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RESEARCH ARTICLE

COMPLICATIONS OF LAPRASCOPIC SURGERY IN WAD MEDANI TEACHING HOSPITAL - GEZIRA STATE (JAN 2009-DEC 2010).

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Abstract

Introduction:-

In 1902 George Kelling of Dresden performed the first laparoscopic procedure in dogs, and in 1910 Hans Christian Jacobaeus of Sweden reported the first laparoscopic operation in humans. In the ensuing several decades, numerous individuals refined and popularized the approach further for laparoscopy. DrCamranNezhat has been called the father of modern day laparoscopy, his techniques, foresight, innovations and courage are said to have revolutionized modern day endoscopic surgery.

Laparoscopic Surgery as a modality of treatment started at Wad medani Teaching Hospital in the 1998th by a single theatre room in the theatre building, with a few surgical equipments, trained staff, and a restricted number of operations. Now it is theater is well equipped, with a well trained staff doing at least one Laparoscopic Surgery per day, and this includes, GB and Varicocel surgeries, Diagnostic Laparoscopy and Adhesiolysis.

Problem definition and identification:-

The Gezira state is one of the largest states in Sudan, located in the center of the country and its population accounting for one third of the population of the whole country.

Wad medani teaching hospital is the only hospital in the area which has a well equipped department of laparoscopic surgery with a very competent staff, serving the state and the states around it.

The first laparoscopic surgery done in Sudan was performed in Wad Medani Teaching Hospital in 1998, and since then it is almost performed daily, especially the Gall bladder surgery, with a high rate of success, and very good outcome.

This research is conducted to measure the benefits of the Minimal Access Surgery (MAS), and focus on the complications and rate of conversion to open surgery.

CHAPTER ONE:-

Justifications:-

1. It is the most safe and modern mode of surgery.

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2. A world wide rapidly growing modality of treatment.
3. There are no researches or papers published on this issue in Gazira University.

Objectives:-
General objectives:
Assessment of the Laparoscopic Surgery as a modality of treatment, in Wad medani Teaching Hospital.

Specific objectives:
1. Observe the rate of injury to the biliary duct and nearby structures
2. Observe the rate of bile leak and post operative peritonitis.
3. Observe the rate of infection of port wounds.
4. Observe the rate of port hernia.
5. Observe the rate of conversion.

CHAPTER TWO:-
Research Methodology:-
A cross-sectional study of not less than 100 patients who will have laparoscopic surgery at WMTH and will be seen preoperatively and postoperatively and managed in WMTH.

Study area:-
Wad Medani Teaching Hospital

Study population:-
All patients selected for Minimal Access Surgery at WMTH during the period from Jan 2009-Dec 2010.

Sampling technique:-
All samples.

Methods of data collection:-
Flow sheat
Records
Observation and follow up

Methods of data analysis:-
Data is going to be analyzed by computer soft ware using Statistical Package for Social Sciences (SPSS) Program.

Inclusion and exclusion criteria:-
All patient conducting laparoscopic surgery are included, patient conducting other types of surgery are excluded.

Ethical considerations:-
Wad Medani Teaching Hospital.

CHAPTER THREE:-
Literature review:-
3.1. Laparoscopic surgery:-
Laparoscopic surgery, also called *minimally invasive surgery* (MIS), *bandaid surgery*, *keyhole surgery* is a modern surgical technique in which operations in the abdomen are performed through small incisions (usually 0.5-1.5cm) as compared to larger incisions needed in traditional surgical procedures.

Practicioners of "open" surgery sometimes use the misleading defensive term "microscopic" surgery, which implies a small incision. However, open surgery typically requires an incision large enough for the surgeon's hands to enter the patient, while the term microscopic refers to various magnifying devices used during open surgery. Keyhole surgery uses images displayed on TV monitors for magnification of the surgical elements.

Laparoscopic surgery includes operations within the abdominal or pelvic cavities, whereas keyhole surgery performed on the thoracic or chest cavity is called thoracoscopic surgery. Laparoscopic and thoracoscopic surgery belong to the broader field of endoscopy.

There are a number of advantages to the patient with laparoscopic surgery versus an open procedure. These include reduced pain due to smaller incisions and haemorrhaging, and shorter recovery time.

The key element in laparoscopic surgery is the use of a laparoscope. There are two types: (1) a telescopic rod lens system, that is usually connected to a video camera (single chip or three chip), or (2) a digital laparoscope where the charge-coupled device is placed at the end of the laparoscope, eliminating the rod lens system.[1] Also attached is a fiber optic cable system connected to a 'cold' light source (halogen or xenon), to illuminate the operative field, inserted through a 5 mm or 10 mmcannula or trocar to view the operative field. The abdomen is usually insufflated, or essentially blown up like a balloon, with carbon dioxide gas. This elevates the abdominal wall above the internal organs like a dome to create a working and viewing

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space. CO_2 is used because it is common to the human body and can be absorbed by tissue and removed by the respiratory system. It is also non-flammable, which is important because electrosurgical devices are commonly used in laparoscopic procedures.

3.2. History:-

It is difficult to credit one individual with the pioneering of the laparoscopic approach. In 1902 Georg Kelling, of Dresden, Saxony, performed the first laparoscopic procedure in dogs and in 1910 Hans Christian Jacobaeus of Sweden reported the first laparoscopic operation in humans. In the ensuing several decades, numerous individuals refined and popularized the approach further for laparoscopy. The introduction of computer chip television camera was a seminal event in the field of laparoscopy. This innovation in technology provided the means to project a magnified view of the operative field onto a monitor, and at the same time freed both the operating surgeon's hands, thereby facilitating performance of complex laparoscopic procedures. Prior to its conception, laparoscopy was a surgical approach with very limited application and used mainly for purposes of diagnosis and performance of simple procedures in gynecologic applications.

In 1972, Clarke invented, published, patented, presented and recorded on film laparoscopic surgery, with instruments marketed by the Ven Instrument Company of Buffalo, New York, USA. The advantages of this surgery were outlined in this paper.

