"COMPARISON OF FEASIBILITY AND SAFETY OF LAPAROSCOPIC APPENDICECTOMY UNDER SPINAL ANAESTHESIA VS GENERAL ANAESTHESIA, ONE YEAR RANDOMISED CONTROLLED TRIAL AT A TERTIARY CARE HOSPITAL"

BY

REG NO. BH0115012

Dissertation

Submitted to the

KLE University, Belgaum, Karnataka

In Partial Fulfillment of the requirements for the degree of

MASTER OF SURGERY (M.S.)

in

GENERAL SURGERY

DEPARTMENT OF SURGERY,

JAWAHARLAL NEHRU MEDICAL COLLEGE,

BELAGAVI- 590010, KARNATAKA

APRIL - 2018

KLE UNIVERSITY, BELAGAVI, KARNATAKA

Endorsement by Head of the Department,

Principal/Head of the Institution.

This is to certify that this thesis entitled **"COMPARISON OF FEASIBILITY AND SAFETY OF LAPAROSCOPIC APPENDICECTOMY UNDER SPINAL ANAESTHESIA VS GENERAL ANAESTHESIA, ONE YEAR RANDOMISED CONTROLLED TRIAL AT A TERTIARY CARE HOSPITAL,"** is a bonafide research work done by **REG NO. BH0115012**

Dr. S. S. Shimikore M.S.
General Surgery
Professor and Head
Department of General Surgery
J.N. Medical College
Belagavi, Karnataka

Date:
Place:

Dr. Mrs. N.S. Mahanthshetti M.D.
Paediatrics
Principal
J.N. Medical College
Belagavi – 590010
Karnataka

Date:
Place:

LIST OF ABBREVIATIONS

BP	BLOOD PRESSURE
CT	COMPUTED TOMOGRAPHY
COPD	CHRONIC OBSTRUCTIVE PULMONARY DISEASE
CSF	CEREBRO SPINAL FLUID
DBP	DIASTOLIC BLOOD PRESSURE
ECG	ELECTROCARDIOGRAPHY
E	EXCELLENT
GA	GENERAL ANAESTHESIA
G	GOOD
HR	HEART RATE
IBS	IRRITABLE BOWEL SYNDROME
NG	NOT GOOD
PONV	POST OPERATIVE NAUSEA & VOMITTING
PACU	POST ANAESTHESIA CARE UNIT
SA	SPINAL ANAESTHESIA
SD	STANDARD DEVIATION
SBP	SYSTOLIC BLOOD PRESSURE
USG	ULTRASONOGRAPHY
VAS	VISUAL ANALOGUE SCALE
POD	POST OPERATIVE DURATION

ABSTRACT

Background:

Laparoscopy has revolutionised surgery and management of the patient with marked decrease in morbidity and post-operative complications. Initially, these procedures were done using only General Anaesthesia. However, now with the introduction of Spinal anaesthesia and after learning its advantages, surgeons are slowly beginning to gravitate towards this mode of anaesthesia. There are different schools of thought which advocate the use of one method over the other and surgeons are still cautious about performing laparoscopic surgery under Spinal anaesthesia. Hence, this study has been taken up to compare the various parameters that may vary when using different methods of anaesthesia and to assess whether one particular method is superior or a safer option when compared with the other.

Aims and Objectives:

The aim of this study is to assess intra operative pain and hemodynamic stability during laparoscopic appendectomy under Spinal anaesthesia in comparison to General anaesthesia and to compare post-operative pain and incidence of post-operative nausea and vomiting between the two methods.

Methods:

Sixty three patients who were admitted in the hospital for appendicitis participated in this Randomized controlled trial conducted in a tertiary care hospital in India. Thirty patients were randomly included in Group A (undergoing laparoscopic surgery under Spinal Anaesthesia) and thirty three patients in Group B (undergoing laparoscopic surgery under General Anaesthesia). Necessary baseline haematological

investigations and imaging was done following which patients were taken up for laparoscopic surgery. The patients' BP, heart rate, SPO_2 and ECG were recorded prior to induction, during surgery and at 15 minute intervals following surgery. The intra operative conditions, ease of operating under Spinal anaesthesia and muscle relaxations were assessed and graded by the surgeon.

All the patients were monitored for nausea and vomiting, headache, sorethroat and transient neurological symptoms. Pain was assessed using visual analogue scale (VAS) and graded at 1, 3, 6, 12hours. Intensity of pain was assessed by using 10 point VAS. Statistical analysis was done using the Chi-square test and the Unpaired student t test.

Results:

10% of the patients who underwent Spinal anaesthesia developed bradycardia while 6.66% developed hypotension. The difference between the heart rates of the two groups was found to be significant from 3 minutes prior to surgery to 45 minutes after surgery. The mean values of Systolic and diastolic pressure was found to be significantly higher in patients who were administered General anaesthesia and no change in the respiratory functions was observed following administration of either Spinal or General anaesthesia. 26.67% of the patients who underwent surgery under Spinal anaesthesia complained of pain in the shoulder on the right side and this difference was statistically significant. Patients who underwent laparoscopic surgery under general anaesthesia recorded higher levels of pain as compared to those under spinal anaesthesia for twelve hours following surgery. However, the difference between the VAS scores for pain between the two groups was significant only up to three hours following surgery. After six hours, this difference was not found to be significant. Only 6.67% of patients who underwent surgery under Spinal anaesthesia

complained of PONV compared to 21.21% of the patients who underwent surgery under General anaesthesia. 3.33% of the patients developed post-operative headache after having underwent surgery under Spinal anaesthesia while 12.12% of patients who underwent surgery under general anaesthesia developed sore throat.

Conclusion:

Laparoscopic surgery under Spinal anaesthesia is a viable and safe alternative as compared to General anaesthesia. The recovery rates and the satisfaction reported by patients is also better. Spinal anaesthesia also helps in maintaining better haemodynamic stabilization. It has the advantages of lesser incidence of post-operative complications related to pain. In patients for whom General anaesthesia is a poor choice, Spinal anaesthesia can be considered as a safe alternative. However more studies are required to further establish the feasibility of performing laparoscopic appendectomy under spinal anaesthesia.

Keywords: Laparoscopic appendicectomy, Spinal anesthesia, General Anaesthesia, Comparison.

LIST OF CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF FIGURES

INTRODUCTION

Appendicitis is the term given for the condition of inflammation of the appendix. Majority of appendectomies are due to appendicitis. It is characterized by inflammation in the appendix and is caused by blockage of the appendix due to faecal impaction or lymphoid hyperplasia. Inflammation compromises blood flow to appendix leading to tissue death resulting in rupture. Rupture results in spillage of bowel contents (including flora) into abdomino-pelvic cavity and peritonitis which may even result in death. [1]

The diagnosis of appendicitis is made based on the person's clinical presentation. In instances where the diagnosis cannot be made based on the person's history and physical examination, close observation, radiographic imaging and laboratory tests are helpful. The two most common imaging tests used are Ultrasound and Computer Tomography. Surgical removal of the appendix is the standard treatment of appendicitis. This may be done via open or laparoscopic surgery.[1]

Until now, General Anaesthesia has been the choice of anaesthesia to be used during Laparoscpic surgeries. Until recently, Abdominal laparoscopic surgeries have rarely been done using Spinal anaesthesia. Therefore, there are only a handful of reports of Laparoscopic surgeries being done using Spinal anaesthesia.[2]

Recently, advantages such as optimal anterior abdominal wall relaxation and the conscious status and receptive nature of the patient together have encouraged researchers to conduct studies to try out Spinal anaesthesia for all laparoscopic surgery patients. Another reason for preferring Spinal Anaesthesia was to prevent the potential problems of GA.[3]

The pneumoperitoneum induced rise in intra-abdominal pressure along with pressure on the diaphragm and carbon dioxide induced peritoneal irritation are factors to be considered while using Spinal anaesthesia. Initially, there was no information as to how the patient would respond to these as he or she would be conscious at the time of surgery. Changes in technique such as methodology of port-site placement and the technique of using nitrous oxide, which is less irritating for the peritoneum compared to carbon dioxide, along with maintenance of low intra peritoneal pressure when using SA have all been reported to reduce discomfort and incidence of neck and shoulder pain.[2]

GA patients unlike SA patients frequently complain of stomach inflation which occurs as a result of mask ventilation. Ryle's tube intubation may be required at times like these which causes unnecessary intervention in a body cavity. The most important point however, seems to be the difference in status of respiratory parameters among the two modes of anaesthesia during laparoscopic surgery. In this context, spontaneous physiological respiration during SA would always be better than an assisted respiration. The increased potential of intubation and ventilation related problems exists during GA as pulmonary functions take 24 hours to return to normal after laparoscopic surgery is performed using GA .[4]

Complications like sore throat, relaxant muscle pain, dizziness, and postoperative nausea and vomiting (PONV) often occur after GA. Regional anaesthesia has been observed to have several advantages like reduced spinal and epidural anaesthesia time, quicker recovery, decreased postoperative nausea and vomiting (PONV). It has also been found to be associated with less changes in blood

pressure and reduced bleeding, though patients do complain of right shoulder tip pain intra-operatively.[5]

Similar studies were done comparing laparoscopic surgeries under spinal versus general anaesthesia in which they compared blood pressure, intra operative pain, PONV, post-operative pain.

The study found that intra operative shoulder pain was noticed more in cases under SA, PONV was seen more in cases under GA, post-operative pain was less in cases under SA but there was no significant difference in scores after around nine hours of surgery, hypotension and bradycardia was seen in few cases under SA and sore throat and pruritus was noticed in patients under GA. They concluded that Laparoscopic surgeries under spinal anaesthesia was technically safe and feasible with excellent recovery and high degree of satisfaction and SA offers good surgical conditions, stable haemodynamics, pain free post-operative period and minimal post-operative sequelae.[2]

There have been relatively few studies comparing the safety and feasibility of performing laparoscopic appendicectomy with the two techniques namely, Spinal and General Anaesthesia hence the current study is done to assess the feasibility and safety of spinal anaesthesia for laparoscopic appendectomy.

OBJECTIVE

Primary Objective:

To study intra operative pain and hemodynamic stability during laparoscopic appendectomy under Spinal anaesthesia in comparison to General anaesthesia.

Secondary objectives:

Comparing post operative pain and incidence of post operative nausea and vomiting

REVIEW OF LITERATURE

The introduction and application of laparoscopy has brought about a radical change in the field of surgery with its benefits of markedly decreased morbidity along with rapid improvement. Initially, procedures involving laparoscopy were done using general anaesthesia which was essential in view of the respiratory changes that occur as a result of pneumoperitoneum which itself is an indispensable component of laparoscopy. The exact regulation of ventilation under strictly monitored conditions while using General anaesthesia has established it to be perfect during such procedures. Nevertheless, Regional anaesthesia has been coming up recently as a strong contender against General anaesthesia for use in laparoscopic procedures.

I. Historical outlook
II. Anatomy and Physiology of appendix
III. Pathophysiology of appendicitis
IV. Prevalence of appendicitis
V. Procedure for appendicectomy
VI. Anaesthesia used for Laparoscopy
VII. Evidence for Laparoscopic appendectomy under General versus Spinal anaesthesia

I. HISTORICAL OUTLOOK:

The appendix is a part of the caecum which arises at the juncture of the longitudinal bands of muscle fibres of the colon (taenia coli). The description of the appendix being similar to that of a “worm” can be dated back as early as the Egyptian civilization, when they observed the presence of the appendix during preparations for

funerals. The function of the organ and the part it plays in diseases however, remained vague and unknown.[6]

It was initially widely believed by authorities in the field of medicine that the caecum was the source and the cause of inflammation occurring in the lower quadrant of the right side of the abdomen. This disease was named "Typhilitis" and infectious processes occurring in the iliac fossa were referred to as "peri-typhilitis". The first description of the clinical presentation of acute appendicitis was given in the nineteenth century by R.H. Fitz, a pathologist practicing at Harvard. He conceived the term of "appendicitis" and supported surgery as the preferred mode of intervention for the disease in 1886.[7] Charles McBurney, a practicing general surgeon and peer of Fitz, elucidated regarding the point of greatest tenderness in appendicitis as being in the right lowermost quadrant.[8] This point, now named after him, is positioned at one-third of the gap between the anterior superior iliac spine on the right side and the umbilicus. This point is also consistent with the location of the appendix's base anatomically. The grid-iron incision used for appendicectomy was also made famous by McBurney and he too, apart from Fitz was a strong supporter of speedy intervention using surgical methods as the preferred mode of management for appendicitis.[9]

This technique for surgically removing an unwanted and afflicted appendix prevailed unchallenged for almost a hundred years. The operating surgeons would localize and skeletonize the appendix, along with controlling its arterial circulation through the gridiron incision on the right side that was espoused by McBurney. Following amputation, the remaining stump was not buried and the caecum was returned to its anatomical position before closure of incision. The gold standard for appendicectomy was considered the open approach itself and stood the test of time for

the better part of a century in view of it being widely regarded as a safe and efficient method which also had the advantages of having very low morbidity and almost nil mortality rates. A gynaecologist of German nationality, Kurt Semm was the pioneer of change in McBurney's method. He operated on a patient and performed laparoscopic appendicectomy for the first time on the 30th of May, 1980.[10,11] His technique was much more convenient as it avoided the necessity of causing trauma to the abdominal wall, by simply using a laparoscope as a means of viewing the appendix. A laparoscopic needle along with endosutures were the instruments used to tie the mesoappendix before division. To ligate the appendix's base, Pretied Roaders loops were employed. Amputation of appendix was performed in between the fixed loops. This technique was much more efficient in view of minimal trauma and invasiveness.

Numerous reasons were put forth by Larson et al for the preferable use of a laparoscopic method over that of an open method.[12] Some of the reasons he cited were better visualization, viewing and identifying damage to other nearby structures, decreased trauma to tissue, faster return to normality for patients, better exposure for overweight patients and decreased chances of infection as the wound area is smaller. One of the more important advantages was the option of being able to firmly diagnose female patients who belong to the childbearing category.[13]

Following the initial laparoscopic appendicetomy, various methods involving adaptations of Kurt Semm's original technique were employed and described.[14] The sophistication of the instruments and the sources of energy used have been refined with each year and now various options are available varying with respect to access, number of ports, size of the ports and even, NOTES.[15,16] The standard approach to laparoscopic appendicetomy includes preparation of the patient preoperatively. This

also includes anaesthetic clearance. An antibiotic, most commonly a broad spectrum antibiotic such as Cephalosporins are administered intravenously

II. Anatomy and Physiology of Appendix:

Normally, an appendix can measure around 9 cms, but may range between 2 cms – 22 cms in a normal healthy adult. It is a retrocaecally positioned organ which is located inside the peritoneal cavity. Five common positions were listed for the appendix following a study of 10,000 cases by Wakeley – ascending appendix in the retrocaecal recess (65%), Descending appendix in the iliac fossa (31%), Transverse appendix in the retrocaecal recess (2.5%), Paracaecal and preileal ascending appendix (1%) and paracaecal and postileal ascending appendix (0.5%).[17] For a long time now, the appendix has been considered to be an organ of vestigial nature with very little function clinically, though there may be an immunological function associated with it, particularly in children and adolescent age groups. During the 14th gestational week, lymphoid tissue begins to form under the appendix's epithelium.[18,19] This lymphatic tissue unlike normal lymph nodes, does not have any lymphatic vessels for drainage from the tissue. Hypotheses have been made that the appendiceal tissue may play a role in the immunological governance of the gut.[20]

Circulation to the appendix is provided by the appendiceal artery which is an end branch of the ileocolic artery's posterior caecal branch. The ileocolic artery originates from the superior mesenteric artery.[21]As the supply to the appendix is from an end artery, there is no provision for increasing the perfusion in the scenario of acute inflammation, thus increasing the risk of ischemia and consequently, perforation. This may serve as a major factor in the aetiology of appendicitis.

