LAPAROSCOPIC CHOLECYSTECTOMY AND THE DYSPEPTIC PATIENT: IDENTIFYING THE APPROPRIATENESS OF OPERATIVE INTERVENTION.

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ABSTRACT

The purpose of this study is to determine if early laparoscopic cholecystectomy in patients with uncomplicated gallstone disease and symptoms of dyspepsia will produce complete symptomatic resolution 1 year postoperatively and to identify appropriate timing of laparoscopic cholecystectomy to decrease cholecystectomy failure rate. Specific research objectives were to determine: 1) if laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia will achieve complete symptomatic relief; 2) the change in the preoperative score to the postoperative score and satisfaction after laparoscopic cholecystectomy for the two groups: patients with gallstones and symptoms of dyspepsia and the patients with gallstones and no dyspepsia; 3) the relationship between the duration of preoperative episodes and the probability of complete resolution of symptoms with laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia; 4) the relationship between the frequency of preoperative episodes and the probability of complete resolution of symptoms with early laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia and 5) the differences in pathologic findings between patients with gallstones and no symptoms of dyspepsia versus patients with symptoms of dyspepsia.

The methods included a retrospective chart review for patient identification, a follow up survey and microscopic pathological examination of gallbladder specimens. Nine hundred and forty two patients entered the study. Three hundred and fifty nine surveys were returned producing a response rate of 43%. Two hundred and sixty four patients (77.0%) had symptoms of dyspepsia (Group I) and 79 patients (23.0%) had no symptoms of dyspepsia (Group II).

Laparoscopic cholecystectomy for patients with gallstones and symptoms of dyspepsia does not achieve complete symptomatic relief 1 year after surgery. The frequency and duration of

preoperative episodes have no relation to the outcome of surgery. The majority of patients in both Groups (I, II) were found to have morphological evidence of acute cholecystitis and only a small number had chronic cholecystitis. Group I had a greater reduction in the Buckley score than Group II after LC but had similar rates of satisfaction from surgery.

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DEDICATION

This is study is dedicated to my mother Talat Malik who has showed me the meaning of perseverance and commitment to higher learning. You provided me with the opportunity to pursue and accomplish my dreams and I am forever in debt to you.

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LIST OF ABBREVIATIONS

PREOP = Preoperative

POSTOP = Postoperative

CHOLE = Cholecystitis

LC= Laparoscopic Cholecystectomy

CHAPTER ONE

OBJECTIVES AND HYPOTHESES

1.1 Objectives

1. To determine if laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia will achieve complete symptomatic relief. Complete symptomatic relief will be defined as the cessation of symptoms of dyspepsia after laparoscopic cholecystectomy.

2. To compare the change in the preoperative score to the postoperative score and satisfaction after laparoscopic cholecystectomy for the two groups: patients with gallstones and symptoms of dyspepsia and the patients with gallstones and no symptoms of dyspepsia.

3. To determine the relationship between the duration of preoperative episodes and the probability of complete resolution of symptoms following laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia. Duration measured by the total period of time between onset of symptoms and laparoscopic cholecystectomy.

4. To determine the relationship between the frequency of preoperative episodes and the probability of complete resolution of symptoms following laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia. Frequency measured by the number of episodes in the period of time prior to laparoscopic cholecystectomy.

5. To determine the differences in gallbladder pathology findings between patients with gallstones and no symptoms of dyspepsia versus patients with gallstones and symptoms of dyspepsia.

1.2 Hypotheses

The study was based on the following hypotheses:

1. Laparoscopic cholecystectomy for patients with gallstones and symptoms of dyspepsia will achieve complete symptomatic relief 1 year post laparoscopic cholecystectomy in 70% of patients.

2. Patients with gallstones and no symptoms of dyspepsia would have a greater reduction in the Buckley score and greater satisfaction after laparoscopic cholecystectomy than those patients who have gallstones and symptoms of dyspepsia.

3. Early laparoscopic cholecystectomy for patients with gallstones and symptoms of dyspepsia will achieve complete symptomatic relief 1 year post laparoscopic cholecystectomy in 70% of patients. Early laparoscopic cholecystectomy is defined by surgical intervention at or before three months of symptoms.