The introduction in 1990 of a laparoscopic clip applier with twenty automatically advancing clips (rather than a single load clip applier that would have to be taken out, reloaded and reintroduced for each clip application) made surgeons more comfortable with making the leap to laparoscopic cholecystectomies (gall bladder removal). On the other hand, some surgeons continue to use the single clip appliers as they save as much as $200 per case for the patient, detract nothing from the quality of the clip ligation, and add only seconds to case lengths.

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3.3. Procedures:-

Laparoscopic cholecystectomy is the most common laparoscopic procedure performed. In this procedure, 5-10mm diameter instruments (graspers, scissors, clip applier) can be introduced by the surgeon into the abdomen through trocars (hollow tubes with a seal to keep the CO2 from leaking).

There are two different formats for laparoscopic surgery. Multiple incisions are required for technology such as the "Da Vinci" system, which uses a console located away from the patient, with the surgeon controlling a camera, vacuum pump, saline cleansing solution, cutting tools, etc. each located within its own incision site, but oriented toward the surgical objective. The surgeon uses two Play Station type controls to manipulate the devices.

In contrast, requiring only a single small incision, the "Bonati system" (invented by Dr. Albert Bonati), uses a single 5-function control, so that a saline solution and the vacuum pump operate together when the laser cutter is activated. A camera and light provide feedback to the surgeon, who sees the enlarged surgical elements on a TV monitor. The Bonati system was designed for spinal surgery and has been promoted only for that purpose.[2] and [3].

Rather than a minimum 20cm incision as in traditional (open) cholecystectomy, four incisions of 0.5-1.0cm will be sufficient to perform a laparoscopic removal of a gallbladder. Since the gall bladder is similar to a small balloon that stores and releases bile, it can usually be removed from the abdomen by suctioning out the bile and then removing the deflated gallbladder through the 1cm incision at the patient's navel. The length of postoperative stay in the hospital is minimal, and same-day discharges are possible in cases of early morning procedures.

In certain advanced laparoscopic procedures where the size of the specimen being removed would be too large to pull out through a trocar site, as would be done with a gallbladder, an incision larger than 10mm must be made. The most common of these procedures are removal of all or part of the colon (colectomy), or removal of the kidney (nephrectomy). Some surgeons perform these procedures completely laparoscopically, making the larger incision toward the end of the procedure for

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specimen removal, or, in the case of a colectomy, to also prepare the remaining healthy bowel to be reconnected (create an anastomosis). Many other surgeons feel that since they will have to make a larger incision for specimen removal anyway, they might as well use this incision to have their hand in the operative field during the procedure to aid as a retractor, dissector, and to be able to feel differing tissue densities (palpate), as they would in open surgery. This technique is called hand-assist laparoscopy. Since they will still be working with scopes and other laparoscopic instruments, CO2 will have to be maintained in the patient's abdomen, so a device known as a hand access port (a sleeve with a seal that allows passage of the hand) must be used. Surgeons that choose this hand-assist technique feel it reduces operative time significantly vs. the straight laparoscopic approach, as well as providing them more options in dealing with unexpected adverse events (i.e. uncontrolled bleeding) that may otherwise require creating a much larger incision and converting to a fully open surgical procedure.

Conceptually, the laparoscopic approach is intended to minimise post-operative pain and speed up recovery times, while maintaining an enhanced visual field for surgeons. Due to improved patient outcomes, in the last two decades, laparoscopic surgery has been adopted by various surgical sub-specialties including gastrointestinal surgery (including bariatric procedures for morbid obesity), gynecologic surgery and urology. Based on numerous prospective randomized controlled trials, the approach has proven to be beneficial in reducing post-operative morbidities such as wound infections and incisional hernias (especially in morbidly obese patients), and is now deemed safe when applied to surgery for cancers such as cancer of colon.

The restricted vision, the difficulty in handling of the instruments (new hand-eye coordination skills are needed), the lack of tactile perception and the limited working area are factors which add to the technical complexity of this surgical approach. For these reasons, minimally invasive surgery has emerged as a highly competitive new sub-specialty within various fields of surgery. Surgical residents who wish to focus on this area of surgery gain additional training during one or two years of fellowship after completing their basic surgical residency.

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The first transatlantic surgery (Lindbergh Operation) ever performed was a laparoscopic gallbladder removal.

Laparoscopic techniques have also been developed in the field of veterinary medicine. Due to the relative high cost of the equiment required, however, it has not become commonplace in most traditional practices today but rather limited to specialty-type practices. Many of the same surgeries performed in humans can be applied to animal cases - everything from an egg-bound tortoise to a German Shepherd can benefit from MIS. A paper published in JAVMA (Journal of the American Veterinary Medical Association) in 2005 showed that dogs spayed laparoscopically experienced significantly less pain (65%)than those that were spayed with traditional 'open' methods. Arthroscopy, thoracoscopy, cystoscopy are all performed in veterinary medicine today. The University of Georgia School of Veterinary Medicine and Colorado State University's School of Veterinary Medicine are two of the main centers where veterinary laparoscopy got started and have excellent training programs for veterinarians interested in getting started in MIS.

3.4. Advantages:-

There are a number of advantages to the patient with laparoscopic surgery versus an open procedure. These include:

- Reduced haemorrhaging , which reduces the chance of needing a blood transfusion.

- Smaller incision, which reduces pain and shortens recovery time, as well as resulting in less post-operative scarring.
- Less pain, leading to less pain medication needed.
- Although procedure times are usually slightly longer, hospital stay is less, and often with a same day discharge which leads to a faster return to everyday living.
- Reduced exposure of internal organs to possible external contaminants thereby reduced risk of acquiring infections.