III. Pathophysiology of Appendicitis:

The fundamental causative phenomenon in acute appendicitis is the obstruction of the lumen of the appendix which then leads to inflammation, followed by suppuration.[22]The more frequently found causes that result in obstruction are faecolith, appendiceal wall kinking or hypertrophy of the lymphoid tissue of the submucosal layer. The lesser frequently found causes that lead to obstruction of the appendix are foreign bodies causing obstruction or worms in the intestine.

Once obstruction of the appendiceal lumen occurs, the pressure inside the lumen begins to increase secondary to mucosal secretion. The volume of the appendix is normally 0.6 ml. The volume of the production of mucus by the appendix can amount to 2 ml to 3 ml / day. As a result of this when the appendix is obstructed, it can result in distension within a few hours. This is the reason for the occasional accelerated development and presentation of appendicitis.[23] Thus, this means that proximal obstruction of the appendix results in a closed loop type of obstruction and if not corrected, the pressure inside the appendiceal lumen can become greater than that of the pressures inside the supplying capillaries and lymphatic system, resulting in venous infarctions.

Inflammation of mucosa in the distal part results in ulceration and consequently, inflammation of the complete wall of the appendix. Increased growth of anaerobic and aerobic microorganisms also result secondary to stagnation occurring distally from the obstruction. The appendix shows a predominance of anaerobes with common cultures found of Eschericia coli, Pseudomonas and Bacteroides. This continuous generation of bacteria along with unceasing production of mucus leads to the degradation of the arterial circulation resulting in gangrene of the inflamed appendix – “gangrenous appendicitis”. Perforation occurs as a result of transmural

necrosis. This can result in localization in the form of an abscess or it may also go on to develop diffuse peritonitis.

Persons having acute appendicitis generally come with pain in the lower quadrant on the right side which may have originated in the periumbilical region.[24]Frequently found signs are febrile status and vomiting which is commonly accompanied by loss of appetite. There is a spurt in the neutrophil count and increased band forms of immature type are observed commonly in these cases with leucocytosis ranging between 11000 – 18000 white blood cells per cubic mm. Plain X – rays of the abdomen may occasionally result in the identification of a faecalith, but most of the investigations can have unspecific findings. CT is more useful in the accurate diagnosis of processes involving acute inflammation in the lower quadrant on the right side.[25] Ultrasound of the lower quadrant on the right side may identify a " bull's eye" sign indicating distension of the appendix. This investigation though, is dependent upon the operator's expertise.[26]

There can be two outcomes of an unwanted nature that can arise during the management of acute appendicitis. The first is appendiceal perforation with the risk of contamination, abscess, peritonitis or even, sepsis. The second is wrong diagnosis with surgical removal of a healthy appendix. Around 10 – 20% of laparoscopic exploration may show healthy looking appendices which are not inflamed and are also normal histologically.[27,28] This percentage has come down drastically since the introduction of laparoscopy.[29]

IV. Prevalence of Appendicitis:

Among surgical emergency procedures, appendicectomy ranks among as one among the most common. Each year, around 2,70,000 cases are operated upon in the USA.[30] The greatest incidence of appendicitis was found in the demographic age

group between 10 – 19 years. Males were found to have a greater incidence rate when compared to females irrespective of their ages. Males have been estimated to have a lifetime risk of 8.6% and females have a risk of 6.7%.[31]The overall incidence is approximately estimated to be around 0.12%.[29]

V. Surgical procedure of appendicectomy

Patients were evaluated pre-operatively and was induced with GA/SA. After induction ryle s tube and foley's catheter were inserted.

Position- patient in supine position with right arm extended and left arm tucked in at patients side.

Steps - under all aseptic conditions abdomen from nipple to midthigh was painted with betadine and drapped. Pneumo peritoneum was created using veress needle/ Hasson's open techniques and a 10mm port was inserted at umblical site and abdomen was inflated with CO_2 and pressure was set at 14mm of Hg

The videoscope is inserted through umblical port site and careful visualization of all quadrants of abdomen is performed and recording is made of all normal and abnormal findings.

Under vision two 5mm ports are inserted into the abdomen (fig-). One is placed in left lower quadrant lateral to the rectus muscles and the epigastric vessels and another 5mm port is placed in midline suprapubic position, so as to avoid the bladder which is decompressed with Foley's catheter.

The appendix, mesoappendix, base of appendix and caecum was visualized. Using a grasping forceps appendix is held and dissection is done by making a window in mesentry at the base of the appendix. Mesoappendix is separated and divided from the appendix upto the base. Rodder's knot is applied at the base of appendix and another knot just above it, and appendix is cut between the two knots. Hemostasis is

achieved and appendix is removed out through through 10mm port site. Ports are removed out safely after inspecting for any other inflammatory processes like tubo-ovarian disease, IBD, meckel s diverticulum, etc.

The abdomen is decompressed and at 10mm port site rectus is closed with port closure and skin closed with ethylon, dressing was done.[32]

VI. Laparoscopic appendicectomy under anaesthesia:

Laparoscopy was introduced as an alternative method of surgery in the 20th century by gynaecologists as it appeared to be a much quicker and safer way to diagnose pain in the pelvic region with reduction in duration of stay in hospital and also, pain postoperatively. This was proved with further practice and other advantages such as improved cosmetic results, faster return to being able to carry out normal activities came to light which ultimately would lead to decrease in expenditure for medical services, decreased bleeding intra-operatively, decreased incidence of complications related to pulmonary system postoperatively, improved function of respiratory system, decreased complications related to wound healing and decreased derangement of metabolic parameters.[33] Recently, Laparoscopy has been emerging as method of choice for patients who are older and have frailer health which has resulted in greater stringency and technical expertise required in the administration of anaesthesia. Laparoscopy does come with the risk of increased complications related to the cardiovascular and respiratory systems, but it also is a method that gives patients the luxury of opting for outpatient procedures which in turn, increases the need for special care when it comes to choosing the technique for anaesthesia. Anaesthesia had also emerged as a safe procedure which is also effective in children,[34] in cases involving arterial bypass,[35] in urological cases such as

laparoscopic nephrectomy for arterial and venous malformations,[36] in total excision of prostate, in cystectomy,[37] hepatic resection[38,39] and distal pancreatectomy.[40] As a result, surgery with laparoscopy comes with a number of fresh challenges for both the surgeon and anaesthesiologist in which correct estimation and expectation of the problems that can arise is required for adequate care of the patient ultimately resulting in early diagnosis and reduction of potential complications. During laparoscopy surgery using anaesthesia, complications such as extraperitoneal insufflation inadvertently, development of pneumomediastinum, pneumothorax or pneumocardium, injuries to structures such as urinary tract, gastrointestinal system and vascular injuries must be kept in mind.[41]

There are two techniques for administration of anaesthesia, namely – General Anaesthesia and Regional anaesthesia. Regional anaesthesia in turn can be administered via - a)Peripheral Nerve blocks which include Rectus Sheath Blocks, b)Neuraxial blocks such as Epidural or Spinal Anaesthesia and c)infiltration via local anaesthesia. This study will be discussing the methods of General and Spinal anaesthesia in detail as describing all the methods of anaesthesia are beyond the scope or aim of this study.

A. General anaesthesia in Laparoscopic surgery:

General Anaesthesia is performed using balanced anaesthesia which involves the use of agents such as Isoflurane, Desflurane, Nitrous oxide or Sevoflurane along with intravenous administration of induction agents like Propofol, Thiopentone etc. and also relaxants of the musculoskeletal system some of which are Succinylcholine, Vecuronium etc. The agents used for maintenance of anaesthesia generally have a shorter duration of action such as Desflurane, Sevoflurane and also constant Propofol infusions. Studies show that early recovery is present on usage of these drugs with

Propofol having an edge over the others in view of comparatively lesser propensity to cause postoperative nausea and vomiting.[42,43] Usage of anaesthestics which are volatile in nature which are more rapid and have a shorter duration of action such as Sevoflurane or Desflurane and analgesics which are opioid in nature such as Remifentanil has the advantage of a more consistent profile for recovery which leads to faster tracking following administration of general anaesthesia. Faster tracking is the term given to shifting the patient from the operating room directly into the step-down unit without having to pass through the post-anaesthesia care unit phase. This is applicable in various procedures using laparoscopy such as fundoplication, cholecystectomy, splenectomy, Nephrectomy etc.[44] Fast track method of surgery is becoming more popular in current surgical practice for laparoscopy especially in paediatric cases with post-operative stay of less than one day following surgery.[45] Moreover, procedures such as endoscopic procedures for thoracic sympathectomy is becoming a safe outpatient procedure.[46] Novel methods such as using auditory evoked potentials or monitoring the Bispectral index are being used to taper and control the volatile anaesthetic used which results in shorter stay both in the PACU and decreased overall stay in the hospital. This leads to an improvement in the perception of quality of life on part of the patient.[47] Outpatient procedures using laparoscopic methods are usually done with the help of intravenous agents such as Midazolam, Propofol, Alfentanil, Ketamine or Vecuronium. Propofol usage has been found to be inferior to Isoflurane, Sevoflurane or desflurane as it has lesser number of patients who were considered as eligible for fast tracking following administration.[48] Patients showed greater tendency to have occurrence of awareness perioperatively and to develop PONV when agents which were opioid based were used in laparoscopy. As a result of this, opioid agents can be used as supplementation for intravenous agents or inhalants

in anaesthesia. Remifentanil has been proved to bestow improved control of haemodynamic responses perioperatively as compared to Alfentanil.[49]Remifentanil has an important advantage as the doses used for cardiovascular response attenuation does not carry the risk of respiratory depression postoperatively and hence does not cause any delay in recovery. Post-operative analgesia is also an important factor that should be considered. It was shown by Song and White that use of Remifentanil as an adjunct during anaesthesia with combination of Desflurane and Nitrous oxide helps in faster recovery without causing worsening of pain, need for medications or PONV following laparoscopy.[50] There was no difference found in PONV, recovery time from anaesthesia, PONV or expenditure in the use of combination of Sevoflurane and Remifentanil when compared to combination of Fentanyl, Propofol and Rocuronium when used for induction in a study by Yang et al on monitoring them for the first twenty four hours following laparoscopic procedure.[51] Use of non-opioids for analgesia was found to show benefit in ambulatory surgery and multimodal analgesia in which faster recovery is an important aim. Non- opioid substances are increasing in popularity for use in laparoscopic surgery as it helps in reducing the need for opioid substances and thus avoids the problem of delayed recovery.[52] Nitrous oxide is usually used for the purpose of analgesia perioperatively and also helps in the need for anaesthetics which are administered via inhalational or intravenous methods. The part that Nitrous oxide plays in the development of complaints such as nausea and vomiting are still vague and controversial. No advantage has been found clinically on the omission of Nitrous Oxide and eliminating it comes with a risk of awareness during the procedure.[53]The techniques for anaesthesia which were previously described in Laparoscopic cholecystectomy did not use Nitrous Oxide. Studies done since then show that there is no change in conditions of surgery irrespective of the use

of Nitrous oxide and therefore, there should not be any need to contraindicate it during laparoscopic cholecystectomy. Avoiding Nitrous oxide however has shown an improvement in surgical conditions while performing surgery of the intestine and colon. This could be due to prevention of diffusion of Nitrous oxide into the lumen of the bowel by not using it during the procedure. A study found that Nitrous oxide can help in combustion if allowed to diffuse into pneumoperitoneum of carbon dioxide for an interval of two hours.[54] Whether this risk is actually applicable in the clinical set-up has not been established, but there will in any case be some diffusion of gas from the abdomen which will be then replaced by Carbon dioxide. Succinylcholine used to be used rampantly for laparoscopic surgeries of shorter duration for muscle relaxation, However it was found to result in increased incidence of muscle pains postoperatively. At present, there are various options to choose from among Non-depolarizing agents that cause neuromuscular blockade as a result of which they are being used more commonly, however no drug has been found to have as short a duration of action as Succinylcholine does. Use of the other drugs in place of Succinylcholine has been found to decrease the incidence of muscle pains postoperatively, especially neck pain.[55,56] Use of other drugs still continues to result in pain in the shoulder as a common postoperative complaint. This is majorly due to the pneumoperitoneum. In view of ease of reversibility of neuromuscular blockade action of the drug, it is preferable to use frequent doses of drugs that are shorter acting when compared to drugs that are long acting. Drugs that reverse the anaesthetic effect are preferable avoided and used as a last resort as they have been hypothesizes to increase PONV incidence postoperatively.[54] This finding was not corroborated in others studies on using Glycopyrrolate or Neostigmine for reversing any residual blockade of neuromuscular system.[57] Residual effects of Neuromuscular blockade can

be the source of great distress to the patients who may develop symptoms involving disturbances of vision, weakness of facial muscles or even generalized weakness along with difficulty in seating oneself without help.[58] Presence of these symptoms can occur irrespective of signs that indicate recovery from Neuromuscular blockade clinically and can result in prolonged duration for complete recovery. This proves that drugs for reversal should always be administered in adequate doses to avoid such unwanted and easily avoided side effects. It is not necessary to intubate patients who undergo General anaesthesia. Laryngeal mask airways have been used to circumvent this step. This has shown equal effectiveness to endotracheal tubes and does not cause gastric distension and also has shown decreased incidence of sore throat.[59,60,61] In any case, the combination of general anaesthesia and endotracheal intubation along with controlled ventilation has been found to be the most safe method and is the method of choice for procedures done on an inpatient basis and laparoscopic surgeries that take a longer duration of time. Patients who suffer from COPD or emphysema should be managed by increasing the rate of respiration instead of tidal volume without which there will be over-inflation of alveoli resulting in pneumothorax.[62,63] Care should be taken to avoid agents that can cause depression of cardiac functions in patients who already have a compromised cardiovascular system and drugs that have properties of vasodilation should be preferred in such cases, for example – Isoflurane. Use of drugs such as Nicardipine which also have vasodilating properties help in decreasing the haemodynamic side effects that pneumoperitoneum can cause and help in better management of patients with cardiac problems. Anticholinergic drugs such as Atropine should always be present to counter the risk of reflex response resulting in increasing vagal tone during the procedure.