4. Patients with gallstones and symptoms of dyspepsia will experience complete resolution of symptoms when laparoscopic cholecystectomy is performed prior to or at the third episode.

5a) Patients with no symptoms of dyspepsia and ultrasonagraphic evidence of gallstones would be found to have no morphological evidence of chronic cholecystitis.

5b) Patients with symptoms of dyspepsia and ultrasonagraphic evidence of gallstones would be found to have morphological evidence of chronic cholecystitis.

CHAPTER TWO

CRITICAL REVIEW OF THE LITERATURE

2.1 Definition of Biliary Colic

Biliary colic is a syndrome typified by pain that ensues when an obstructing stone causes sudden distension of the gallbladder. “Colic” as defined in the dictionary as paroxysmal pain in the abdomen, is a misnomer, as biliary pain typically does not increase and decrease spasmodically. Severe right upper quadrant or epigastric pain begins suddenly and intensifies. This steady pain usually lasts between 15 minutes to six hours and then gradually disappears over 30 to 90 minutes, leaving a vague ache and may be associated with nausea and vomiting. Its duration is seldom less than 15 minutes. The pain is often sufficiently severe for some to seek medical attention requiring the use of narcotics for relief. Episodes of pain occur irregularly (episodic), separated by pain-free periods lasting from days to years. The severity of pain also varies. This pain is unrelated to bowel movements and not associated with urination. (1). Biliary-type pain can be precipitated following a large meal, the so-called “fatty food intolerance,” but is not specific for biliary tract disease. Biliary pain is mediated by splanchnic nerves and may radiate like angina to the back, right scapula or shoulder tip, or down the arm or into the neck. In rare circumstances, the pain may also be confined to the back. (2)

2.2 Definition of Dyspepsia

Dyspepsia as defined by the Rome II consensus report refers to pain or discomfort centered in the upper abdomen (3). It is common, with a prevalence of 40-60% in the general population. Dyspeptic symptoms are thought to originate in the upper gastrointestinal tract. These symptoms

may indicate gastroesophageal reflux disease (GERD), peptic ulceration, cholelithiasis, or upper gastrointestinal malignancy. Fifty percent of patients will have no underlying cause after upper gastrointestinal investigations (2). Functional (non-ulcer) dyspepsia was defined as dyspeptic symptoms present for at least 25% of the time for at least a month in the absence of definite structural disease (3). Presently, the most widely accepted mechanism explaining functional dyspepsia is visceral hypersensitivity, which may contribute to both enhanced motor and symptomatic responses to food ingestion (4). Individuals might refer to this symptom as "indigestion". Other symptoms that may also be reported in association with dyspepsia are: bloating, early satiety, nausea, and vomiting. Dyspepsia can be intermittent or continuous and can be related to meals. (2)

2.2.1 Natural History of Dyspepsia

A complete understanding of the natural history of functional dyspepsia remains elusive. Studies that evaluated the clinical course of functional dyspepsia have been inconsistent and suggest that a proportion of patients will improve or may go into remission. These studies lacked population-based studies and were partially confounded by including patients with reflux disease (5). Sanft and Jones suggest patients with symptoms of dyspepsia will remain symptomatic over time (6). The exact prognosis is variable and continues to remain unpredictable.

2.3 Laparoscopic Cholecystectomy and Patients with Dyspepsia

Studies suggest that patients with gallstones who complain of dyspeptic symptoms without biliary colic are less likely to improve following cholecystectomy. However, approximately 70% of these patients will still benefit from surgery. This suggests that some of the dyspeptic symptoms may be caused by gallstones (7-9). Two studies have shown that biliary pain is

relieved in greater than 95% of patients after laparoscopic cholecystectomy after one year of follow-up (10,11).

Borly et al (12) prospectively investigated whether preoperative factors could predict symptomatic outcome after cholecystectomy over a 2 year period. Before the operation a questionnaire, ultrasound and dynamic cholescintigraphy were completed. One year postoperatively, a new questionnaire was completed. The questionnaire consisted of 121 questions on personal data, a visual analogue scale (VAS), and a Danish version of the McGill Pain Questionnaire (MPQ). The MPQ was used to look for preoperative descriptors that could predict the symptomatic outcome. A further 16 questions were on dyspeptic symptoms on a scale of yes (=1) or no (=0), that cumulatively made the dyspeptic score. The one year after the operation questionnaire consisted of the same VAS for pain and questions on dyspepsia as the preoperative questionnaire. One hundred patients were entered into the study and 80 patients had completed the questionnaire. Of the 80 patients, 71 were woman. Twenty one patients continued to experience abdominal pain after the operation and were characterized by the preoperative presence of a high dyspepsia score, irritating abdominal pain, and introverted personality.