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3.5. Risks:

Some of the risks are briefly described below:

- The most significant risks are from trocar injuries to either blood vessels or small or large bowel. The risk of such injuries is increased in patients who have below average body mass index[4] or have a history of prior abdominal surgery. The initial trocar is typically inserted blindly. While these injuries are rare, significant complications can occur. Vascular injuries can result in hemorrhage that may be life threatening. Injuries to the bowel can cause a delayed peritonitis. It is very important that these injuries be recognized as early as possible.[5]
- Some patients have sustained electrical burns unseen by surgeons who are working with electrodes that leak current into surrounding tissue. The resulting injuries can result in perforated organs and can also lead to peritonitis. This risk is reduced through the use of bipolar, instead of monopolar (patient-current-return) electrosurgical tools.
- There may be an increased risk of hypothermia and peritoneal trauma due to increased exposure to cold, dry gases during insufflation. The use of heated and humidified CO2 may reduce this risk.[6]
- Many patients with existing pulmonary disorders may not tolerate pneumoperitoneum (gas in the abdominal cavity), resulting in a need for conversion to open surgery after the initial attempt at laparoscopic approach.
- Not all of the CO2 introduced into the abdominal cavity is removed through the incisions during surgery. Gas tends to rise, and when a pocket of CO2 rises in the abdomen, it pushes against the diaphragm (the muscle that separates the abdominal from the thoracic cavities and facilitates breathing), and can exert pressure on the phrenic nerve. This produces a sensation of pain that may extend to the patient's shoulders. For an appendectomy, the right shoulder can be particularly painful. In some cases this can also cause considerable pain when breathing. In all cases, however, the pain is transient, as the body tissues will absorb the CO2 and eliminate it through respiration. [7]

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- Coagulation disorders and dense adhesions (scar tissue) from previous abdominal surgery may pose added risk for laparoscopic surgery and are considered relative contra-indications for this approach.

3.6. Robotics and technology:

The process of minimally invasive surgery has been augmented by specialized tools for decades. However, in recent years, electronic tools have been developed to aid surgeons. Some of the features include:

- Visual magnification - use of a large viewing screen improves visibility
- Stabilization - Electromechanical damping of vibrations, due to machinery or shaky human hands
- Simulators - use of specialized virtual reality training tools to improve physicians' proficiency in surgery
- Reduced number of incisions

Robotic surgery has been touted as a solution to underdeveloped nations, whereby a single central hospital can operate several remote machines at distant locations. The potential for robotic surgery has had strong military interest as well, with the intention of providing mobile medical care while keeping trained doctors safe from battle.

3.7. Non-robotic hand guided assistance systems:-

There are also user-friendly non robotic assistance systems that are single hand guided devices with a high potential to save time and money. These assistance devices are not bound by the restrictions of common medical robotic systems. The systems enhance the manual possibilities of the surgeon and his team, regarding the need of replacing static holding force during the intervention.

CHAPTER THREE:-

Some of the features are:

- The stabilisation of the camera picture because the whole static workload is conveyed by the assistance system.
- Some systems enable a fast repositioning and very short time for fixation of less than 0.02 seconds at the desired position. Some systems are lightweight constructions (18kg) and can withstand a force of 20 N in any position and direction.
- The benefit – a physically relaxed intervention team can work concentrated on the main goals during the intervention.
- The potentials of these systems enhance the possibilities of the mobile medical care with those lightweight assistance systems. These assistance systems meet the demands of true solo surgery assistance systems and are robust, versatile, and easy to use.

CHAPTER THREE:-

3.8. Complications of laparoscopic surgery:

Laparoscopic surgery has experienced a boom during the 1990's. In the example of cholecystectomy, the benefits of the laparoscopic approach were so readily apparent that laparoscopic surgery became the standard of care without any randomized prospective trial comparing it to the prior gold standard, open cholecystectomy. The enthusiasm for laparoscopic surgery has been tempered somewhat with the reports of unique complications associated with this approach. Complications of laparoscopic surgery can be grouped into the following three categories:

- Complications of access;
- Physiologic complications of the pneumoperitoneum; and
- Complications of the operative procedure.

- **Complications of access:**

The first step in a laparoscopic procedure is to access the peritoneal cavity in order to establish pneumoperitoneum. One method of access, using the Veress needle, is considered the closed technique. After nasogastric suction and drainage of the urinary bladder, a stab incision is made at the umbilicus, followed by the blind passing of a Veress into the abdominal cavity. Position of the needle within the peritoneal cavity can be confirmed by aspiration through a water filled syringe and by the water drop test. Once the surgeon is comfortable that the needle is in the peritoneal cavity, pneumoperitoneum is established and trocars are inserted.

A second method of access is the open technique. After making the umbilical skin incision, the surgeon incises the anterior abdominal fascia and the peritoneum under direct vision. The surgeon can then assess the peritoneal cavity for any adhesions prior to insertion of the first trocar. The surgeon can either suture the fascia closed around the trocar or can use the wedge-shaped Hasson trocar to establish a seal in order to allow the development of pneumoperitoneum.

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Access to the peritoneum is not an innocuous aspect of a laparoscopic procedure. Jansen et al. (8) found that of the 145 complications reported in 25,764 laparoscopic gynecological cases, 57% were caused while obtaining access. The rate of complication associated with Veress needle or trocar insertion was approximately 0.3%. Furthermore, complications resulting from Veress needle and trocar insertion include injuries to major retroperitoneal vessels and to bowel, which are associated with significant morbidity and mortality. Other more minor complications resulting from Veress needle and trocar insertion include abdominal wall hematoma, wound infection, and fascial dehiscence and herniation.

Mayol et al. (9) carried out a prospective trial of 403 patients to assess which factors were predictive of a complication with the placement of trocars. The surgeons performing the procedures were allowed to use clinical judgement in deciding between the closed or open technique to insert the umbilical trocar, and prior abdominal surgery was not considered an absolute contraindication to closed technique. At three months of follow-up, the rate of complication related to access of the abdominal cavity was 5%, with the most frequent complications being abdominal wall hematoma (2.0%), umbilical hernia (1.5%), and umbilical wound infection (1.2%). The rate of penetrating injuries was 0.2%. Using multivariate analysis, the authors determined that use of closed technique was the only factor associated with complications (odds ratio = 6.0, p = 0.04), whereas age, gender, obesity, prior abdominal surgery and the laparoscopic procedure performed were not associated. Nuzzo et al. (10) presented a

series of 330 patients in which the open technique was used exclusively with no incidence of injury to a major vessel or to bowel with trocar insertion. Open technique leads to less frequent wound complications in laparoscopic surgery. Though major vascular injuries and bowel injuries with trocar placement are quite rare, use of the open technique may decrease the incidence of these dangerous complications.