B. Spinal anaesthesia in Laparoscopic surgery:

Spinal anaesthesia is the most straightforward and uncomplicated procedure among techniques for regional anaesthesia. This method has gained popularity in ambulatory services following the advent of pencil point needles that have a fine gauge. Though Spinal anaesthesia provides a number of advantages over General anaesthesia, the use of hyperbaric spinal anaesthetic methods in conventional doses is not considered optimal for laparoscopic procedures. It has been found that assuming the Trendelenburg position can result in a greater propensity for increased block of sympathetic system resulting in bradycardia and fall of blood pressure.[64] Use of decreased doses of anaesthetics in local anaesthesia and use of hypobaric substances decreases the side effects such as decrease in blood pressure, distension of bladder and prolonged duration of block of sensory and motor system to a minimum.[65] Small doses of spinal anaesthetic is preferred over general anaesthesia using Desflurane in ambulatory procedures such as gynaecologic laparoscopy. It has been found to have decreased incidence of pain postoperatively, decreased expenditure and also more rapid recovery.[66] Smaller doses of spinal anaesthesia have been found to have a shorter period of recovery when compared to anaesthesia performed using Propofol.61 Nitrous oxide has been administered via extraperitoneal insufflation along with Spinal anaesthesia for inguinal repair of hernia via laparoscopic extraperitoneal methods and this method of surgery has been found to be safe.[68] Surgeries that attempted to perform Laparoscopic cholecystectomy using spinal anaesthesia along with pneumoperitoneum filled with Nitrous oxide were successful.[69] Patients suffering from COPD of a severe nature and who have to undergo inguinal hernia repair by Laparoscopic intraperitoneal methods can do so using the option of spinal anaesthesia with the help of hyperbaric Bupivacaine instead of opting for General anaesthesia.[70] Spinal anaesthesia is showing a trend towards

gaining more popularity in surgery considering the introduction of procedures such as micro-laparoscopy and laparoscopy without having to create pneumoperitoneum.

VII. Evidence for Laparoscopic appendicectomy under General versus Spinal anaesthesia:

Till date, there have been few contributions that have been made by developing countries with respect to the innovations that have been made in this area. There is however, a slow but steady increase in the data being reported from these countries with emphasis on evidence based medicine.[71,72] There are a number of advantages that Regional anaesthesia has over General anaesthesia, some of them being decrease in stress reactions to surgery, avoiding airway intubation, availability of safe and competent post-operative analgesia along with faster ambulation with decreased risk of thrombosis of deep veins. Many studies have compared the use of General anaesthesia and Regional anaesthesia in laparoscopic procedures and the results show that Regional anaesthesia is a good option compared to general anaesthesia. Most of the problems reported with Regional anaesthesia are accelerated fall in blood pressure due to blockade of sympathetic system, respiratory changes, Complaints of shoulder pain postoperatively due to irritation of diaphragm and greater time required due to need to maintain pressure intra-abdominally.

Turkstani et al. conducted a study comparing General anaesthesia with use of spinal anaesthesia in a sample of fifty who underwent cholecystectomy by laparoscopic procedures and found that there was a significant reduction on comparing the pain scores and amount of consumption of analgesics postoperatively between those who had undergone spinal anaesthesia and General anaesthesia. There was no significant difference on comparing the total duration of stay in hospital, but the difference between total expenditure was significant with those who had opted for

spinal anaesthesia having to spend less on the whole. Postoperative complaint of shoulder pain was reported in almost half of the patients and a very small proportion did complain of hypotension, however these problems were swiftly and efficiently dealt with.[73]

Another study compared patients who underwent cholecystectomy by laparoscopic method under general versus spinal anaesthesia and found that spinal anaesthesia was comparatively a safer and more efficient technique with respect to expenditure. They also reported almost half of the sample to have complained of shoulder pain postoperatively and 41% to have developed decrease in blood pressure. These complaints were treated with medications and controlled.[74]

A study was conducted in Egypt by Ellakany. He assessed forty patients who received General anaesthesia versus Spinal anaesthesia in the thoracic segments. His study found that the analgesic conditions were superior postoperatively for spinal anaesthesia and patients also reported superior satisfaction. He found that around 40% patients had significant fall in blood pressure and around a quarter complained of discomfort in the abdomen, but that these were managed adequately. None of his patients who underwent surgery with spinal anaesthesia complained of nausea or vomiting postoperatively.[75]

A study in India assessed sixty patients and reported better analgesia post-operatively following the use of spinal anaesthesia when compared to the use of general anaesthesia. The difference between complications that developed intra-operatively, duration of recovery, duration of total stay in hospital and level of satisfaction experienced by patients were not found to be significant. None of the patients assessed complained of nausea or vomiting postoperatively following the use of spinal anaesthesia.[76]

A study was done by Mehta et al which assessed 60 patients who underwent laparoscopic cholecystectomy, 30 each in general anaesthesia group and Spinal anaesthesia group.[77] This study found that 30% of the patients who were assessed developed hypotension.Another study was carried out in Kathmandu by Gautam which assessed feasibility of Spinal anaesthesia in Laparoscopic cholecystectomy.[78] Neither of these studies found bradycardia in any of their patients.

A study done by Sinha et al described the feasibility of using Spinal anaesthesia in 4645 patients who underwent laparoscopic surgery, out of which 2992 underwent cholecystectomy. 18.21% of their patients developed hypotension with the use of Spinal anaesthesia.[79]Another study done by Hartmann et al tried to identify the various factors that result in hypotension following Spinal anaesthesia in data sets of 3315 patients over a span of 3 years and 7 months. 5.4% of patients developed hypotension following induction.[80]Palachawaet al[81] in Thailand found that 15.7% in their study developed hypotension as a complication following administration of spinal anaesthesia while 20.2% of the patients in the study by Throngumchai et al[82] developed hypotension.

Some of the literature highlights few of the advantages of spinal anaesthesia as that of being able to spontaneously maintain respiration during while controlled ventilation is required following administration of General anaesthesia.[83] Twenty four hours is generally required for patients' respiratory functions to come back to baseline levels after undergoing laparoscopic surgery with general anaesthesia.[84] The increase in levels of $PaCO_2$ was found to be greater following CO_2 pneumoperitoneum while under General anaesthesia in a study comprising of forty five patients conducted by Nishio et al .[85] Significant changes were observed in levels of artificial blood gas during surgery done with administration of epidural anaesthesia in a small study

conducted by Chiu et al.[86] Epidural anaesthesia during laparoscopy was found to not cause depression of respiratory functions in a study conducted by Ciofolo et al which assessed seven patients for effects on respiration by epidural anaesthesia while undergoing gamete intrafallopian transfer.[87] A study done by Van Zandart et al. reported 25% as the incidence rate of shoulder tip pain in patients who underwent laparoscopic cholecystectomy while under spinal anaesthesia.[88] However, another study by Tzovaras et al documented 43% of their patients as having developed shoulder pain while undergoing laparoscopic cholecystectomy.[89] Low doses of local anaesthetics along with opioid substances which act as adjuvants have been found to be useful in obtaining satisfactory conditions for gynaecological laparoscopic surgeries in a study done by Lennox et al which assessed twenty patients.[90]

Malins et al conducted a study and found that incidence rates of PONV can go upto 30% inspite of using relatively newer drugs for anaesthesia such as propofol or isoflurane.[91] Nathanson et al conducted a study which assessed sixty one patients out of which 3.3% patients developed spinal headache as a postoperative complication.[92]

The data available seems to indicate that Spinal anaesthesia is a safe and good alternative to General anaesthesia for use in laparoscopic procedures. There have been relatively few studies comparing the safety and feasibility of performing Appendicectomy with the two techniques namely, Spinal and General Anaesthesia hence this study is being done to examine the feasibility and safety of spinal anaesthesia for laparoscopic appendectomy.

MATERIALS AND METHODS

- **Study design**: Randomized Controlled trial

- **Study period** : One year study – from January 1st 2016 to December 31st 2016

- **Source of data**: Hospital survey.

All patients admitted at KLE'S Dr. PRABHAKAR KORE HOSPITAL AND MRC, Belagavi during Jan 2016 to Dec 2016 for appendicitis

- **Sample Size:**

Sample size is 30,a total sample size of 60 cases will be taken with 30 in group A and another 30 in group B.

By formula:

$$N = \frac{[2(Z_{\alpha/2}+Z_{\beta})^2 PQ]}{(P_1-P_2)^2}$$

Where $Z_\alpha = 1.96$

$Z_\beta = 0.89$

$Q = 100-P$

$P_1=0\%$

$P_2=24\%$

$$P = \frac{(P_1+P_2)}{2}$$

N = 30

❖ **Inclusion criteria:**

Patients who present with pain in the right iliac fossa, with muscle guarding, tenderness at McBurney's point, vomiting, fever, leucocytosis, and age more than 18 years, admitted and posted for laparoscopic appendectomy in KLE'S Dr. PRABHAKAR KORE HOSPITAL, Belagavi and those who give written and informed consent for participation in study.

❖ **Exclusion criteria:**

1. Patients with generalized peritonitis, appendicular abscess or perforation, and a palpable mass.
2. Immunocompromised individuals.
3. Subjects with pulmonary tuberculosis.
4. Subjects with Diabetes mellitus

❖ Investigations or interventions to be conducted on patients

- Complete Blood Count
- Mini Renal Function tests.
- Liver Function tests.
- Urine Routine and Microscopy.
- Chest X Ray.
- Electrocardiogram.
- USG Abdomen.

- **Methodology**- All patients admitted at KLES Dr.Prabhakar Kore hospital and MRC, Belagavi during Jan-2016 to Dec-2016 for appendicitis were included in this study.

Patients were randomly divided into 2 groups that is GROUP A (under spinal anaesthesia) and GROUP B(under general anaesthesia)

Once the patient was shifted inside the operating room, monitors to assess the vital parameters of the patient were attached and baseline values such as Heart Rate (HR), Blood pressure, ECG and peripheral oxygen saturation were recorded. Participants of both groups were loaded with 10ml/kg of Ringer lactate solution prior to surgery and were premedicated with Inj. Ondansetron 4mg; Inj. Midazolam 0.05 mg/kg, Pentazocine 0.5mg/kg.

Patients in the GA group underwent induction with Thiopentone sodium 5mg-1 kg and succinyl chlorine 2mg kg-1, and were intubated with appropriate size of cuffed endotracheal tube. HR & BP were observed and documented at 1minute, 3 minute and 5minutes post-intubation and at an interval of every15 min following this period. Carbon dioxide was insufflated to create pneumoperitoneum and maintained at a pressure of 14mmHg. After the surgery, anaesthesia reversal was done with the use of neostigmine (0.05m/kg) and glycopyrrolate in intravenous manner following which the extubation was done and the patient was shifted to recovery room.

Patients in the SA group were positioned in left lateral decubitus position. Lumbar puncture was conducted with strict aseptic precautions using 26 gauge disposable quincke type spinal needle at L3-4 inter space using a midline approach. Following free flow of CSF, 3ml of bupivacaine hydrochloride and 25 mcg of fentanyl were administered intrathecally and documentation of the time was done. Once the sensory blockade reached up to T6 level, surgery was started using CO_2

insufflation with pressure maintained at 14mm Hg. During the surgery, parameters such as Blood pressure, nausea, vomiting, oxygen desaturation (SpO2<90%) shoulder pain were monitored.

Hypotension was defined as decrease in SBP >20% and Bradycardia was defined as HR< 60/min. Intraoperative complaints of shoulder tip pain were documented and were administered Inj. Midazolam 1mg and Inj. Ketamine 25mg for the same.

In both the groups BP, heart rate, SPO_2 and ECG will be recorded at following point of time

- Prior to induction.
- At 1, 2, 5minutes after spinal/general anaesthesia.
- Immediately after pneumo peritoneum and
- Every 15min thereafter.

The intra operative conditions and muscle relaxations will be assessed by asking the surgeon to grade the range between "not good – good – excellent". The operating surgeon will be asked to grade the ease of operating under spinal anaesthesia and conversion to GA will be considered as failure.

All the patients will be monitored for evidence of complications in the post anaesthesia care unit. Patients will be questioned about nausea and vomiting, headache, sorethroat and transient neurological symptoms. Pain will be assessed using visual analogue scale (VAS) and graded at 1, 3, 6, 12hours. Intensity of pain will be assessed by using 10 point VAS representing various intensity of pain from '0' (no pain) to 10(worst possible pain).

- **Methods of statistical analysis**: Student t test and Chi square test

RESULT

63 patients were divided into Group A (30 patients) and Group B(33 patients). The mean age of the participants in Group A was 31.40 ± 10.04 and the mean age of participants in Group B was 29.64 ± 10.38. The difference in the mean age of the two groups was not significant. (Table 1)

Table-1: Age Distribution

Variable	Group A(n=30)	Group B(n=33)	P-value	significance
Age(yrs)	31.40±10.04	29.64±10.38	0.49	N.S.