There were several limitations to this study. A power analysis was not included or described at all. Therefore sample size may have been insufficient. Secondly, the modified MPQ and the dyspeptic score have not been validated. The majority of the subjects were female.

Lorusso et al (13) studied whether psychological factors can be associated with poor outcome after cholecystectomy in patients with uncomplicated gallstone disease and symptoms of dyspepsia by questionnaires. Fifty two (42 female, 10 male) patients were included in the study and were evaluated 2 weeks prior to surgery and 1 year post surgery. Criteria for defining dyspeptic patients were evaluated by two of the authors independently based on reported

symptoms by the patients. The patients were assessed for psychological factors (90 item Hopkins Symptom Checklist) and by a Gastrointestinal Symptom Rating scale. Twenty one (40.4%) patients did not improve after surgery. These patients showed significantly higher psychological factors and dyspeptic symptoms than the improved group.

The limitations to this study are sample size and lack of power analysis calculation. The evaluation of dyspeptic patients did not involve a validated scoring system.

Middelfart et al (14) compared the occurrence of abdominal pain and dyspepsia 5-10 years after cholecystectomy in 2 groups of patients: acute cholecystitis (345) and symptomatic gallstones (296). Patients were included during the period of 1986 to 1990. The questionnaire included questions on postoperative symptoms: duration of abdominal pain months to years (yes/no), severity of abdominal pain (VAS score), presence of 16 dyspeptic symptoms (yes/no), and outcome after surgery (cured/improved/same/ worse). Six hundred and forty one questionnaires sent and 519 returned (83% response rate). Complaints of pain after cholecystectomy were made by 194 (37%) patients. Complaints of abdominal pain and dyspepsia were found to be with similar frequencies in both the gallstone and acute cholecystitis group.

One limitation of the study was evaluation only of patients who had undergone an open cholecystectomy (larger incision). The laparoscopic era began in 1991. This study also included patients with choledocholithiasis. The strengths of this study are the number of patients enrolled and high response rate to the questionnaire.

Luman et al (15) prospectively investigated the effect of laparoscopic cholecystectomy on patients' symptoms before and after surgery. Ninety seven patients were evaluated using standard questionnaires. The standard questionnaire contained questions pertaining to pain characteristics (site, duration, frequency, quality, periodicity and alleviating and aggravating factors), dyspeptic

symptoms (nausea, vomiting, heartburn, food intolerance, early satiety) and colonic symptoms (bloating, constipation, and diarrhea). The questionnaire included a history of hysterectomies and psychiatric disturbances. The questionnaire was administered before surgery and 6-10 months after surgery via an outpatient review or an interview by telephone. Patients with complicated gallstone disease (history of jaundice, abnormal liver function tests, dilated common bile duct, and pancreatitis) were included in the study. The study group was 78 (80%) woman and 19 men (20%). Thirteen patients (13%) complained of pain similar to the pain prior to surgery and this group was the symptomatic group. Ten patients had symptoms less than 6 months and 3 patients had symptoms greater than 6 months. Abdominal bloating and previous use or current consumption of psychotropic drugs (antidepressants or anxiolytic) were significantly more common in this group. In this group, 77% had mild or no histological changes of cholecystitis.

This study has several limitations. The size of the sample is small, the symptomatic group having only 13 patients. The questionnaire used, does not seem to have been validated. They also included patients with complicated gallstone disease (pancreatitis, common bile duct stones, and obstructive jaundice).

Lublin et al. (16) investigated the persistence or resolution of symptoms associated with cholelithiasis after laparoscopic cholecystectomy. Between 1989 and 1995, a mailed validated survey of 1380 patients was conducted. The response rate was 44.3%. Pain was present in 75% of patients preoperatively, and non pain symptoms were present in 80%. Postoperatively, non pain symptoms (indigestion, fatty food intolerance, heartburn, nausea, vomiting, diarrhea, chills, fever, and jaundice) were significantly reduced. Preoperatively, longer duration of pain, frequent episodes of postprandial pain, age <40 and numerous sites of pain were all predictive of a higher

incidence of persistent pain after laparoscopic cholecystectomy. Postoperative diarrhea was experienced in 21% of patients.