CHAPTER THREE:-

- **Physiologic complications of Pneumoperitoneum:**

Pneumoperitoneum causes several local and systemic effects, as reviewed by Hackam and Rotstein. The majority of these effects are beneficial for patient recovery, such as an observed decrease in postoperative pain and metabolic stress response, as measured by serum glucose and insulin levels , and the hepatic catabolic response, measured by functional hepatic nitrogen clearance . Laparoscopic surgery has some side effects which may be detrimental. Carbon dioxide pneumoperitoneum causes respiratory acidosis, presumably from absorption of the gas. Patel et al. found that patients undergoing laparoscopic cholecystectomy were at high risk for developing deep venous thrombosis (DVT), with 40% having calf DVT and 15% having axial vein DVT on follow-up screening.(11)

The pneumoperitoneum required for laparoscopic surgery leads to several important hemodynamic alterations (8–11). Cardiac output decreases by up to 30% during laparoscopic surgery, due to a decrease in stroke volume. Pneumoperitoneum also causes an increase in systemic vascular resistance. As a result, mean arterial pressure remains unchanged or increases up to 16%. Patients with marginal cardiac performance may warrant invasive cardiac monitoring to assure they tolerate pneumoperitoneum. Joris et al. (11) demonstrated that these hemodynamic changes were at least in part due to intravascular volume status, and could be ameliorated by preloading patients with isotonic fluid and achieving pneumoperitoneum in the supine position rather than the reverse-Trendelenberg position. Furthermore, treating patients with clonidine blunted the increase in mean arterial pressure, systemic vascular resistance and the release of catecholamines.

CHAPTER THREE:-

Complications of operative procedures:-

Cholecystectomy:-

Cholecystectomy was the first operation in general surgery in which laparoscopy replaced open surgery as the standard of care. We have the advantage of reviewing a decade of experience with laparoscopic cholecystectomy. A statewide database from Connecticut (12) noted dramatic increases in the number of cholecystectomies performed once laparoscopic cholecystectomy became the standard of care. The inference is that the threshold for performing cholecystectomy has been lowered with the advent of laparoscopic cholecystectomy. In addition, Russell et al. (12) noted that the rate of major bile duct injuries during open cholecystectomy increased after laparoscopic cholecystectomy became the standard of care, suggesting the open procedure was being reserved for the most difficult cases. Thus, it is difficult to make comparisons between the open procedure and the laparoscopic procedure, as the patient populations to which they are offered are likely quite different.

The most important complication related to the operative procedure of laparoscopic cholecystectomy is biliary injury. Major bile duct injury during laparoscopic cholecystectomy is associated with local factors (e.g. acute cholecystitis, gallstone pancreatitis, and aberrant anatomy) and experience of surgeon . A recent prospective series of 10,174 patients from Switzerland confirmed the findings of earlier studies. While the overall rate of common bile duct injury was 0.31%, this rate decreased in a statistically significant manner (from 0.49% during the first 10 cases to 0.04% after 100 cases) with number of procedures performed.(12)

The classic mechanism for major bile duct injury has been presented by Lee et al, and involves misidentification of the common bile duct or common hepatic duct for the cystic duct. This leads to dissection of the common hepatic or common bile duct, with the associated possibility of devascularization, and results in loss of part of the biliary tree. A second common method of injury is delayed stricture related to thermal injury. The first attempt at a repair for a major biliary injury offers the best chance for the patient. Repair of a major bile duct injury should be undertaken by an experienced hepatobiliary surgeon, even if this involves transfer to another facility for

CHAPTER THREE:-

definitive care. However, Russell et al. (12) reported that 89% of patients with major bile duct injury underwent repair at the hospital of origin, and only 5% of these required further interventions.

Laparoscopic antireflux surgery:-
The ability to perform antireflux procedures laparoscopically has led to an increase in popularity of these procedures. The average operating time reported in series ranges from 71 minutes to 202 minutes, with all authors reporting a significant decrease in the length of the procedure as experience increases. Complications, perioperative and postoperative, occur with a frequency of 4% to 16%. The most commonly reported intraoperative complications include perforation of either the esophagus or stomach, splenectomy, and pneumothorax. The rate of splenectomy is much lower in laparoscopic than in open antirefluxprocedures .

The most impressive benefit of laparoscopic surgery appears to be in the postoperative period. Patients have lower incidences of wound, cardiac and pulmonary complications. Postoperative hospital stay is limited to two to four days, and accounts for the reduced overall costs of the laparoscopic procedure . A common postoperative complication is dysphagia, occurring in 22% to 57% of patients, with 4% to 32% requiring dilatation. This has led several authors to advocate routine mobilization of part of the greater curvature of the stomach, to allow for a more floppy wrap. Other postoperative complications include paraesophageal herniation, atelectasis and pneumonia.

Laparoscopic inguinal hernia repair:-
There are several methods available for laparoscopic repair of inguinal hernia. The method most commonly used is the trans-abdominal pre-peritoneal herniorrhaphy (TAPPH). First, the peritoneal cavity is entered and pneumoperitoneum is established. Next, the pre-peritoneal space is dissected, a large polypropylene mesh is fixed into place with staples, and the peritoneum is closed over the mesh. This approach has

CHAPTER THREE:-
obvious advantages in the setting of recurrent hernia, in that the anterior approach requires dissection through scar. The TAPP approach also has a potential benefit in bilateral hernias, as Voitk noted that of all patients presenting with unilateral hernia by physical examination, 30% were discovered at laparoscopy to have bilateral hernias. Complications occur during and after TAPP at a rate of 6% to 31% Excluding laparoscopic access associated injuries, intraoperative complications include bladder injury, injury to the epigastric vessels and to the spermatic cord.(13)

Perhaps the most relevant postoperative complication is recurrence of the inguinal hernia. Large series have reported recurrence rates of TAPP at 1.0% to 2.9% (minimum follow-up of 26 months) . The serious complication of mesh infection occurs rarely, with Litwin et al. reporting one out of 535 patients and Leibl et al. reporting three out of 2700 patients. The ironic complication of port site herniation, the substitution of one hernia for another, also occurs infrequently. Litwin et al. reported three port site hernias occurring in 535 patients who underwent TAPP. Urinary retention occurs in 3% to 7% of patients postoperatively. Other postoperative complications include hematoma/seroma and neuralgia.