Majority of the participants in both the groups were females, 53.33% in Group A and 57.78% in Group B. (Table 2)

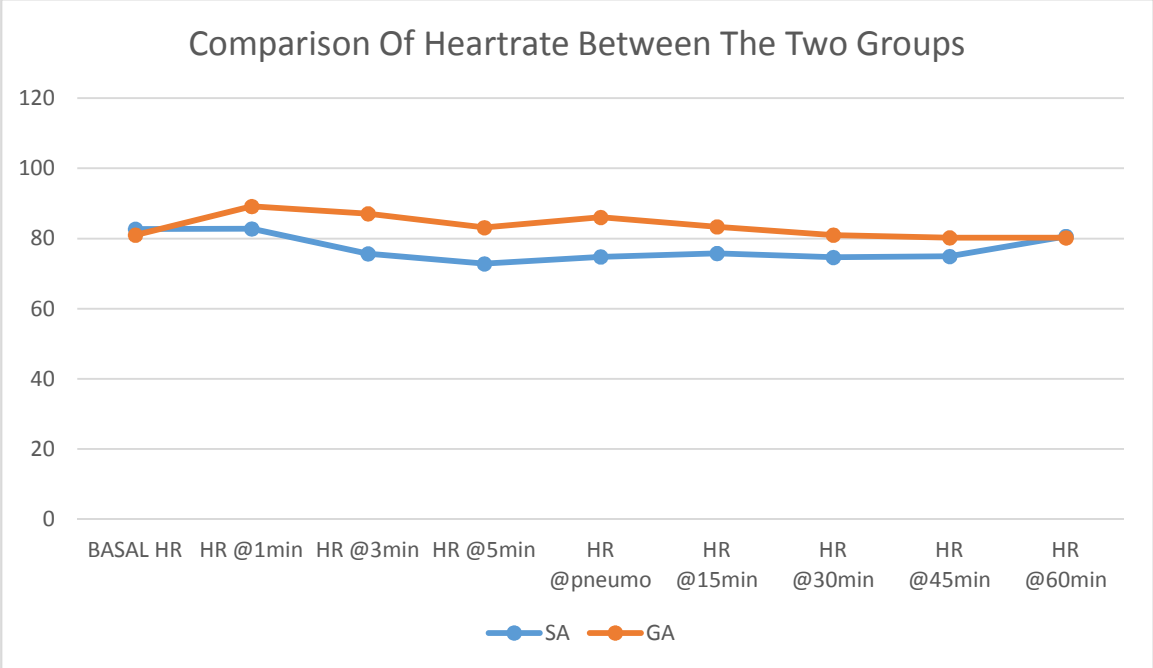
Table-2: Sex Distribution

SEX	GROUP A(n=30)	GROUP B(n=33)
Male	14(46.67%)	14(42.42%)
Female	16(53.33%)	19(57.58%)
Total	30(100%)	33(100%)

The difference between the mean heart rates of the two groups at 3 mins, 5 mins, pneumo, 15 mins, 30 mins, 45 mins were significant.(Table 3)

Table- 3: Comparison of Mean heart rate at different time intervals presented as mean ±SD

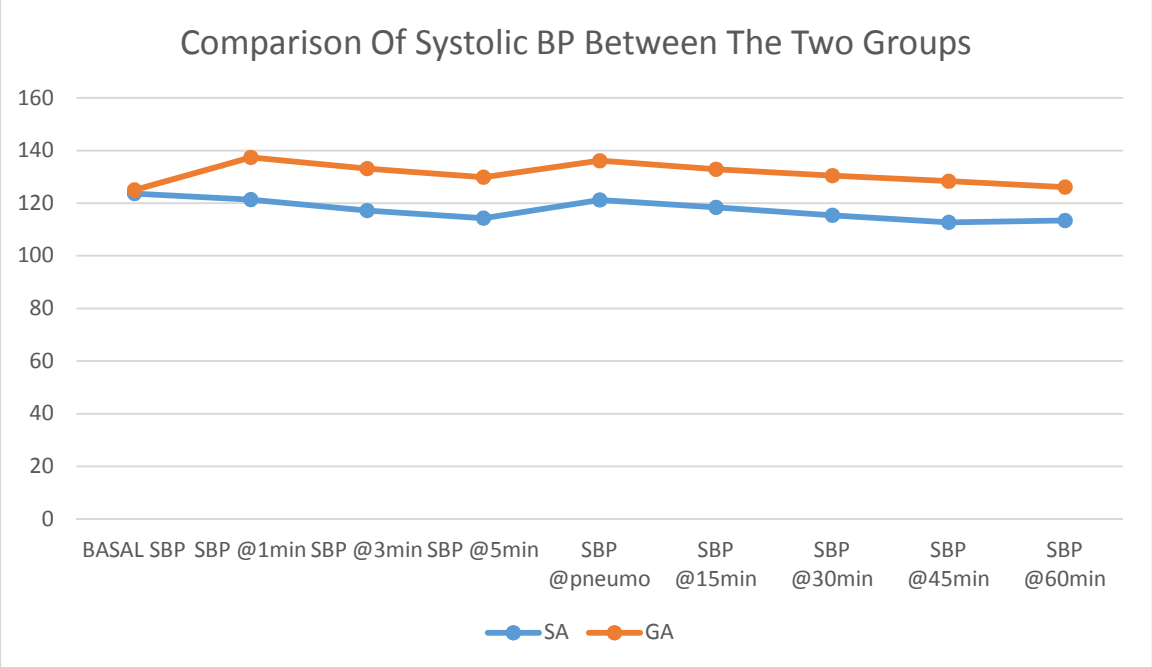
Heart rate	Group A (n=30)	Group B (n=33)	p-value	significance
Basal HR	82.70±15.26	81.00±14.89	0.66	N.S.
HR @1min	82.77±15.54	89.16±13.49	0.08	N.S.
HR @3min	75.67±11.30	87.09±10.13	<0.0001	S
HR @5min	72.80±9.34	83.12±7.39	<0.0001	S
HR @pneumo	74.80±9.63	86.03±7.11	<0.0001	S
HR @15min	75.77±8.32	83.36±7.27	0.0003	S
HR @30min	74.63±7.60	81.00±6.64	0.0007	S
HR @45min	74.90±6.76	80.24±6.80	0.0027	S
HR @60min	80.63±11.99	80.21±7.39	0.87	N.S



The difference in systolic blood pressure between the two groups was significant at 1 min, 3 mins, 5 mins, pneumo, 15 mins, 30 mins, 45 mins and 60 mins. (Table 4)

Table- 4: Comparison of systolic blood pressure presented as Mean ±SD

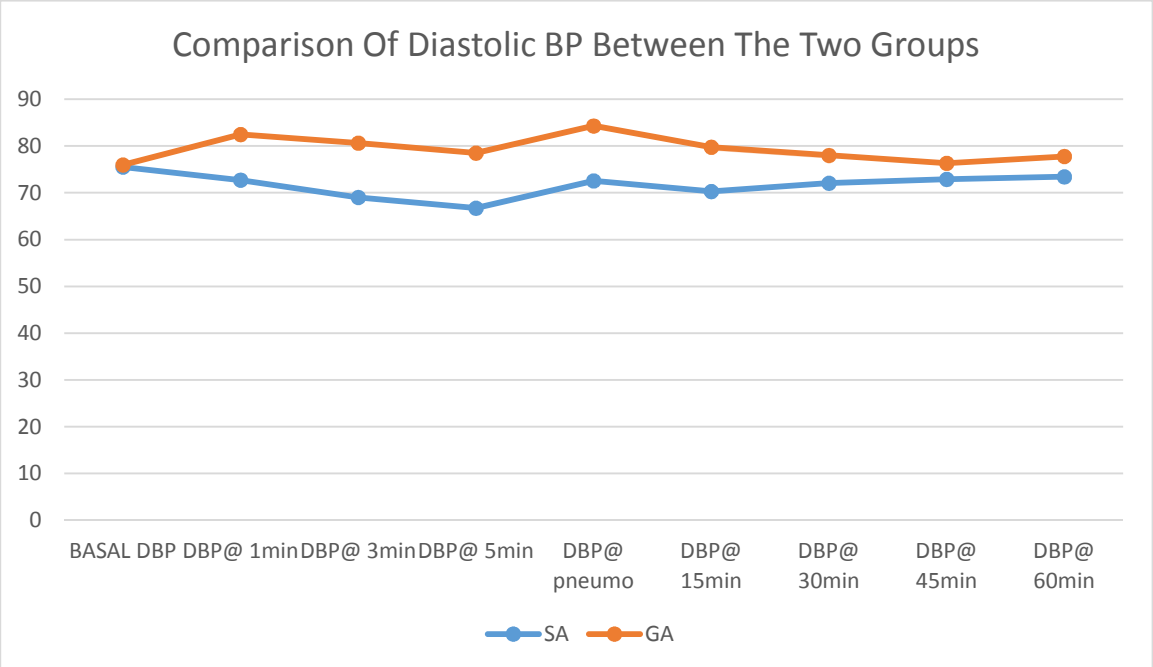
Sys BP	Group A	Group B	p-value	significance
Basal Sys BP	123.70±10.59	125.03±16.02	0.70	N.S
Sys BP@1min	121.37±9.89	137.39±12.08	<0.0001	S
Sys BP @3min	117.20±8.39	133.15±10.48	<0.0001	S
Sys BP @5min	114.33±7.20	129.88±8.63	<0.0001	S
Sys BP @pneumo	121.23±7.39	136.12±8.31	<0.0001	S
Sys BP @15min	118.40±7.29	132.88±8.29	<0.0001	S
Sys BP @30min	115.40±6.50	130.45±7.75	<0.0001	S
Sys BP @45min	112.73±5.35	128.33±7.54	<0.0001	S
Sys BP @60min	113.40±5.47	126.12±5.58	<0.0001	S



The difference between the diastolic blood pressure between the two groups was found to be significant at 1 min, 3mins, 5 mins, pneumo, 15 mins, 30 mins, 45 mins and 60 mins. (Table 5)

Table- 5: Comparison of diastolic blood pressure as Mean ±SD

Dia BP	Group A	Group B	p-value	significance
Basal Dia BP	75.53±7.66	75.97±9.20	0.84	N.S.
Dia BP @1min	72.73±6.93	72.48±7.12	<0.0001	S
Dia BP @3min	69.03±5.88	80.64±6.49	<0.0001	S
Dia BP @5min	66.73±5.04	78.51±7.15	<0.0001	S
Dia BP @pneumo	72.57±4.38	84.30±7.10	<0.0001	S
Dia BP @15min	70.30±4.27	79.76±6.42	<0.0001	S
Dia BP @30min	72.07±4.39	78.00±7.40	0.0003	S
Dia BP @45min	72.90±4.40	76.33±7.85	0.039	S
Dia BP @60min	73.43±4.61	77.79±7.39	0.0073	S



In this study none of the patients under spinal anaesthesia developed abdominal pain or abdominal discomfort intra-operatively. But 26.67% patients in Group A complained of shoulder pain intra-operatively. There was no incidence of shoulder pain in patients of Group B. The relationship between intra-operative shoulder pain and type of administration of anaesthesia was significant. (Table 6)

Table-6: Incidence of intra operative shoulder pain

			Group		Total
			Group A	Group B	
Pain	Yes	Count	8	0	8
		%	26.67%	0%	13.33%
	No	Count	22	33	55
		%	73.33%	100%	86.66%
Total count			30	33	63
p-value=0.0052					

Majority of the patients who complained of nausea and vomiting post-operatively belonged to Group B (21.21%) while only 6.67% patients in Group A developed PONV. There was no significant relationship between incidence of PONV and type of anaesthesia used. (Table 7)

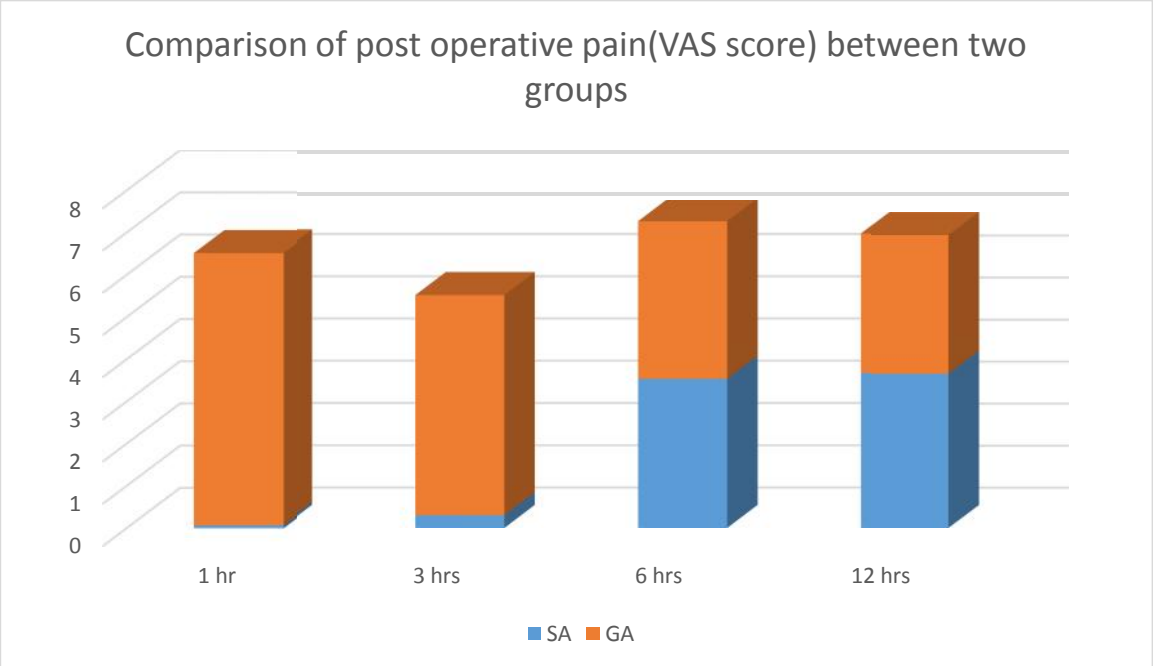
Table-7: Incidence of post operative nausea & vomiting

			Group		Total
			Group A	Group B	
Post op nausea & vomiting	yes	Count	2	7	9
		%	6.67%	21.21%	13.94%
	No	Count	28	26	54
		%	93.33%	78.79%	86.06%
Total count			30	33	63
p-value=0.198					

The difference between mean VAS scores of both the groups was significant at 1 hour and 3 hours following surgery. There was similarity observed between mean VAS scores 6 hours following surgery. (Table 8)

Table-8: Post operative pain scores (VAS Score) in both Groups, mean VAS score

Time interval	A Mean± SD	B Mean± SD	p-value	significant
1 hrs	0.07±0.25	6.45±1.73	<0.0001	S
3 hrs	0.30±0.59	5.21±1.27	<0.0001	S
6 hrs	3.53±0.86	3.73±0.84	0.35	N.S.
12 hrs	3.67±1.27	3.30±0.85	0.183	N.S.



The incidence of bradycardia and hypotension was found to be more in Group A while the incidence of sore throat and headache was more in group B. (Table 9)

Table-9: Other Complications

	Group A(n=30)	Group B(n=33)
HR <60	3(10%)	0(0%)
Hypotension	2(6.67%)	0(0%)
Sore throat	0(0%)	4(12.12%)
Head ache	1(3.33%)	2(6.06%)

The operating surgeon was asked to grade the ease of operating under spinal anaesthesia, based on intra operative conditions and muscle relaxations and there was no significant changes between the two groups as most of them were graded as good by the operating surgeons.(Table-10)

Table-10: Surgical conditions as graded by the operating surgeon.

	GROUP A(N= 30)	GROUP B(N= 33)	TOTAL
NOT GOOD	0	0	0
GOOD	18	18	36
EXCELLENT	12	15	27
TOTAL	30	33	63
P VALUE- 0.85			

DISCUSSION

General anaesthesia continues to be the most widely accepted mode of administering anaesthesia due to analgesic effects, loss of consciousness and as it provides relaxation along with improved control of airway. However there are disadvantages such as decrease in lung capacities, increase in airway pressure, increase in CO_2 levels, increase in complaints of PONV, basal atelectasis etc. that go hand in hand with general anaesthesia. This clearly points towards the need for an alternative method of anaesthesia. This study compared the use of General anaesthesia in Laparoscopic appendicectomy with that of Spinal anaesthesia.