This study has several limitations. There were a significant number of patients (20%) who were asymptomatic that had their gallbladders removed (N=109), standard of practice in North America and would influence results. Also pediatric age group (12-18 yrs) patients were included as participants. The duration and frequency of pain experienced prior to surgery was not defined. All patients were operated in the time that laparoscopic cholecystectomy was in its developmental phase. All patients had intraoperative cholangiograms which may be a confounding variable. The authors claim to have used a validated survey tool, but make no reference to how that was defined or the actual survey itself. Although they state the survey was created with the help of "survey professionals", this in itself does not constitute validation. Also, participants received the survey approximately 4 years (mean) after surgery with the longest time between surgery and survey completion being 7 years. Memory recall would be a significant bias.

2.4 Buckley's Validated Dyspeptic Symptom Score

Buckley et al. (17) produced a validated dyspeptic symptom score in 1997. For a symptom score to be valid, three criteria must be fulfilled: reproducibility, responsiveness, and validity. Fifty consecutive patients were recruited with a 3 month or greater history of dyspepsia. The control group was comprised of asymptomatic hospital employees who denied symptoms of indigestion or gastrointestinal disease and who were not taking any medications. The dyspeptic group was asked to indicate from a list of 18 symptoms, the symptoms they experienced. The four most common symptoms were identified: epigastric pain, heartburn, belching/burping, and bloating. These were then assessed in relation to severity, frequency and duration of symptoms. Severity of symptoms was graded on a 5 point Likert scale. Frequency of symptoms was graded

on a 4 point scale and duration of symptoms was graded on a 3 point scale. The total symptom score was tabulated by the summation of individual severity, frequency, and duration scores.

Study participants were questioned on initial presentation to clinic, one week later prior to diagnostic/therapeutic intervention and then after treatment. Reproducibility, responsiveness and validity were determined by comparing the scores of the dyspeptic group to the control group. Wilcoxon matched pairs signed rank test was used to analyze the reproducibility and responsiveness comparisons. The Kruskal-Wallis 1 way- ANOVA test was used to analyze the validity. Patients with dyspepsia had scores greater than 16. Healthy volunteers with no gastrointestinal symptoms had scores less than 6. This questionnaire is utilized for the assessment of patients with symptoms of dyspepsia. Our scoring criteria were derived from Buckley's method and hence renders the criteria used as valid.

CHAPTER THREE

THEORETICAL FRAMEWWORK

3.1 Introduction

3.1.1 Gallbladder: Anatomy and Physiology

The gallbladder is described as a pear shaped sac approximately 7-10 cm in length. It has four anatomic areas: fundus, body, infundibulum, and neck. It is located in the fossa on the inferior surface of the liver. The gallbladder via the cystic duct joins with the common hepatic duct to form the common bile duct that empties into the duodenum. The blood supply to the gallbladder is from the cystic artery, which originates from the right hepatic artery. The primary function of the gallbladder is to concentrate and store hepatic bile and deliver bile into the duodenum in response to a meal. (18)

3.1.2 Gallstone Disease

Gallstones are the most common cause of biliary tract disease in adults. Gallstones are composed of cholesterol and can be less often pigment stones. Cholesterol stones form as a result of cholesterol supersaturation, accelerated cholesterol crystal nucleation and impaired gallbladder motility (19). One to 2% of patients with asymptomatic gallstones will develop serious symptoms and complications annually (20). Less than 20% of individuals with gallstones will become symptomatic. Treatment is required for symptom relief and for complications of gallstones. Symptoms of gallstones can be nonspecific and include: biliary pain, abdominal pain, nausea and vomiting, bloating, flatulence, belching, heartburn, and food intolerance. Complications of gallstone disease include: acute cholecystitis, chronic cholecystitis, biliary colic, choledocholithiasis (common bile duct stones) with or without cholangitis, cholecystoenteric

fistula, gallstone pancreatitis and (very rarely) gallbladder carcinoma (19). Laparoscopic cholecystectomy is now the gold standard for symptomatic gallstones with an operative mortality rate less than 0.1% for elective cholecystectomy is (21).

