delicate; the technicians are not well conversant with the equipment and cannot service the instruments when faulty.

Of the patients undergoing LA, 21% had normal appendix on histological examination in the study compared to studies in other centres, Maxwell JG; Robinson CL et al [32], who found 41% of the patients had normal appendix.

Patients who underwent LA had a shorter hospital stay compared to OA group. The average duration of hospital stay for LA group in the study was 3 days while for the OA group was 5 days. When compared with a study by Puser Jochanan G.; Greenberg Dan found that the average hospital stay was 2.5 days in the LA group and 2.7 days in the OA group and there was no statistical difference [34].

In another study by Anderson DG; Edelman DS[35], they found that the duration of hospital stay was lower in the LA group compared to OA group, while in this study it showed no statistical difference between LA group and OA group.

There were very few complications noted in the study. In the LA group, only 1 patient (3%) developed abdominal distension, which was managed conservatively and resolved. For those undergoing OA, 9.3% had complications. The most common being wound sepsis, which occurred, in 6.7% of the patients. One patient had abortion post surgically. These results compare well with the study done by Anderson DG; Edalman DS [35] in that there were minimal complications after LA. Jochanan G; Greenberg Dan [34] in there review noted that there were no significant differences in intra and postoperative complications. One patient (3%) had no improvement after LA while the OA group also had one patient showing no improvement. The rest of the patients, in LA - 97% and OA - 97.6% had resolution of symptoms. The two patients in the study were all females and were referred to the gynaecologic clinic.

CONCLUSION:

1. Laparoscopic appendicectomy takes longer to perform in our institution than open appendicectomy.
2. Postoperative complications are lower with laparoscopic appendicectomy when compared with open appendicectomy.
3. There are fewer number of patients undergoing laparoscopic surgery at Kenyatta National Hospital.
4. From the study, it can be concluded that laparoscopic appendicectomy surgery compares well with other centres.

RECOMMENDATIONS

The fewer number of patients who underwent laparascopic appendicectomy shows that Kenyatta National Hospital needs to streamline and facilitate the development of laparascopic surgery by offering training to both surgeons and nursing staff in laparascopic surgery. Laparascopic appendicectomy should be done as the need arises or the next day after patient resuscitation. This will help to improve the operating time in our institution.

There is need to computerize and categorize the operative procedures differently as it is difficult currently to retrieve patients files in the records department based on the operative procedure done.

Kenyatta National Hospital should set up training laboratories as this will help surgeons and surgical trainees acquire tactile skills and manual dexterity necessary before operating or assisting at laparoscopy.

Appendix 1

PROFORMA QUESTIONAIRE

1. PATIENT PROFILE

   Name:

   Age

   Sex

   IP No

2. ANY PREVIOUS SURGERY

3. PRE-OP DIAGNOSIS

4. PRESENTING COMPLAINTS/SYMPTOMS

   Pain

   Nausea

   Vomiting

   Others (Specify)

5. DURATION OF COMPLAINTS/SYMPTOMS

6. IMAGING STUDIES/BIOCHEMICAL STUDIES

   Abdominal u/s

   WBC count

   Haemogram

   U/E

   Others (specify)

7 PRE-OP CO MORBIDITIES

Specify

8 OPERATIVE DIAGNOSIS

9 TYPE OF SURGERY

LA

OA

10 COMPLICATIONS

Specify - Intra operative 1.

2.

3.

- Cause 1.

2.

3.

11. CONVERSION TO OPEN PROCEDURE

12. REASON FOR CONVERSION

13. POST OP COMPLICATIONS (Specify)

- Time of recognition
- Cause

14. TIME OF DISCHARGE AFTER SURGERY

- No change in symptoms
- Resolution of symptoms
- Worsening
- Death

APPENDIX II

Tel.: 726300/726450/726550
Fax: 725272
Telegrams: "MEDSUP", Nairobi

KENYATTA NATIONAL HOSPITAL
P.O. Box 20723, Nairobi

Ref. KNH-ERC/01/1580

Date 14 November 2002

Dr. Bernard J. Mwero
Dept. of Surgery
Faculty of Medicine
University of Nairobi

Dear Dr. Mwero,

RESEARCH PROPOSAL "LAPAROSCOPIC APPENDICECTOMY VS OPEN APPENDICECTOMY AT KNH - A FOUR YEAR RETROSPECTIVE STUDY (APRIL 1998 - APRIL 2002)" (P56/5/2002)

This is to inform you that the Kenyatta National Hospital Ethical and Research Committee has reviewed and **approved** the revised version of your above cited research proposal.

On behalf of the Committee I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of data base that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Thank you.

Yours faithfully,

PROF. A.N. GUANTAI
SECRETARY, KNH-ERC

c.c. Prof. K.M. Bhatt,
Chairman, KNH-ERC,
Dept. of Medicine, UON.

Deputy Director (CS),
Kenyatta N. Hospital.

Supervisor: Prof. Pankaj G. Jani, Dept. of Surgery, UON

The Chairman, Dept. of Surgery, UON

The Dean, Faculty of Medicine, UON

CMRO

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