In our study none of the patients under spinal anaesthesia developed intra-operative abdominal pain or abdominal discomfort. 8 of our patients(26.67%) who underwent surgery under spinal anaesthesia complained of pain in the shoulder on right side. This was controlled by giving Propofol intravenously. Sedatives, intrathecal administration of clonidine or interscalene block can also be used for managing pain at shoulder tip. Our study findings show close correspondence with the incidence rates of shoulder tip pain in a study done by Van Zandart et al. They reported 25% as the incidence rate in patients who underwent laparoscopic cholecystectomy while under spinal anaesthesia.[87] However, another study by Tzovaras et al documented 43% of their patients as having developed shoulder pain while undergoing laparoscopic cholecystectomy.[88]

Our study found that patients who underwent laparoscopic surgery with general anaesthesia recorded tachycardia and greater values of mean HR. Bradycardia was observed to occur in 3 patients (10%) who underwent Spinal anaesthesia while none of the patients who underwent General anesthesia developed Bradycardia. These patients were administered Inj. Glycopyrrolate for correction of bradycardia.

Previously a study was done by Mehta et al which assessed 60 patients who underwent laparoscopic cholecystectomy, 30 each in general anaesthesia group and Spinal anaesthesia group.[76] Another study was carried out in Kathmandu which assessed feasibility of Spinal anaesthesia in Laparoscopic cholecystectomy.[77] Both these studies did not record any patients as having developed bradycardia.

Hypotension was recorded in 2 patients(6.66%) who underwent surgery with Spinal anaesthesia. Patients were administered i.v. fluids and inotropes for the same. A study done by Sinha et al described the feasibility of using Spinal anaesthesia in 4645 patients who underwent laparoscopic surgery, out of which 2992 underwent cholecystectomy. They found that 18.21% of their patients developed hypotension with the use of Spinal anaesthesia.[78] The study done by Mehta et al found that 30% of their patients recorded hypotension.[76] A study done by Hartmann et al attempted to identify the various factors that result in hypotension following Spinal anaesthesia in data sets of 3315 patients over a span of 3 years and 7 months. They found that 5.4% of patients had developed hypotension following induction.[79]

Palachawa et al[80] in Thailand found that 15.7% in their study developed hypotension as a complication following administration of spinal anaesthesia while Thrognumchai et al[81] reported 20.2% of the patients in their study as having developed hypotension. Our study showed around two to four times lower rates of incidence of hypotension as compared to the aforementioned studies. The rates of incidence on administering spinal anaesthesia have not been observed to change depending on whether the surgery is laparoscopic or open type.

The mean values of systolic pressure and diastolic pressure have been found to be higher in patients who were administered General Anaesthesia as compared to

those who received Spinal anaesthesia as a result of decreased occurrence of bleeding during surgery.

In our study, there was no change in the respiratory functions following administration of either general or spinal anaesthesia during surgery. There is controversy regarding the respiratory functions of patients following laparoscopic surgery. Some of the literature highlights the advantage of being able to spontaneously maintain respiration during surgery while under spinal anaesthesia as compared to controlled ventilation which is required following administration of General anaesthesia.[82] Twenty four hours are generally required for patients' respiratory functions to come back to baseline levels after undergoing laparoscopic surgery with general anaesthesia.[83] The increase in levels of $PaCO_2$ was found to be greater following CO_2 pneumoperitoneum while under General anaesthesia in a study comprising of forty five patients conducted by Nishio et al .[84] Significant changes were observed in levels of artificial blood gas during surgery done with administration of epidural anaesthesia in a small study conducted by Chiu et al.[85] Epidural anaesthesia during laparoscopy was found to not cause depression of respiratory functions in a study conducted by Ciofolo et al which assessed seven patients for effects on respiration by epidural anaesthesia while undergoing gamete intrafallopian transfer.[86]

In our study, it was observed that patients who underwent laparoscopic surgery under general anaesthesia recorded higher levels of pain as compared to those under spinal anaesthesia for twelve hours following surgery. However, the difference between the VAS scores for pain between the two groups was significant only at one hour and three hours following surgery. At six hours, nine hours and twelve hours this difference was not found to be significant on statistical analysis. Literature supports

this finding as restlessness has been observed to be more common postoperatively after administration of General anaesthesia. One of the advantages of Spinal anaesthesia is lesser need for analgesia postoperatively. Analgesia has been found to be required more on administering General anaesthesia than Spinal anaesthesia in early part of postoperative period. These patients were administered Inj Tramadol 100 mg i.v. in 100 ml Normal Saline for relief of pain. Low doses of local anaesthetics along with opioid substances which act as adjuvants have been found to be useful in obtaining satisfactory conditions for gynaecological laparoscopic surgeries in a study done by Lennox et al which assessed twenty patients.[89]

6.67% of patients who underwent surgery under Spinal anaesthesia complained of PONV as compared to 21.21% of patients who underwent General anaesthesia. Surgical conditions were classified as being not good, good or excellent during surgery and there was no significant difference observed between the two groups with respect to this aspect. Malins et al conducted a study and found that incidence rates of PONV can go upto 30% inspite of using relatively newer drugs for anaesthesia such as propofol or isoflurane.[90]

During the study, one patient who underwent surgery under spinal anaesthesia (3.33%) complained of headache following puncture of dural matter. Nathanson et al conducted a study which assessed sixty one patients out of which 3.3% patients developed spinal headache as a postoperative complication.[91] Our study has been able to replicate this finding. Incidence of sore throat was found to be higher in patients who underwent surgery under General anaesthesia (12.12%) as compared to those who underwent surgery under Spinal anaesthesia. This can contribute to longer stay in the hospital which will lead to increased expenses.

The skill of the surgeon and the experience of the anaesthesistis crucial for the success of any laparoscopic surgery. The findings of our study help to conclude that laparoscopic surgery under spinal anaesthesia is a viable and safe alternative as compared to general anesthesia. The recovery rates and satisfaction reported by patients is also better. Spinal anaesthesia help to provide good conditions for surgery with better haemodynamic stabilization. It also has the advantages of having lesser incidence of post operative complications or complaints related to pain. Patient profile should always be considered and thus, it can even be considered in cases in which General anaesthesia is considered a poor choice for the patient.

CONCLUSION

Spinal Anaesthesia can be used safely and is a good alternative to General anaesthesia while conducting Laparoscopic appendicectomy. It is a feasible option with patients showing good recovery with high levels of satisfaction. Moreover, it also gives improved control over haemodynamic circulation. It offers good conditions for surgery and decreased incidence of pain post-operatively. It is a better option in conditions where General anaesthesia cannot be given in certain patients who have to undergo Laparoscopic appendicectomy. However more studies are required to further establish the feasibility of performing laparoscopic appendectomy under spinal anaesthesia

SUMMARY

This study has been conducted in the tertiary care center, KLES Dr. Prabhakar Kore Hospital and research center, Belagavi. Thirty patients were included in the group that underwent laparoscopic appendicectomy under Spinal anaesthesia while thirty three patients were included in the group that underwent Laparoscopic appendicectomy under General anaesthesia.

10% of the patients who underwent Spinal anaesthesia developed bradycardia while 6.66% developed hypotension. The difference between the heart rates of the two groups was found to be significant from 3 minutes prior to surgery to 45 minutes after surgery. The mean values of Systolic and diastolic pressure was found to be significantly higher in patients who were administered General anaesthesia as compared to those who received Spinal anaesthesia. There was no change in the respiratory functions observed following administration of either Spinal or General anaesthesia. 26.67% of the patients who underwent surgery under Spinal anaesthesia complained of pain in the shoulder on the right side. In our study, it was observed that patients who underwent laparoscopic surgery under general anaesthesia recorded higher levels of pain as compared to those under spinal anaesthesia for twelve hours following surgery. However, the difference between the VAS scores for pain between the two groups was significant only at one and three hours following surgery. At six, nine and twelve hours, this difference was not found to be significant. Only 6.67% of patients who underwent surgery under Spinal anaesthesia complained of PONV while 21.21% of the patients who underwent surgery under General anaesthesia complained of PONV. 3.33% of the patients developed post operative headache after having underwent surgery under Spinal anaesthesia while 12.12% of patients who underwent surgery under general anaesthesia developed sore throat.

Thus, our study suggests that Laparoscopic surgery under Spinal anaesthesia is a viable and safe alternative as compared to General anaesthesia. The recovery rates and the satisfaction reported by patients is also better. Spinal anaesthesia also helps in maintaining better haemodynamic stabilization. It has the advantages of lesser incidence of post-operative complications related to pain. In patients for whom General anaesthesia is a poor choice, Spinal anaesthesia can be considered as a safe alternative. However more studies are required to further establish the feasibility of performing laparoscopic appendectomy under spinal anaesthesia

BIBLIOGRAPHY

1. O'Connell PR. The Vermiform Appendix. In: R.C.G. Russell, N.S. Williams and C.J.K. Bulstrode,editors. Bailey and Love's Short Practice of Surgery, 23rd edition. London. Arnold, A member of the Hodder Headline Group;2000
2. Gurudatta KN, Mohammed A. A clinical study of comparison between Spinal anesthesia and General anesthesia for lower abdominal laparoscopic surgeries.Sch.J.App.Med.Sci. 2014;2:1127-33..
3. S Rajeev, Gurwara AK, GuptaSC. Laparoscopic appendectomy using spinal anaesthesia. JSLS 2008;12:133–138.
4. SK Manish, K Alok, NSubrata. Laparoscopic appendectomy under spinal anaesthesia. E-ISSN: 2279-0853, P-ISSN: 2279-0861. VOLUME 11, ISSUE 2 (NOV.- DEC. 2013), PP 33-35
5. Patel D, Patel HV. Laparoscopic appendicectomy surgery using Spinal Anesthesia. IAIM 2015;2:103-7.
6. Herrington JL Jr. The vermiform appendix: its surgical history. *Contemp Surg*. 1991;39:36-43.
7. Fitz RH. Perforating inflammation of the vermiform appendix with special reference to its early diagnosis and treatment. *Trans Assoc Am Phys.* 1886;1:107-44.
8. McBurney C. The incision made in the abdominal wall in cases of appendicitis with a description of a new method of operating. *Ann Surg.* 1894;20:38.
9. McBurney C. Experience with early operative interference in cases of disease of the vermiform appendix. *NY State Med J.* 1889;50:676-687.
10. Semm K. Endoscopic appendectomy. *Endoscopy*. 1983;15:59-64.

11. Litynski GS. *Highlights in the History of Laparoscopy.* Frankfurt: Barbara BernertVerlag; 1996:136.
12. Larson GM, Cheadle WG, Polk HC Jr. Appendectomy for acute appendicitis. In Ballantyne GH, Leahy PF and Modlin IM, eds. *Laparoscopic Surgery*. Philadelphia: WB Saunders and Company; 1994:220.
13. Kavic MS. Laparoscopic appendectomy. In Grochmal S, ed. *Minimal Access Gynecology*. Oxford: Radcliffe Medical Press; 1995:149-162.
14. Kavic MS, Semm K. Laparoscopic appendectomy. In Kavic MS, Levinson CJ, Wetter PA, eds. *Prevention and Management of Laparoendoscopic Complications*. Miami: Society of Laparoendoscopic Surgeons; 1999:35.
15. Roberts KE. True single port appendectomy: first experience with the "puppeteer technique." *SurgEndosc*. 2008;23:1825-1830.
16. Horgan S, Cullen JP, Talamini MA, et al. Natural orifice surgery: initial clinical experience. *SurgEndosc*. 2009;23:1512-1518.
17. Wakeley CPG. Position of the vermiform appendix as ascertained by the analysis of 10,000 cases. *J Anatomy.* 1933;67:277.
18. Kyriazis AA, Esterly JR. Development of lymphoid tissues in the human embryo and early fetus. Arch Pathol. 1970;90:348.
19. Archer OK, Sutherland DE, Good RA. Appendix of the rabbit: a homologue of the bursa in the chicken? Nature. 1963;200:337-339.
20. Fisher AC. Acute appendicitis. In Cameron, JL, ed. *Current Surgical Therapy*. St. Louis, MO: Mosby; 2001;267-272.
21. Schumpelick V, Dreuw B, Ophoff K, Prescher A. Appendix and cecum: embryology, anatomy, and surgical applications. *SurgClin N Am*. 2000;80:295-318.

22. Lally KP, Cox CS, Andrassy RJ. Appendix. In: Townsend CM, ed. *Sabiston Textbook of Surgery.* 16th ed.Philadelphia: WB Saunders Co.; 2001:917-28.
23. Schumpelick V, Dreuw B, Ophoff K, Prescher A. Appendix and cecum: embryology, anatomy, and surgical applications. *SurgClin N Am*. 2000;80:295-318.
24. Silen W. *Cope's Early Diagnosis of the Acute Abdomen*. 18th ed. New York: Oxford University Press; 1991:67-84.
25. Birnbaum BA, Balthazar EJ. Computed tomography of appendicitis and diverticulitis. *RadiolClin North Am.* 1994;32:885-98.
26. Rossi P, Covarelii P, Mosci F, Bisacci R, Sensi B, Moggi L. Ultrasonography in management of acute appendicitis. *SurgEndosc.* 1996;149:619-21.
27. Detmer DE, Nevers LE, Sikes ED Jr. Regional results of acute appendicitis care. JAMA. 1981;246:1318-1320.
28. Flum DR, Morris A, Koepsell T, Dellinger EP. Has misdiagnosis of appendicitis decreased over time? JAMA. 2001;286:1784-1753.
29. Andreu-Ballester JC, Gonzalez-Sanchez A, Ballester F, et al. Epidemiology of appendectomy and appendicitis in the Valencian community (Spain), 1998-2007. *Dig Surg.* 2009;26:406-412.
30. Hall MJ, Owings MF. 2000 National Hospital Discharge Survey. Advance data from vital and health statistics; no 329. Hyattsville, Maryland: National Center for Health Statistics. 2002.
31. Addis DG, Shaffer N, Fowler B, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol. 1990;132:910-925.
32. Laparoscopic appendicectomy. In: Ellison EC, Zollinger RM, editors. Zollinger's atlas of Surgical Operations. 10th edition. McGraw Hill Education.2016;166-70.