3.1.2.1 Acute Cholecystitis: Pathophysiology, Clinical Manifestations and Diagnosis

The initiating event in acute cholecystitis is the obstruction of the cystic duct by a gallstone. This leads to gallbladder distention, inflammation and edema of the gallbladder wall. The gallbladder wall may become grossly thickened and reddish with subserosal hemorrhages. Pericholecystic fluid is commonly present. In some cases, the inflammatory process leads to progressive ischemia and necrosis of the gallbladder wall.

Clinically this manifests as an attack of biliary colic that does not subside and more severe. Often, the patient is febrile (temperature greater than 38 degrees Celsius) and may be associated with anorexia, nausea and vomiting. Physical exam may reveal focal tenderness, guarding in the right upper quadrant and a mass (gallbladder and adherent omentum). Murphy's sign is characteristic of acute cholecystitis, which is described as an inspiratory arrest with deep palpation in the right subcostal area.

Laboratory investigations may reveal an elevated leukocyte count. Serum bilirubin and transaminases may be mildly elevated. Diagnosis is confirmed with ultrasonagraphy, which is the most useful radiologic test with a sensitivity and specificity of 95%. Ultrasonagraphy is useful for detecting stones (presence or absence), pericholecystic fluid, and gallbladder wall thickening. Focal tenderness over the gallbladder when compressed with the sonagraphic probe is described as the sonagraphic Murphy's sign and may be suggestive of acute cholecystitits. (18)

3.1.2.2 Chronic Cholecystitis

Chronic cholecystitis is characterized by recurrent attacks of pain. The pain develops as the stone obstructs the cystic duct and produces a progressive increase of tension in the gallbladder wall. The gallbladder may be contracted. (18)

3.1.3 Operative Indications and Contraindications

Candidates for laparoscopic cholecystectomy are patients with symptomatic gallstones who can tolerate a general anesthetic and have no serious cardiopulmonary diseases or other co-morbid conditions. Generally, patients with gallstones and vague symptoms should not undergo cholecystectomy (22) and those patients with one or more biliary colic attacks should be offered an operation. Those patients with gallstones and vague symptoms should undergo further investigations (23). Contraindications for surgery are related to anaesthesiological considerations (severe co-morbidities), uncontrollable coagulopathy and pregnancy. (19)

3.1.4 History of Cholecystectomy

Carl Langenbuch performed the first open cholecystectomy in 1882 in Berlin (24). This procedure was the gold standard for over a century (23). The first laparoscopic cholecystectomy was performed in 1985 in Germany (25). By 1993, the laparoscopic approach was declared the gold standard by the National Institutes of Health (NIH) consensus conference (23). Cholecystectomy can be completed in one of two procedures: laparoscopic or open. Laparoscopic cholecystectomy is the gold standard for the treatment of gallstone disease.

3.1.4.1 Laparoscopic Cholecystectomy

The patient is placed supine and undergoes a general anesthetic with endotracheal intubation. The procedure requires four trocars placed in the peritoneal cavity. Pneumoperitoneum is established with carbon dioxide ($CO_{2)}$ insufflation through a closed

technique via a special hollow needle (Veress needle) or an open technique. A 10mm trocar is then inserted through a peri-umbilical incision. The laparoscope with an attached video camera is passed through this umbilical port. Three additional ports (epigastrium, mid-clavicular line, and flank) are placed under direct vision. The operation is performed and visualized through a video screen with magnification.

The most lateral port (flank) is used for an atraumatic grasper to grasp the gallbladder fundus and retract it cephalad. The mid clavicular port is used to grasp the infundibulum with an atraumatic grasper, and retract laterally and toward the right lower quadrant. The epigastrium port is used for the dissection by a laparoscopic dissector, hook or scissors. The hepatoduodenal ligament is dissected out to identify and skeletonize the cystic duct and artery. The duct and artery are then clipped and transected. The gallbladder is then dissected off the gallbladder fossa. The gallbladder is then removed through the umbilical incision. (18).

3.1.4.2 Open Cholecystectomy

Open cholecystectomy is performed without the use of laparoscopy and CO_2 pneumoperitoneum. The patient undergoes a general anesthetic with endotracheal intubation. The patient is supine, prepped and draped in a sterile fashion. The surgery can be performed through either a large vertical midline or right subcostal (Kocher) incision. The dissection is the same as the laparoscopic procedure.