Wellwood et al. conducted a large (200 patients in each arm) randomized prospective trial comparing TAPP to Lichtenstein tension-free mesh repair. They concluded that TAPP led to a lower rate of wound infection, groin/thigh pain, genital swelling, local numbness, and constipation. Urinary retention did occur in a greater percentage of the patients undergoing TAPP. Finally, TAPP cost significantly more than the Lichtenstein repair per patient.(13)

Laparoscopic appendectomy:-
Open appendectomy is a well-established and safe procedure for the treatment of acute appendicitis. As such, proponents of the laparoscopic procedure need to present some benefit, be it decreased cost, decreased morbidity, or sooner return to work, to warrant use of this approach. A critical review and a meta-analysis of randomized controlled trials did not establish any conclusive results. The rate of

CHAPTER THREE:-
complications were similar. Slim et al. found the most common complication in open appendectomy was wound infection, while the most common complication of the laparoscopic procedure was intraabdominal abscess. Garbutt et al.(13) found no difference in the rate of intraabdominal abscess. Recent studies have found a trend toward increased intra-abdominal infection in the laparoscopic group.

Laparoscopic colectomy:-

The promise of diminished postoperative discomfort and morbidity, along with decreased hospital length of stay has lead to the application of laparoscopic surgery to bowel resection. Many series describe laparoscopic assisted procedures, in which the dissection and ligation of blood vessels are carried out laparoscopically. The bowel is then delivered through a small incision, and the resection and anastomosis are performed extracorporeally.

In patients undergoing laparoscopic bowel surgery, the rates of morbidity (12% to 25%) and the mortality (0% to 2.6%) appear to be similar to those obtained after open surgery. Intraoperative complications include enterotomy, mesenteric bleeding, and ureteric injury. Conversion to open procedure occurs 8% to 25% of the time. Bennet et al. have used multivariate analysis to show that surgeons who have performed over 40 cases have lower rates of intra-operative and post-operative complications. Postoperative length of stay is commonly reported as six days. The utility of laparoscopy in oncologic surgery has been called into question. Of the series reviewed recurrence rates were 4% to 6%. Most recurrences occurred in patients with advanced disease, either stage C lesions or in association with diffuse peritoneal metastasis(13).

CHAPTER FOUR:-

Results:-

Age groups:

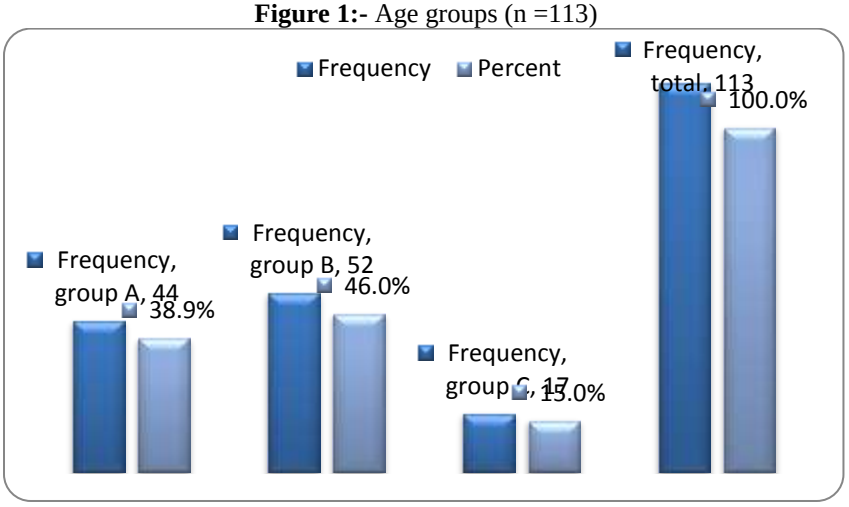
The studied population was classified in to three age groups:

1. Group A (20-39) years: 44 patients which account for 38.9%.
2. Group B (40-59) years: 52 patients which account for 46.1%.
3. Group C (60 and above) years: 17 patients which account for 15%.

Table 1:-Age groups (n =113)

No.	Group	No. of patients	Percentage
1	20-39 years	44	38.9
2	40-59 years	52	46.1
3	>,=60	17	15

Figure 1:- Age groups (n =113)



CHAPTER FOUR:-

Gender distribution:-

Both male and females were included in the study. The gender distribution was:

1. Male: 17 (15%).
2. Female: 96 (85%).

*The female male ratio was (5.6:1.0).