33. Gonzalez R, Smith CD, McClusky III DA, et al. Laparoscopic approach reduces likelihood of perioperative complications in patients undergoing adrenalectomy. Am Surg 2004;70:668 - 74.
34. Mattioli G, Repetto P, Carlini C, et al. Laparoscopic vs open approach for the treatment of gastroesophageal reflux in children. SurgEndosc 2002;16:750 - 2.
35. Javerliat I, Coggia M, Bourriez A, Di Centa I, Cerceau P, Goeau-Brissonniere OA. Total laparoscopic aortomesenteric bypass. Vascular 2004;12:126- 9.
36. Spaliviero M, Novick AC, Gill IS. Laparoscopic nephrectomy for large renal arteriovenous malformation. Urology 2004;63:1176- 7.
37. Hemal AK, Singh I. Hand assisted laparoscopic radical cystectomy for cancer bladder. IntUrolNephrol 2004;36:191 - 5.
38. Buell JF, Thomas MJ, Doty TC, et al. An initial experience and evolution of laparoscopic hepatic resectional surgery. Surgery 2004;136:804 - 11.
39. Descottes B, Glineur D, Lachachi F, et al. Laparoscopic liver resection of benign liver tumors. SurgEndosc 2003;17:23 - 30.
40. Shimizu S, Tanaka M, Konomi H, Tamura T, Mizumoto K, Yamaguchi K. Spleen-preserving laparoscopic distal pancreatectomy after division of the splenic vessels. J LaparoendoscAdvSurg Tech A 2004;14:173 - 7.
41. Joshi GP. Complications of laparoscopy. AnesthesiolClin North America 2001;19:89 - 105.
42. Eriksson H, Korttila K. Recovery profile after desflurane with or without ondansetron compared with propofol in patients undergoing outpatient gynecological laparoscopy. AnesthAnalg 1996;82:533-8.

43. Raeder JC, Mjaland O, Aasbo V, Grogaard B, Buanes T. Desflurane versus propofol maintenance for outpatient laparoscopic cholecystectomy. ActaAnaesthesiolScand 1998;42:106- 10.
44. Wilmore DW, Kehlet H. Management of patients in fast track surgery. BMJ 2001;322:473 - 6.
45. Grewal H, Sweat J, Vazquez WD. Laparoscopic appendectomy in children can be done as a fast-track or same-day surgery. JSLS 2004;8:151 - 4.
46. Duarte JB, Kux P, Castro CH, Cruvinel MG, Costa JR. Fast track endoscopic thoracic sympathicotomy. ClinAuton Res 2003;13:I63 - 5.
47. Recart A, Gasanova I, White PF, et al. The effect of cerebral monitoring on recovery after general anesthesia: a comparison of the auditory evoked potential and Bispectral Index devices with standard clinical practice. AnesthAnalg 2003;97(6):1667- 74.
48. Song D, Joshi GP, White PF. Fast-track eligibility after ambulatory anesthesia: a comparison of desflurane, sevoflurane, and propofol. AnesthAnalg 1998;86(2):267-73.
49. Philip BK, Scuderi PE, Chung F, et al. Remifentanil compared with alfentanil for ambulatory surgery using total intravenous anesthesia. AnesthAnalg 1997;84:515-21.
50. Song D, White PF. Remifentanil as an adjuvant during desfluraneanesthesia facilitates early recovery after ambulatory surgery. J ClinAnesth 1999;11:364 - 7.
51. Yang H, Choi PT, McChesney J, Buckley N. Induction with sevoflurane-remifentanil is comparable to propofol-fentanyl-rocuronium in PONV after laparoscopic surgery. Can J Anaesth 2004;51:660- 7.

52. Power I, Barratt S. Analgesic agents for the postoperative period. Nonopioids. SurgClin North Am 1999;79:275- 95.
53. Tramer M, Moore A, McQuay H. Omitting nitrous oxide in general anaesthesia: meta-analysis of intraoperative awareness and postoperative emesis in randomized controlled trials. Br J Anaesth 1996;76:186- 93.
54. Diemunsch PA, Torp KD, Van Dorsselaer T, et al. Nitrous oxide fraction in the carbon dioxide pneumoperitoneum during laparoscopy under general inhaled anesthesia in pigs. AnesthAnalg 2000;90:951- 3.
55. Ding Y, Fredman B, White PF. Use of mivacurium during laparoscopic surgery: effect of reversal drugs on postoperative recovery. AnesthAnalg 1994;78:450 - 4.
56. Smith I, Ding Y, White PF. Muscle pain after outpatient laparoscopy influence of propofol versus thiopental and enflurane. AnesthAnalg 1993;76:1181- 4.
57. Hovorka J, Korttila K, Nelskyla K, et al. Reversal of neuromuscular blockade with neostigmine has no effect on the incidence or severity of postoperative nausea and vomiting. AnesthAnalg 1997;85:1359- 61.
58. Kopman AF, Yee PS, Neuman GG. Relationship of the train-of-four fade ratio to clinical signs and symptoms of residual paralysis in awake volunteers. Anesthesiology 1997;86:765 - 71.
59. Maltby JR, Beriault MT, Watson NC, Liepert D, Fick GH. The LMA-ProSeal is an effective alternative to tracheal intubation for laparoscopic cholecystectomy. Can J Anaesth 2002;49:857- 62.
60. Maltby JR, Beriault MT, Watson NC, Liepert DJ, Fick GH. LMAClassic and LMA-ProSeal are effective alternatives to endotracheal intubation for gynecologic laparoscopy. Can J Anaesth 2003;50:71- 7.

61. Verghese C, Brimacombe JR. Survey of laryngeal mask airway usage in 11,910 patients: safety and efficacy for conventional and nonconventional usage. AnesthAnalg 1996;82:129 - 33.
62. Salihoglu Z, Demiroluk S, Dikmen Y. Respiratory mechanics in morbid obese patients with chronic obstructive pulmonary disease and hypertension during pneumoperitoneum. Eur J Anaesthesiol 2003;20:658- 61.
63. Hsieh CH. Laparoscopic cholecystectomy for patients with chronic obstructive pulmonary disease. J LaparoendoscAdvSurg Tech A 2003;13:5 - 9.
64. Vaghadia H. Spinal anesthesia for outpatients: controversies and new techniques. Can J Anesth 1998;45:R64-75.
65. Vaghadia H, McLeod DH, Mitchell GW, Merrick PM, Chilvers CR. Small-dose hypobaric lidocaine-fentanyl spinal anesthesia for short duration outpatient laparoscopy. I. A randomized comparison with conventional dose hyperbaric lidocaine. AnesthAnalg 1997;84:59- 64.
66. Lennox PH, Vaghadia H, Henderson C, Martin L, Mitchell GW. Small-dose selective spinal anesthesia for short-duration outpatient laparoscopy: recovery characteristics compared with desfluraneanesthesia. AnesthAnalg 2002;94(2):346-50.
67. Stewart AV, Vaghadi H, Collins L, Mitchell GW. Small-dose selective spinal anaesthesia for short-duration outpatient gynaecological laparoscopy: recovery characteristics compared with propofol anaesthesia. Br J Anaesth 2001;86:570 - 2.
68. Spivak H, Nudelman I, Fuco V, et al. Laparoscopic extraperitoneal inguinal hernia repair with spinal anesthesia and nitrous oxide insufflation. SurgEndosc 1999;13:1026 -9.

69. Hamad MA, El-Khattary OA. Laparoscopic cholecystectomy under spinal anesthesia with nitrous oxide pneumoperitoneum: a feasibility study. SurgEndosc 2003;17:1426- 8.
70. Schmidt J, Carbajo MA, Lampert R, Zirngibl H. Laparoscopic intraperitoneal onlay polytetrafluoroethylene mesh repair (IPOM) for inguinal hernia during spinal anesthesia in patients with severe medical conditions. SurgLaparoscEndoscPercutan Tech 2001;11:34 – 7
71. Singh Bajwa SJ. Anesthesiology research and practice in developing nations: Economic and evidence-based patient-centered approach. J AnaesthesiolClin Pharmacol. 2013;29:295–6.
72. Bajwa SJ, Kalra S. Logical empiricism in anesthesia: A step forward in modern day clinical practice. J AnaesthesiolClin Pharmacol. 2013;29:160–1.
73. Turkstani A, Ibraheim O, Khairy G, Alseif A, Khalil N. Spinal versus general anesthesia for laparoscopic cholecystectomy: A cost effectiveness and side effects study. APICARE. 2009;13:9–14
74. Imbelloni LE, Fornasari M, Fialho JC, Sant'Anna R, Cordeiro JA. General anesthesia versus spinal anesthesia for laparoscopic cholecystectomy. Rev Bras Anestesiol. 2010;60:217–27.
75. Ellakany M. Comparative study between general and thoracic spinal anesthesia for laparoscopic cholecystectomy. Egyptian J Anaesth. 2013;29:375–81.
76. Mehta PJ, Chavda HR, Wadhwana AP, Porecha MM. Comparative analysis of spinal versus general anesthesia for laparoscopic cholecystectomy: A controlled, prospective, randomized trial. Anesth Essays Res. 2010;4:91–5.
77. Gautam B; Spinal anaesthesia for laparoscopic cholecystectomy; A feasibility and safety study. Kathmandu University Medical Journal. 2009;7:360-8.

78. Sinha R, Gurwara AK, Guptha SC; Laparoscopic surgery using spinal Anesthesia. J of society of Laparoendoscopic Surgeons.2008;12:133-8.

79. Hartmann B, Junger A, Klasen J. The incidence and risk factors for hypotension after spinal anesthesia induction; an analysis with automated data collection. AnesthAnalg., 2002; 94;152;159

80. Palachawa K, Chau-in W, Naewthong P Uppan K, Kamhon R; Complications of spinal anesthesia at Stinagarind Hospital. Thai J Anesth., 2001; 27: 7-12.

81. Throngnumchai R, Sanghirun D, Traluzxamee K, Kamhom R; Complication of spinal anesthesia at Lerdsin Hospital, Thai J Anesth., 1999; 25; 24-27.

82. Pursanani KG, Bazzay, Calleja M, Mughal MM. Laparoscopic cholecystectomy under epidural anesthesia in patients with chronic respiratory disease. Surg Endosc.,1998; 12:1082-4.

83. Putensen-Himmer G, Putensen CH, Lammer H, HaisjackI M; Comparison of post operative lung function in patient undergoing laparotomy or Laparoscopy for cholecystectomy. Am Rev Resp Dis., 1992; 145: A-156.

84. Nishio I, Naguchi J, Konishi M, Ochiai R Takeda J, Fukumshima K. The effect of anesthetic techniques and insufflatory gases on ventilation during laparoscopy (in Japanes). Masui,1993;42:862-6.

85. Chiu AW, Huang WJ, Chen KK, Chang LS; Laparoscopic ligation of bilateral spermatic varices under epidural anesthesia. Urol Int., 1996; 57:80-4.

86. Ciofolo MJ, Clergue F, Seebacher J, Lefebvre G, Viars P; Ventilatory effects of laparoscopy under epidural anesthesia. AnaesAnalg., 1990; 70(4): 357-361.

87. Van Zundart AAJ, Stultiends G, Jakimowiez JJ, Peak DL; Laparoscopic cholecystectomy under segmental thoracic anesthesia& feasibility study. BJA, 2007;98: 682-686.

88. Tzovaras G, Fafonlakis F, Prastas K; Spinal V/s General Anesthesia for Laparoscopic cholecystectomy: Interim analysis of a control randomized trial. Arch Surg, 2008; 143(5) 497-501.
89. Lennox PH, Himat V, Henderson C, Martin L, Mitchell GWE; Small dose SSA for short duration outpatients laparoscopy – recovery characteristics compared to desfluranceanesthesia. Anaesthesia. Analgesia, 2002; 94(2): 346-350.
90. Malins AF, Field JM, Nesting PM, Cooper GM; Nausea and vomiting oral ondansetron, Metaclopramide and placebo, Br J Anaes., 1994;72: 231-233.
91. Nathanson LK, Shimi S, Cuschieri A; Laparoscopic cholecystectomy. The Dundee technique. Br Journal of Surgery, 1991; 78(2): 155- 159
92. Ghodki PS, Sardesai SP, Thombre SK; Evaluation of intrathecal clonidine to decrease shoulder tip pain in Laparoscopy under spinal anesthesia, 2010; 54(3): 231-234.

ANNEXURE-I

CONSENT FOR PARTICIPATION IN RESEARCH STUDY

Mr/Mrs/Miss. _____ we are requesting you to enrol yourself in study titled "COMPARISON OF FEASIBILITY AND SAFETY OF LAPAROSCOPIC APPENDICECTOMY UNDER SPINAL ANAESTHESIA VS GENERAL ANAESTHESIA, ONE YEAR RANDOMISED CONTROLLED TRIAL AT A TERTIARY CARE HOSPITAL". conducted by Dr. _____, Post Graduate in M.S. General Surgery under the guidance of Dr. S.C.METGUD$_{MD.}$ Professor, Department of General Surgery, and Dr. _____ $_{MD,}$ Professor Department of Anaesthesia, J.N. Medical College, Belagavi under KLE university, Belagavi.

Respected Sir/Madam, We request you to participate in our study as you are eligible for participating in the study. Your participation in the research is absolutely voluntary. Your decision to participate in the study or otherwise will not affect the relationship with kle hospital. If you decide not to participate, you are free to to withdraw at any time. During the study your operative outcome will be accessed by some questions which will be answered by your operating surgeon.

Purpose of the study

This research is intended to compare feasibility and safety of laparoscopic appendectomy under spinal anaesthesia vs general anaesthesia. The main purpose of this study is to study intra operative pain and hemodynamic stability during laparoscopic appendectomy under spinal anaesthesia in comparison to general anaesthesia. The principal investigator of the study is Dr. _____, under the guidance of Dr. _____.

Procedure Involved:

If you agree to enrole yourself in my study, you will be asked your detail history. Then you will be clinically examined in detail and routine investigations like HB, TC, DC, PLATELET COUNT, RBS, BLOOD UREA, SERUM CREATININE, BLOOD GROUPING, CHEST X RAY, ECG, USG ABDOMEN AND PELVIS, will be done accordingly. Computer generated random numbers are used to assign the type of surgery to the patients that is, group A (UNDER SPINAL ANAESTHESIA) and group B (UNDER GENERAL ANAESTHESIA).

In both the groups, DBP, heart rate, SPO2 and will be recorded at the following points of time.

• Prior to induction.

• At 1, 3, 5 minutes after spinal anaesthesia and general anaesthesia.

• Immediately after pneumo peritoneum and

• Every 15 minutes thereafter.

The intra operative conditions and muscle relaxation will be assessed by asking the surgeon to grade the range between "not good - good - excellent". The operating surgeon will be asked to grade the ease of operating under SA, comfortable /not comfortable/unhappy, and conversion to GA will be considered as failure.

All the patients will be monitored for evidence of complications in the post anesthesia care unit. Patients will be questioned about nausea and vomiting, head ache, sore throat and transient neurological symptoms. Pain will be assessed using visual analogue scale (3) (VAS) and graded at 1, 3, 6 and 12 hours. Intensity of pain will be assessed by using 10 point VAS representing various intensity of pain from '0' (No pain) to 10 (Worst possible pain).

Risks and Benefits:

There is no increased risk involved in becoming a part of this study and the complications are those which are normally anticipated. This study will help to estimate the incidence of postoperative pain in comparison with the two techniques involved. The results derived at the end of study will benefit all similar patients admitted in this hospital.

Withdrawing/removal from the study

The participant has freedom to withdraw from the study whenever he/she wishes and with any prior notice. Even if you decline to participate, there will not be any change in the line of your management or the relationship with your doctor. You will be told about all the new information that affects your decision to participate in the study. The investigator may also exclude a participant from the study at anytime.

Privacy and Confidentiality:

The only people to know that you are a research subject are members of the research team. No information about you or information provided by you during the research will be disclosed to other without your written permission except:

1. In emergency to protect your rights and welfare.
2. If required by law.

Institutional/sponsors policy:

If any unforeseen complications or injury occurs during the period of study the participant will be given treatment within the limitations of KLE's prabhakar kore hospital general ward.

Financial Incentives for participation:

The participant neither gets any financial incentives during the period of study nor will be asked to pay for the purpose of this study.

Authorization to Publish Results:

When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity. Any information that is obtained in connection with this study and that can be identified with your identity remaining confidential.

Contact details

In case of any queries regarding this study please contact chief investigator, Dr. Veerendra Patil or Dr._____ under whose guidance the study is being done. For further enquiry regarding this study you may contact the chairman of ethical committee, Dr. _____.

Principal investigator:

DR. _____

Postgraduate student,

Department of surgery,

J.N.Medical College,

KLE University, belagavi-10

Ph no: 9880024946

GUIDE:

DR. _____

Professor,

Department of Surgery

J.N.Medical College,

KLE University, Belagavi-10

Ph no: _____

CO-GUIDE:

Dr. _____

Professor,

Department of Anaesthesia

J. N. Medical College

KLE University, Belagavi-10

Ph no: _____

CHAIRMAN OF ETHICAL COMMITTEE

DR. _____

Professor of pathology & Chairman,

JNMC Institutional Ethics Committee on Human Subjects Research,

J.N.Medical College, KLE University, Belagavi-10

Ph no: _____

CONSENT STATEMENT:

I, Mr / Ms /Mrs. _____ voluntarily agree for the participation as a subject of study. By signing this consent form I am not giving up any of my legal rights, I may withdraw from the study anytime. I am signing the consent form after having read or been read for me in my vernacular language, including the risks and the benefits and having all my questions answered.

Subject Name : _____

Signature or the Left Thumb Print of Subject : _____

Witness Name: _____ Signature: _____

Investigators Name: _____ Signature: _____

Date: _____

Place: _____

ANNEXURE-I

CONSENT FOR PARTICIPATION IN RESEARCH STUDY

Mr/Mrs/Miss. _____ we are requesting you to enrol yourself in study titled **"** COMPARISON OF FEASIBILITY AND SAFETY OF LAPAROSCOPIC APPENDICECTOMY UNDER SPINAL ANAESTHESIA VS GENERAL ANAESTHESIA, ONE YEAR RANDOMISED CONTROLLED TRIAL AT A TERTIARY CARE HOSPITAL". conducted by Dr. VEERENDRA PATIL, Post Graduate in M.S. General Surgery under the guidance of Dr. S.C.METGUD$_{MD.}$ Professor, Department of General Surgery, and Dr. MANJUNATH PATIL $_{MD,}$ Professor Department of Anaesthesia, J.N. Medical College, Belagavi under KLE university, Belagavi.

Respected Sir/Madam, We request you to participate in our study as you are eligible for participating in the study. Your participation in the research is absolutely voluntary. Your decision to participate in the study or otherwise will not affect the relationship with kle hospital. If you decide not to participate, you are free to to withdraw at any time. During the study your operative outcome will be accessed by some questions which will be answered by your operating surgeon.

Purpose of the study

This research is intended to compare feasibility and safety of laparoscopic appendectomy under spinal anaesthesia vs general anaesthesia. The main purpose of this study is to study intra operative pain and hemodynamic stability during laparoscopic appendectomy under spinal anaesthesia in comparison to general anaesthesia.The principal investigator of the study is Dr. VEERENDRA PATIL, under the guidance of Dr. S C METGUD.

Procedure Involved:

If you agree to enrole yourself in my study, you will be asked your detail history. Then you will be clinically examined in detail and routine investigations like HB, TC, DC, PLATELET COUNT, RBS, BLOOD UREA, SERUM CREATININE, BLOOD GROUPING, CHEST X RAY, ECG,USG ABDOMEN AND PELVIS, will be done accordingly. Computer generated random numbers are used to assign the type of surgery to the patients that is, group A(UNDER SPINAL ANAESTHESIA) and group B(UNDER GENERAL ANAESTHESIA).

In both the groups, DBP, heart rate, SPO2 and will be recorded at the following points of time.

• Prior to induction.

• At 1, 3, 5 minutes after spinal anaesthesia and general anaesthesia.

• Immediately after pneumo peritoneum and

• Every 15 minutes thereafter.

The intra operative conditions and muscle relaxation will be assessed by asking the surgeon to grade the range between "not good - good - excellent".The operating surgeon will be asked to grade the ease of operating under SA, comfortable/not comfortable/unhappy, and conversion to GA will be considered as failure.

All the patients will be monitored for evidence of complications in the post anesthesia care unit. Patients will be questioned about nausea and vomiting, head ache, sore throat and transient neurological symptoms. Pain will be assessed using visual analogue scale (3) (VAS) and graded at 1, 3, 6 and 12 hours. Intensity of pain will be assessed by using 10 point VAS representing various intensity of pain from '0' (No pain) to 10 (Worst possible pain).

Risks and Benefits:

There is no increased risk involved in becoming a part of this study and the complications are those which are normally anticipated. This study will help to estimate the incidence of postoperative pain in comparison with the two techniques involved. The results derived at the end of study will benefit all similar patients admitted in this hospital.

Withdrawing/removal from the study

The participant has freedom to withdraw from the study whenever he/she wishes and with any prior notice. Even if you decline to participate, there will not be any change in the line of your management or the relationship with your doctor. You will be told about all the new information that affects your decision to participate in the study. The investigator may also exclude a participant from the study at anytime.

Privacy and Confidentiality:

The only people to know that you are a research subject are members of the research team. No information about you or information provided by you during the research will be disclosed to other without your written permission except:

1. In emergency to protect your rights and welfare.
2. If required by law.

Institutional/sponsors policy:

If any unforeseen complications or injury occurs during the period of study the participant will be given treatment within the limitations of KLE's prabhakar kore hospital general ward.

Financial Incentives for participation:

The participant neither gets any financial incentives during the period of study nor will be asked to pay for the purpose of this study.

Authorization to Publish Results:

When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity. Any information that is obtained in connection with this study and that can be identified with your identity remaining confidential.

Contact details

In case of any queries regarding this study please contact chief investigator, Dr. Veerendra Patil or Dr.S.C.METGUD under whose guidance the study is being done. For further enquiry regarding this study you may contact the chairman of ethical committee, Dr. S.Gangapilli.

Principal investigator:
DR.VEERENDRA PATIL
Postgraduate student,
Department of surgery,
J.N.Medical College,
KLE University, belagavi-10
Ph no: 9880024946

GUIDE:
DR.S.C.METGUD
Professor,
Department of Surgery
J.N.Medical College,
KLE University, Belagavi-10
Ph no: 9448110517

CO-GUIDE:
Dr. MANJUNATH PATIL
Professor,
Department of Anaesthesia
J. N. Medical College
KLE University, Belagavi-10
Ph no: 9743110637

CHAIRMAN OF ETHICAL COMMITTEE
DR.GANGA PILLI
Professor of pathology & Chairman,
JNMC Institutional Ethics Committee on Human Subjects Research,
J.N.Medical College, KLE University, Belagavi-10
Ph no: 9480275601

CONSENT STATEMENT:

I, Mr / Ms /Mrs. _____ voluntarily agree for the participation as a subject of study. By signing this consent form I am not giving up any of my legal rights, I may withdraw from the study anytime. I am signing the consent form after having read or been read for me in my vernacular language, including the risks and the benefits and having all my questions answered.

Subject Name : _____

Signature or the Left Thumb Print of Subject : _____

Witness Name: _____ Signature: _____

Investigators Name: _____ Signature: _____

Date: _____

Place: _____

ANNEXURE - II - PROFORMA

PROFORMA OF CLINICAL EXAMINATION OF INDIVIDUAL PATIENT

Group:

Name : Age :

Sex : IP no.:

Address : Religion:

Education: Date of admission:

Occupation: Date of discharge:

2. Chief Complaints:

3. History of Presenting Complaints:

4. Past History:

5. Personal History:

6. Family History:

7. GENERAL PHYSICAL EXAMINATION:

Built and Nourishment:

Weight:

Pallor / Icterus / Cyanosis / Clubbing / Oedema / Lymphadenopathy

Vital Signs: PR: /min; BP: mmHg; RR: /min; Febrile/Afebrile

8. Systemic Examination:

Abdomen:

Inspection:

Palpation:

Percussion:

Auscultation:

Cardio Vascular System:

Respiratory System:

9. Clinical Impression:

10. Investigations:

Blood - Routine : Hb: Total Leucocyte Count: Platelet count: Random blood sugar :

Blood urea. :

Sr. Creatinine. :

LFT's :

Bleeding time :

Clotting time :

Urine routine and microscopy:

11. Operation Details:

Date of Surgery:

Anaesthesia: General Anaesthesia/spinal anaesthesia

Duration of Surgery:

12. Assessment of:

- Intra operative heart rate and BP and SPO2 monitoring.

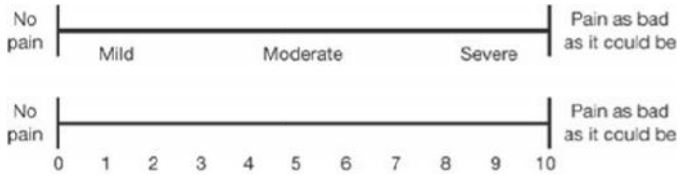
	Prior to induction	@1min	@3min	@5min	@pneumo	15min	30min	45min	60min
PR									
BP									
SPO2									

- Intra operative pain: YES/NO
- GRADE OF EASE OF OPERATION BY OPERATING SURGEON
  (Based on intra operative condition and muscle relaxation)

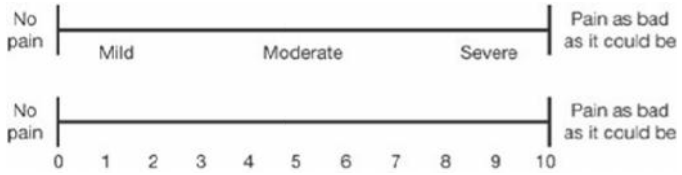
  NOT GOOD/ GOOD/ EXCELLENT

- POST OPERATIVELY
  - POST OPERATIVE NAUSEA AND VOMITTING: YES/NO
  - SORE THROAT: YES/NO
  - POST OPERATIVE PAIN IS ASSESED BY VISUAL ANALOGUE SCALE(VAS)

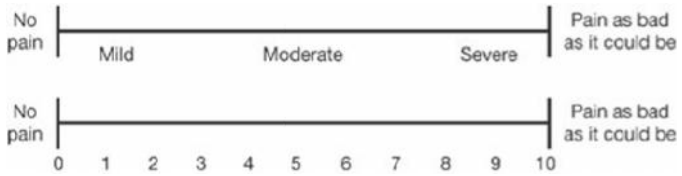
VAS AFTER 1HOUR:



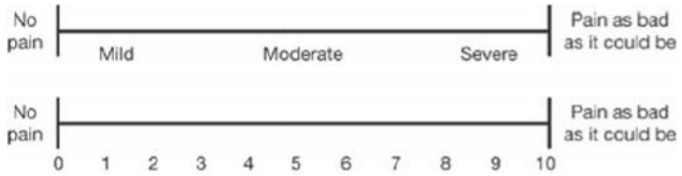
VAS AFTER 3HOURS:



VAS AFTER 6HOURS:



VAS AFTER 12HOURS:



ANNEXURE – III

FIGURES

FIG-1 SPINAL TRAY WITH INSTRUMENTS.