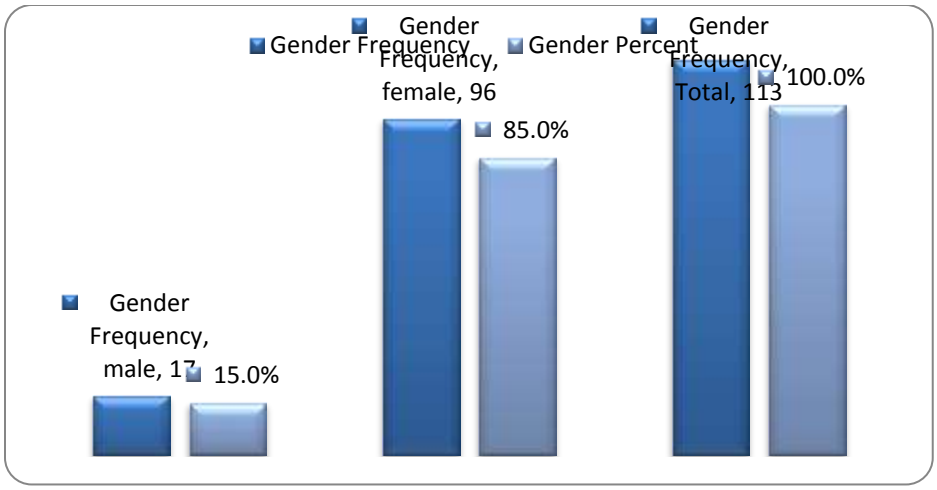


Figure 2:-Gender distribution. (n =113)

CHAPTER FOUR:-

Geographical distribution:-

The majority of the studied population was from Wad Medani locality, they accounted for 41 (36.3%) patients. The other patients were from Kamlin locality, Hasahesa locality, E.Gezira locality, S.Gezira locality, Almanagel locality, Um al qura locality, and others which refer to other states.

Table 2:- Geographical distribution. (n=113)

	Wad medani	**Kamlin**	**Hasahesa**	**E.Gezia**	**S.Gezira**	**Al managel**	**Um al qura**	**Others**	**Total**
numbers	41	3	12	6	19	11	5	16	113
percent	36%	2.7%	10.6%	5.3%	16.8%	9.7%	4.4%	14.2%	100%

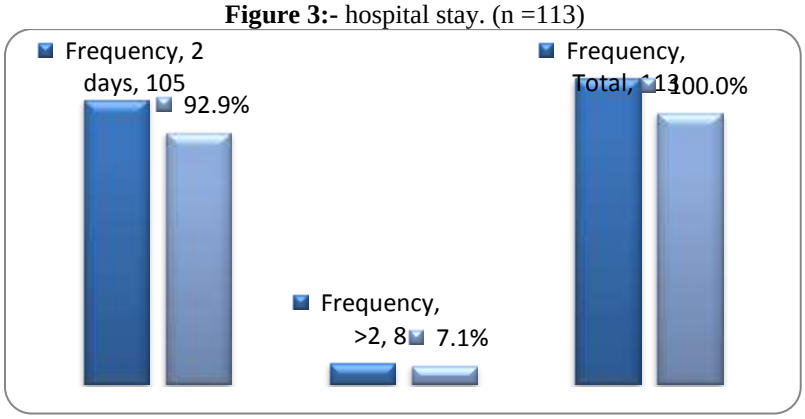
CHAPTER FOUR

Hospital stay:-

The length of the hospital stay was classified into two categories:

1. Less than 2 days: 105 (92.9%) patients.
2. More than 2 days: 8 (7.1%) patients

Figure 3:- hospital stay. (n =113)

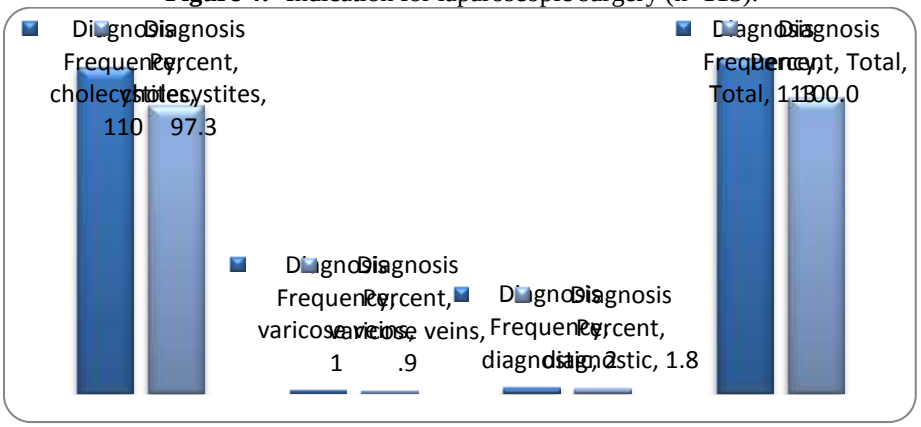


CHAPTER FOUR:-

Indication for laparoscopic surgery:-

1. 110 (97.3%) patients underwent laparoscopic cholecystectomy
2. 1 (0.9%) patient underwent high ligation of varicose veins.
3. 2 (1.8%) patients underwent diagnostic laparoscopy.

Figure 4:- Indication for laparoscopic surgery (n=113).

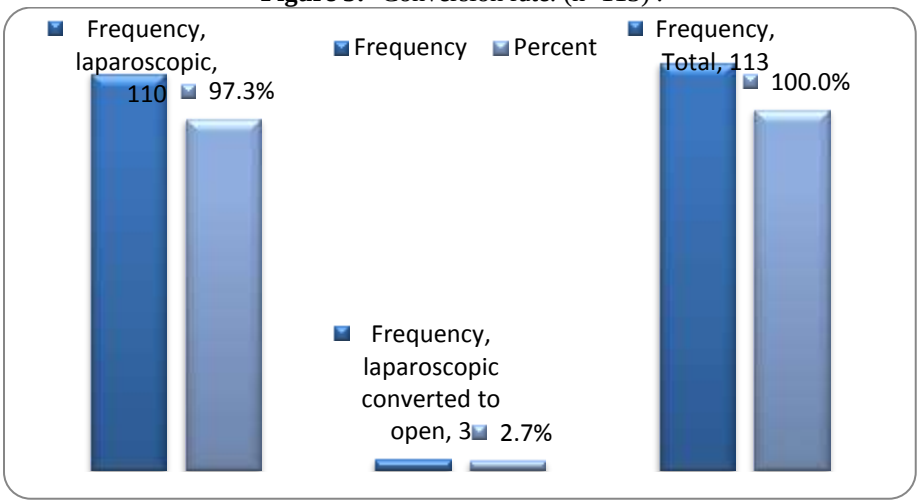


CHAPTER FOUR:-

Conversion rate:

- 3 (2.7%) laparoscopic operations were converted to open surgery.