FIG-2: SPINAL ANAESTHESIA

FIG-3: LAPAROSCOPIC INSTRUMENTS

FIG-4: PORTS FOR LAP.APPENDECTOMY

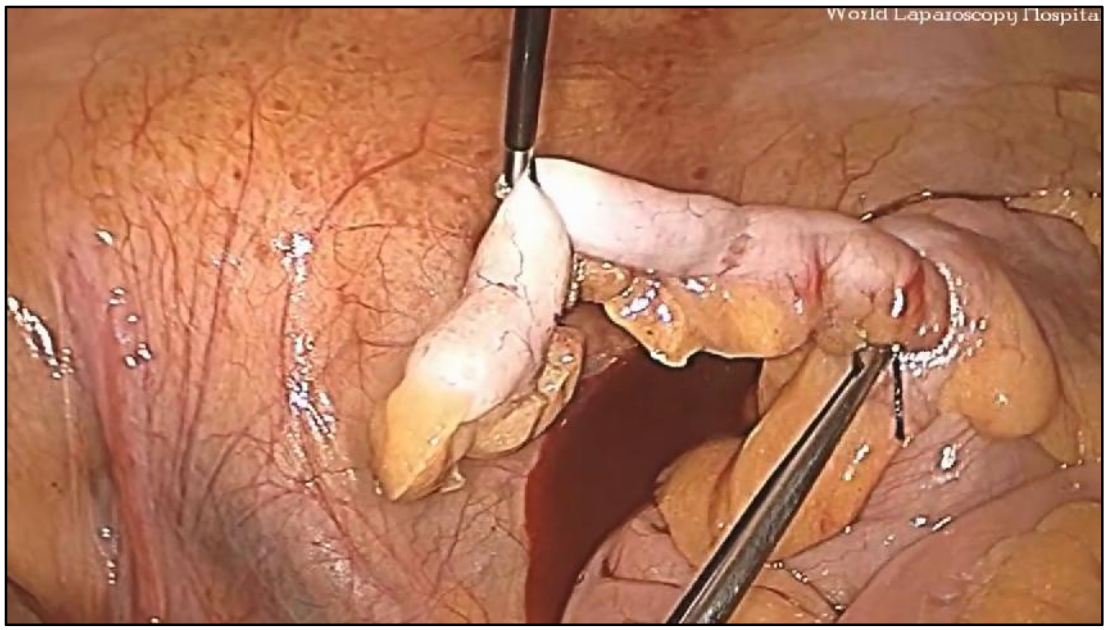


FIG-5: LAPAROSCOPIC .APPENDECTOMY

				GROUP	PULSE RATE(min)									SYSTOLIC BP(mm Hg)						
SL.no	IP no.	AGE	SEX	GA/SA	BASAL	1	3	5	PNEUMO	15	30	45	60	BASAL	1	3	5	PNEUMO	15	30	45	60
1	710428	43	M	GA	84	98	94	90	93	91	85	84	82	120	138	135	135	143	138	134	133	130
2	711788	18	M	GA	80	104	102	88	94	89	93	91	94	126	138	140	137	140	139	135	132	131
3	713006	20	F	SA	86	88	78	68	86	85	84	83	82	121	119	114	111	117	114	110	108	109
4	712653	35	F	GA	90	101	98	90	98	92	88	88	86	140	139	130	126	134	130	126	124	126
5	715888	30	F	SA	82	84	71	64	70	71	70	71	80	125	123	117	114	120	117	113	111	112
6	719161	32	F	SA	92	94	84	82	82	84	80	78	90	141	136	130	127	130	128	124	125	123
7	720954	25	M	SA	82	68	76	66	74	71	73	75	70	120	118	116	115	121	118	114	113	111
8	721324	38	M	GA	70	84	86	82	86	80	82	82	84	134	148	145	141	150	144	140	141	139
9	722106	28	F	GA	72	84	80	84	87	80	76	74	76	114	130	120	122	130	125	124	125	126
10	722881	28	F	GA	72	88	86	86	82	88	84	80	84	110	116	122	117	125	119	117	118	119
11	723995	39	F	GA	64	70	74	76	78	79	77	78	69	133	150	142	138	136	141	130	132	131
12	724261	31	M	SA	77	80	68	68	66	66	64	66	75	115	112	110	117	132	131	127	125	127
13	724924	20	F	GA	94	96	90	80	86	82	78	80	78	124	140	143	140	147	142	136	132	130
14	727079	25	F	GA	102	108	102	90	94	94	90	94	90	98	110	107	110	117	115	116	120	118
15	727816	18	F	GA	74	84	80	78	76	76	70	76	76	117	134	128	126	134	129	135	121	120
16	728878	28	F	SA	78	70	71	74	70	72	68	66	76	115	116	111	108	114	111	107	108	109
17	729101	20	F	SA	66	70	64	68	61	64	70	72	76	130	120	116	114	122	117	115	110	112
18	730114	28	M	GA	68	70	74	76	80	72	82	98	84	160	150	142	138	146	135	136	132	123
19	730289	30	F	GA	111	110	102	88	94	80	76	72	88	136	150	146	135	137	139	138	136	131
20	733124	21	F	GA	80	84	86	84	89	88	82	76	78	124	130	126	120	128	124	121	118	121
21	735788	30	F	GA	68	70	74	72	78	76	71	70	79	115	124	126	124	130	119	120	116	118
22	736075	50	F	SA	98	94	90	88	88	86	84	82	94	121	119	120	114	126	120	115	114	112
23	738137	41	M	GA	102	110	102	92	96	90	84	84	90	141	150	134	131	133	130	126	122	119
24	737459	31	F	SA	106	110	98	90	94	95	90	91	100	119	115	112	110	117	114	109	110	110
25	735923	52	F	SA	70	72	68	68	68	69	70	77	68	114	112	110	107	119	113	110	111	113
26	736550	19	F	SA	68	69	64	66	64	64	66	69	70	150	140	130	127	130	128	125	120	123
27	735760	18	F	SA	104	100	90	94	88	87	86	84	102	132	130	121	116	124	123	119	117	115
28	737732	25	F	SA	88	92	80	70	77	78	74	76	88	125	126	124	121	126	123	117	114	113
29	737977	25	F	SA	72	76	74	72	76	75	72	74	70	117	116	112	109	117	114	110	108	109
30	745003	55	F	SA	100	104	84	77	80	81	76	78	98	140	136	130	124	131	128	123	120	121
31	743944	35	M	SA	102	106	90	84	86	85	82	80	96	123	121	122	116	121	117	112	110	113
32	747635	27	M	SA	78	82	80	72	78	80	80	82	76	114	112	108	104	111	108	106	104	106
33	738367	20	F	GA	98	104	94	86	80	86	81	82	88	121	130	126	120	127	124	122	119	121
34	739929	58	M	GA	76	80	84	80	76	82	76	74	76	117	128	125	134	139	138	140	136	126
35	749663	21	M	SA	84	86	80	74	76	79	78	74	80	137	134	128	122	128	125	121	116	118
36	748771	25	F	SA	64	68	66	68	66	68	70	72	67	117	118	114	111	119	115	112	110	108
37	743002	30	M	GA	82	88	86	78	82	76	75	74	84	140	150	140	138	144	139	135	134	131
38	748183	31	F	GA	60	72	70	72	79	68	64	66	64	114	140	136	132	142	140	136	135	133
39	748352	42	M	SA	70	72	74	69	68	66	69	68	72	123	120	116	108	120	120	116	112	113
40	751115	35	M	SA	72	78	68	70	70	72	72	70	74	109	105	106	110	108	106	108	106	108
41	751003	27	F	GA	69	74	70	64	74	74	71	78	76	120	130	123	119	129	124	121	118	122
42	754466	31	M	SA	102	98	88	82	82	80	81	80	96	131	126	121	117	123	120	117	112	111
43	752036	22	M	GA	70	80	84	88	89	86	82	78	74	110	138	132	127	132	132	129	127	125
44	756616	21	M	GA	104	108	98	89	92	93	90	82	90	130	144	139	135	140	139	136	134	131
45	754708	51	F	GA	91	96	90	82	84	88	84	83	81	137	140	132	127	138	133	130	126	124
46	757089	25	F	SA	96	94	86	78	84	82	82	78	92	134	130	125	121	126	121	118	113	120
47	756748	47	M	GA	64	88	90	92	88	89	88	80	68	100	124	121	124	126	130	128	125	121
48	758056	18	F	GA	60	78	80	87	90	92	89	90	88	116	129	128	125	131	127	126	122	126
49	760381	33	M	SA	68	72	70	74	70	72	74	71	70	110	106	104	103	110	108	110	104	110
50	762341	50	M	SA	62	58	54	56	66	68	62	64	64	126	121	115	112	121	118	113	111	110
51	761985	21	F	GA	68	84	78	74	78	70	74	76	74	110	130	131	121	126	124	121	124	119
52	765551	40	M	SA	64	54	50	52	52	64	60	62	70	104	102	100	100	102	104	106	108	110
53	764517	38	M	GA	58	70	72	71	74	77	80	78	70	119	143	130	134	140	137	134	132	131
54	772867	25	M	GA	96	92	90	84	88	80	82	79	70	142	160	150	140	147	144	141	137	130
55	773724	19	F	GA	104	118	104	96	94	93	85	81	78	140	154	151	148	150	145	143	141	125
56	774030	22	M	GA	90	90	92	84	86	90	80	88	84	100	120	123	130	136	137	136	133	127
57	774633	26	F	GA	94	98	96	94	98	84	82	78	78	124	137	140	132	137	135	130	132	130
58	775181	32	F	SA	68	66	66	686	68	70	74	76	69	125	121	115	112	119	114	110	112	106
59	774651	20	F	GA	78	78	80	82	87	78	90	78	88	170	160	155	140	150	144	142	140	137
60	777605	35	M	SA	74	70	68	70	70	71	66	68	70	130	136	130	124	130	128	123	116	112
61	777164	24	M	SA	88	98	80	68	76	84	78	76	82	132	135	129	126	132	131	127	120	116
62	778466	26	M	SA	120	110	90	84	88	84	84	84	102	111	116	110	110	121	118	125	114	122
63	734661	40	M	GA	80	84	86	84	89	88	82	76	78	124	130	126	120	128	124	121	118	121

												POSTOPERATIVE ASSESSMENT OF SEVERITY OF PAIN									
DIASTOLIC BP(mm Hg)									ASSESSMENT BY SURGEON	INTRA-OP SHOULDER TIP PAIN		PAIN (VAS scores at different intervals)(hrs)				POSTOPERATIVE COMPLICATIONS					
BASAL	1	3	5	PNEUMO	15	30	45	60	(NG/G/E)	(Y/N)	SPO2	1	3	6	12	NAUSEA/VC	HYPOTENSI	BRADYCARI	HEADACHE	SORE THRC	POST OPER/
78	87	84	82	91	85	82	80	81	G	N	100	3	4	3	4	P	A	A	A	A	4
74	82	84	83	81	76	74	72	74	E	N	100	5	4	3	3	A	A	A	A	A	5
79	77	72	69	75	73	74	76	76	G	N	100	0	0	2	2	A	A	A	A	A	7
90	98	92	89	98	94	91	90	90	G	N	100	4	3	4	3	P	A	A	A	P	2
73	71	68	65	71	69	71	70	72	E	N	100	0	1	4	2	A	A	A	A	A	5
88	86	80	73	78	75	76	77	76	G	N	100	0	0	3	3	A	A	A	A	A	4
86	89	85	80	84	81	82	83	82	E	Y	100	0	0	3	2	A	A	A	A	A	1
86	88	82	81	87	81	80	83	81	G	N	100	6	7	5	4	A	A	A	A	A	3
76	80	74	72	82	78	81	77	82	G	N	100	4	5	4	5	A	A	A	P	A	4
72	74	76	74	86	81	85	78	83	E	N	100	5	7	4	5	A	A	A	A	A	3
82	90	86	88	94	87	86	84	87	G	N	100	6	4	3	5	A	A	A	A	A	3
74	77	72	70	77	75	77	79	79	E	N	100	0	0	2	3	A	A	A	A	A	2
84	87	89	90	92	90	88	86	87	G	N	100	5	4	3	3	P	A	A	A	P	6
60	70	68	66	78	74	68	64	69	G	N	100	6	5	4	2	A	A	A	A	A	4
76	82	78	75	80	73	74	75	73	E	N	100	6	6	3	3	A	A	A	A	A	6
76	74	70	68	69	68	70	71	71	G	N	100	0	1	3	4	A	A	A	A	A	7
80	76	71	69	73	75	73	71	74	G	N	100	0	0	4	3	A	A	A	A	A	4
80	86	80	81	88	81	76	78	77	G	N	100	7	8	5	4	A	A	A	A	A	3
74	90	84	82	89	83	80	78	81	E	N	100	7	7	4	3	P	A	A	A	P	6
68	74	72	68	76	72	71	69	70	G	N	100	8	7	3	4	A	A	A	A	A	5
71	76	78	76	84	78	74	72	75	G	N	100	9	7	5	4	A	A	A	P	A	4
81	77	72	70	76	74	80	83	82	E	Y	100	0	0	3	4	A	A	A	A	A	3
88	90	89	82	86	79	78	83	79	E	N	100	6	5	4	3	A	A	A	A	A	5
64	68	65	66	78	76	77	76	77	E	N	100	0	0	3	4	A	A	A	A	A	4
74	72	68	66	71	68	69	71	73	G	N	100	0	1	3	3	A	A	A	A	A	2
81	77	72	71	74	71	72	71	70	G	N	100	1	2	4	3	A	A	P	A	A	6
73	69	65	66	70	69	71	73	75	G	Y	100	0	0	3	2	A	A	A	A	A	4
66	65	63	62	68	67	79	75	73	E	N	100	0	0	4	3	A	A	A	A	A	5
70	66	62	63	69	68	70	71	70	G	N	100	0	0	4	4	A	A	A	A	A	3
86	80	75	71	74	71	73	74	71	G	N	100	0	0	5	3	A	A	A	A	A	3
80	76	70	68	72	71	74	76	74	E	Y	100	0	0	4	5	A	A	A	A	A	3
71	76	64	61	66	65	67	66	64	G	N	100	0	0	3	5	A	A	A	A	A	4
78	80	74	70	76	77	79	74	80	G	N	100	7	6	4	3	A	A	A	A	A	3
72	77	75	71	79	80	76	71	74	G	N	100	8	6	5	3	A	A	A	A	A	5
92	84	80	77	79	77	74	78	80	E	Y	100	0	0	4	4	A	A	A	A	A	5
68	66	65	62	68	65	66	70	72	G	Y	100	0	1	4	5	A	A	A	A	A	4
90	98	94	89	94	88	90	84	91	G	N	100	6	5	3	4	A	A	A	A	A	3
66	80	81	78	89	84	72	70	69	E	N	100	8	6	3	2	A	A	A	A	A	3
78	70	71	68	72	71	70	72	80	E	N	100	1	2	4	5	P	A	A	A	A	4
70	68	66	64	76	72	74	69	65	E	N	100	0	0	5	3	A	P	A	A	A	2
80	84	79	78	84	78	79	78	77	G	N	100	5	5	2	3	A	A	A	A	A	3
83	76	72	70	74	71	73	71	73	G	N	100	0	0	5	3	A	A	A	A	A	2
68	80	78	74	80	78	75	71	74	E	N	100	4	5	3	4	A	A	A	A	A	6
85	92	89	88	98	92	90	87	91	G	N	100	3	3	5	4	A	A	A	A	A	4
75	77	78	76	77	75	76	79	74	G	N	100	8	5	4	3	P	A	A	A	A	4
78	72	70	67	72	68	70	74	76	E	N	100	0	1	3	5	A	A	A	A	A	3
70	77	76	72	71	68	71	68	73	G	N	100	6	4	5	4	A	A	A	A	A	3
60	72	71	69	75	73	68	64	69	E	N	100	9	5	4	3	A	A	A	A	A	2
71	68	62	62	69	65	68	70	71	G	Y	100	0	0	4	4	A	A	A	A	A	4
64	60	61	60	67	65	66	68	69	E	N	100	0	0	3	6	P	A	P	P	A	2
66	80	81	78	82	76	70	68	69	E	N	100	9	5	4	3	A	A	A	A	A	5
62	62	60	58	68	66	67	70	71	G	N	100	0	0	2	6	A	P	P	A	A	2
72	79	82	78	84	81	76	72	75	E	N	100	8	4	3	2	A	A	A	A	A	6
82	84	80	80	85	78	78	80	77	G	N	100	8	6	4	3	P	A	A	A	P	3
80	88	87	86	85	82	84	82	83	G	N	100	7	5	4	2	A	A	A	A	A	3
62	74	74	72	77	71	67	65	68	E	N	100	8	5	3	2	A	A	A	A	A	2
74	82	86	84	81	76	69	71	70	G	N	100	9	6	4	3	A	A	A	A	A	4
76	70	66	64	71	68	69	70	72	E	Y	100	0	0	3	6	A	A	A	A	A	6
100	90	88	91	97	91	95	97	94	E	N	100	6	3	4	3	P	A	A	A	A	3
80	76	71	66	74	71	73	72	73	G	N	100	0	0	4	2	A	A	A	A	A	2
78	72	70	68	77	72	74	76	77	E	N	100	0	0	5	4	A	A	A	A	A	4
64	62	63	58	65	62	63	64	65	G	N	100	0	0	3	4	A	A	A	A	A	4
68	74	72	68	76	72	71	69	70	E	N	100	7	5	2	3	A	A	A	A	A	3

Chapter 1

Introduction

Chapter 2

Objectives

Chapter 3

Review of Literature

Chapter 4

Methodology

Chapter 5

Results

Chapter 6

Discussion

Chapter 7

Conclusion

Chapter 8

Summary

Chapter 9

Bibliography

Chapter 10

Annexures

Master Chart