Figure 5:- Conversion rate. (n=113) .



Reasons for conversion:-

The reasons for conversion from laparoscopic to open surgery were:

1. Bleeding; one (0.9%) patient.
2. Difficult procedure; two (1.8%) patients.

- There are no other reasons for conversion in the studied population.

Table3:- Reasons for conversions.

Reasons for conversion	No. of pt	Percent
Bleeding	1	0.9%
Difficult Procedure	2	1.8%
Total	3	2.7%

CHAPTER FOUR:-

Follow up:-

The studied population has been followed up postoperatively for complication. The complications were:

1. Infection (peritonitis due to biliary leakage): One (0.9) patient.
2. Umbilical port hernia: One (0.9) patient.
3. Death: One (0.9) patient.

Table 4:- The follow up of patients . (n=113)

No.	Complication	Number of patients	Percent
1	Infection	1	0.9%
2	Umbilical port hernia	1	0.9%
3	Death	1	09%

Complications of laparoscopic surgery:

The overall number of laparoscopic surgeries complications in the studied population was:

Table5:- Complications of laparoscopic surgery

No.	Complication	Number of patients	Percentages of complications
1	Bleeding	1	0.9%
2	Difficult Procedure	2	1.8%
3	Infection	1	0.9%
4	Umbilical port hernia	1	0.9%
5	Death	1	0.9%
Total		6	5.4%

CHAPTER FOUR:-

Discussion:-

Laparoscopic surgery, also called minimally invasive surgery (MIS), bandaid surgery, keyhole surgery, or pinhole surgery is a modern surgical technique in which operations in the abdomen are performed through small incisions (usually 0.5-1.5cm) as compared to larger incisions needed in traditional surgical procedures. Laparoscopic surgery includes operations within the abdominal or pelvic cavities, whereas keyhole surgery performed on the thoracic or chest cavity is called thoracoscopic surgery. Laparoscopic and thoracoscopic surgery belong to the broader field of endoscopy.

The number of patients in the study was 113 patients. The female- male ratio was (5.6:1.0) respectively.

Most of the studied population underwent laparoscopic cholecystectomy. It accounted for 97.3%, high ligation of varicocele accounted for 0.9% and diagnostic laparoscopic surgery accounted for 1.8% of the studied population The result is in agreement with Inderbitzin DT, Opitz I, Giger U, Kocher T, and Krähenbühl L.72.8% of the cases in their study underwent laparoscopic cholecystectomy.(14)

According to the geographical distribution of the studied patients, most of them were coming from Gezira state (85.8%) and the rest from other states accounting for 14.2%.

Patients used to stay at hospital post operatively less than 2 days The result is in agreement withShahnawaz Ahangara, Abdul Munnon Durrania, Shaheena Chalkoob, Masooda Jan Shaha, Muhammad Idrees Bashira. The mean (range) hospital stay was 2 (1–5) days in their study.(15)

CHAPTER FOUR:-

The successful rate of laparoscopic surgeries was 94.6%. The result is in agreement with IbnOuf MA, Salama AA, Fedail SS the successful rate of laparoscopic surgeries in his study was 94.81%.(16)

Complications from laparoscopic surgeries in the study arise in 5.4% of the cases The result is in agreement with Shahnawaz Ahangara, Abdul Munnon Durrania, Shaheena Chalkoob, Masooda Jan Shaha, Muhammad Idrees Bashira Complications from laparoscopic surgeries arise in 1–5% of the cases in their study and in agreement with Al-Mulhim AS, Amin TT. The complication rate was 4.03% in their study. (15, 17).

The mortality rate was 0.9% of the studied population The result is not in agreement with Shahnawaz Ahangara, Abdul Munnon Durrania, Shaheena Chalkoob, Masooda Jan Shaha, Muhammad Idrees Bashira study, the mortality rate was very low 0.05% (15).

The conversion rate from laparoscopic to open surgery was due to bleeding during the procedure in 0.9%. While 1.8% were due to difficult procedure (total 2.7%) which is low, this doesn't go with WaseemMemon, and Tariq Wahab's study. The conversion rate was 4% in their study. (18).

The studied populations have been followed up postoperatively for complication. The complications were infection (peritonitis due to biliary leakage) One (0.9%) patient, umbilical port hernia One (0.9%) patient and one death (0.9%). This doesn't go with Inderbitzin DT, Opitz I, Giger U, Kocher T, Krähenbühl L the death rate in their study was (0.05 per cent).(19)

The overall percentage of complications in the studied populations was (5.4%). The result is an agreement with Jaskiran S. Randhawa and

CHAPTER FOUR:-

Aswini K. Pujahari in their study the Complications from laparoscopic surgeries arise in (1–5%) of the cases.(20)

CHAPTER FIVE:-

Conclusions:-

1. Laparoscopic surgeries were feasible and cost effective in Sudan.
2. Laparoscopic surgeries could be performed safely in the majority of patients, by an experienced surgical team.
3. Laparoscopic surgeries were an effective way to treat patients and were worthy to be recommended because of its advantages of less interferences, few complications, and quick recovery.
4. Laparoscopic surgery has lesser morbidity rate.
5. The incidence of organ injury in laparoscopic surgery is 0.9%.

Common cause of injury inLaparoscopic surgeries:

- Misinterpretation of anatomy
- Technical Errors
- Surgeon operates on image rather than reality
- Visual psychological studies has shown that laparoscopic surgeon works on snap interpretation by brain and success or disaster depends on whether snaps are right or wrong

6. Laparoscopic surgeries were a safe method of treatment with very low conversion rate
7. Laparoscopic surgeries has a low hospital stay
8. Although procedure times are shorter, hospital stay is less, which leads to a faster return to work.
9. less post operative discomfort since they are much smaller incisions

CHAPTER FIVE:-

Recommendations:-

1. More training to surgeons, and staff.
2. Increase the capacity of the department; more Laparoscopic rooms, and more staff.
3. Laparoscopic surgeries should be performed for emergency conditions such as appendicectomy.
4. To train registrars to perform Laparoscopic surgeries.
5. To do more surgical operations through laparoscopic surgery procedures.
6. To train the trainees how to perform open surgeries so as to deal with complications of laparoscopic surgeries (in cases of conversions).
7. Since laparoscopic surgery has a high diagnostic yield and is a cost-effective technique it should be recommended for use in developing countries.
8. The awareness of the population for laparoscopic surgery should be increased.

References:-

1. W. Stephen, M.D. Eubanks; Steve Eubanks (Editor); Lee L., M.D. Swanstrom (Editor); Nathaniel J. Soper (Editor) Lippincott Williams & Wilkins 2nd Edition 2004 **Mastery of Endoscopic and Laparoscopic Surgery**
2. www.bonati.com
3. www.wikipatents.com/5203781.html
4. Mirhashemi R, Harlow BL, Ginsburg ES, et al: **Predicting risk of complications with gynecologic laparoscopic surgery. ObstetGynecol** 92:327, 1998
5. Janie Fuller, DDS, (CAPT, USPHS), Walter Scott, Ph.D. (CAPT, USPHS), BinitaAshar, M.D., Julia Corrado, M.D. FDA, CDRH, **"Laparoscopic Trocar Injuries: A report from a U.S. Food and Drug Administration (FDA) Center for Devices and Radiological Health (CDRH) Systematic Technology Assessment of Medical Products (STAMP) Committee"** Finalized: November 7, 2003
6. YuanfeiPeng, Ph.D., MinhuaZheng, M.D., Ph.D., Qing Ye, Ph.D., Xuehua Chen, Ph.D., Beiqing Yu, Ph.D., and Bingya Liu, M.D., Ph.D. **"Heated and Humidified CO_2 Prevents Hypothermia, Peritoneal Injury, and Intra-Abdominal Adhesions During Prolonged Laparoscopic Insufflations"**, Journal of Surgical Research 151, 40–47 (2009)doi:10.1016/j.jss.2008.03.039
7. **"Abdominal pain after laparoscopy: the value of a gas drain."** Br J ObstetGynaecol
8. Jansen F W, Kapiteyn K, Trimbos-Kemper T, Hermans J, Trimbos J B. **Complications of laparoscopy: a prospective multicentre observational study.** Br J Obstet Gynecol. (1997); 104: 595–600.
9. Mayol J, Garcia-Aguilar J, Ortiz-Oshiro E, De-Diego C J, Fernandez-Represa J A**. Risks of the minimal access approach for laparoscopic surgery: multivariate analysis of morbidity related to umbilical trocar insertion**. World J Surg. (1997); 21: 529–533. [PubMed]
10. Nuzzo G, Giulante F, Tebala G D, Vellone M, Cavicchione C. **Routine use of open technique in laparoscopic operations. J Am Coll Surg.** (1997); 184: 58–62. [PubMed]
11. Hackam D J, Rotstein O D. **Host response to laparoscopic surgery: mechanisms and clinical correlates**. Can J Surg 41. (1998); (2): 103–111.
12. Ortega A E, Peters J H, Incarbone R, Estrada L, Ehsan A, Kwan Y, Spencer C J, Moore-Jeffries E, Kuchta K, Nicoloff J T. **A prospective randomized comparison of the metabolic and stress hormonal responses of laparoscopic and open cholecystectomy.** J Am Coll Surg. (1996); 183: 249–256. [PubMed]
13. Glerup H, Heindorff H, Flyvbjerg A, Jensen S L, Vilstrup H. **Elective laparoscopic cholecystectomy nearly abolishes the postoperative hepatic catabolic stress response.** Ann Surg. (1995); 221(3): 214–219. [PubMed] [Free Full text in PMC]
14. Br J Surg. 2007 May;94(5):599-603.**Incidence of clinical pulmonary embolism after laparoscopic surgery.**Inderbitzin DT, Opitz I, Giger U, Kocher T, Krähenbühl L. Department of General Surgery, Hôpital Cantonal Fribourg, Fribourg, Switzerland.
15. Shahnawaz Ahangara, Abdul Munnon Durrania, Shaheena Chalkoob, Masooda Jan Shaha, Muhammad Idrees Bashira Received 27 September 2009; received in revised form 4 November 2009; accepted 11 November 2009. published online 07 December 2009.**Mini-lap cholecystectomy: Modifications and innovations in technique**Volume 8, Issue 2, Pages 112-117 (2010)
16. IbnOuf MA, Salama AA, Fedail SS. Gastro-intestinal and Liver Diseases Center, IbnSena Hospital, Sudan.**Laparscopiccholecytectoy: a local experience in Sudan** Saudi J Gastroenterol. 2001 Jan;7(1):22-5.
17. Al-Mulhim AS, Amin TT.Department of Surgery, College of Medicine at Al-Ahsa, King Faisal University, Al-Ahsa, Saudi Arabia. abdu3939@yahoo. **Outcome of laparoscopic cholecystectomy at a secondary level of care in Saudi Arabia.**Saudi J Gastroenterol. 2011 Jan-Feb;17(1):47-52.
18. WaseemMemon, Tariq Wahab, department of surgery, Isra University Hospital. Hydarabad, Pakistan. **Laparoscopic cholecystectomy: Conversion rate and its causes at Isra University Hospital**. Isra University Hospital. Received: Feb.12.2008. Accepted April24.2008.
19. Inderbitzin DT, Opitz I, Giger U, Kocher T, Krähenbühl L. Department of General Surgery, Hôpital Cantonal Fribourg, Fribourg, Switzerland. **Incidence of clinical pulmonary embolism after laparoscopic surgery.**Br J Surg. 2007 May;94(5):599-603.
20. Jaskiran S. Randhawa and Aswini K. Pujahari. Indian Journal of Surgery.**Preoperative prediction of difficult lap chole: a scoring method .**Volume 71, Number 4, 198-201, DOI: 10.1007/s12262-009-0055-y.