Compared with open cholecystectomy, laparoscopic cholecystectomy has significantly decreased the length of hospital stay (can be done as a day procedure), postoperative pain, and recovery time. However, there has been an increased incidence of major bile duct injuries since its inception. (26)

3.1.4.3 Complications from Cholecystectomy

Prior to surgery, the surgeon explains the potential complications that can occur from cholecystectomy to the patient as part of the informed consent. Complications from cholecystectomy can be divided into intraoperative and postoperative complications. Intraoperative complications can occur from the trocar insertions (to gain access to the abdominal cavity) and can subsequently cause a blood vessel or bowel injury. These can be very serious potential complications.

Inadvertent injury to surrounding structures during dissection can result in bile duct injuries occurring. These injuries have the highest associated morbidity. Postoperative complications include fever, bile/fluid collection, bile leak, and retained common bile duct stones.

Another intraoperative consideration is conversion to laparotomy (open cholecystectomy). This may be required based on the surgeon's judgment. Most common reason for conversion to laparotomy (open through large midline or subcostal skin incision) is the inability to identify important anatomic structures.

Other potential causes for conversion are: distorted anatomy from previous surgeries, inflammation, anatomic anomalies/variations and intraoperative complications (vascular, bowel or bile duct injury). Conversion should be thought of as a prudent maneuver for achieving safe removal of the gallbladder and not a complication or failure. Risk of conversion for uncomplicated gallstone disease is less than 1% and for patients with acute cholecystitis or history of, may be as high as 20% (26).

3.1.5 Post Laparoscopic Cholecystectomy Pain

After cholecystectomy for symptomatic gallstone disease, 20-30% of patients continue to have abdominal pain of unknown origin. This pain is described as persistent or intermittent symptoms similar to those symptoms experienced prior to the operation. Symptoms may be secondary to common bile duct stones, peptic ulcer disease or many other causes (27). Preoperative factors such as flatulence, dyspepsia, bloating, an introverted personality together and long duration of attacks of pain are risk factors for postoperative dissatisfaction (15). However, there is no literature to identify appropriate timing criteria for laparoscopic cholecystectomy in patients with dyspeptic symptoms and gallstones.

3.1.6 Correlation between Preoperative Findings, Intraoperative Observations and Gallbladder Pathology

The correlation between the preoperative findings, intraoperative observations and gallbladder pathology varies. For acute cholecystits, Bingener et al. found prospectively that the specificity for acute cholecystitis diagnosed on ultrasound examination was 77% compared to findings at operation and 71% relative to the histologic findings (28**).** This suggests that a small number of patients with a preoperative diagnosis of acute cholecystitis, will not have acute cholecystitis. Microscopic features of acute cholecystitis were edema, hemorrhage, necrosis; chronic cholecystitis as sclerosis, presence of haemosiderin pigment, scars and Rockitansky-Aschoff sinuses (29, 30). There is a lack of literature demonstrating the correlation between gallbladder histology in patients with symptoms of dyspepsia.

3.2 Study Purpose

Up until now, it is clear in the literature that long duration of pain symptoms and symptoms of dyspepsia are risk factors for post laparoscopic cholecystectomy pain (12, 13, 15). However,

there is no literature showing that patients with of a short duration of symptoms of dyspepsia and uncomplicated gallstone disease are amenable to cure by laparoscopic cholecystectomy. This retrospective cohort study aims to investigate whether early laparoscopic cholecystectomy in patients with uncomplicated gallstone disease and symptoms of dyspepsia will produce complete symptomatic resolution 1 year postoperatively. Based on this, we hope to identify the appropriate timing of laparoscopic cholecystectomy for patients with uncomplicated gallstone disease and symptoms of dyspepsia.

CHAPTER FOUR

METHODS

4.1 Study Design

This retrospective cohort includes a retrospective chart review of patients in the Saskatoon Health Region, a follow-up survey and microscopic pathological examination of gallbladder specimens (Figure 1). A pilot study was conducted to determine the feasibility of this project and to assist in determination of statistical power analysis (Appendix B). The estimated time period for this study was six months.

4.2 Ethics

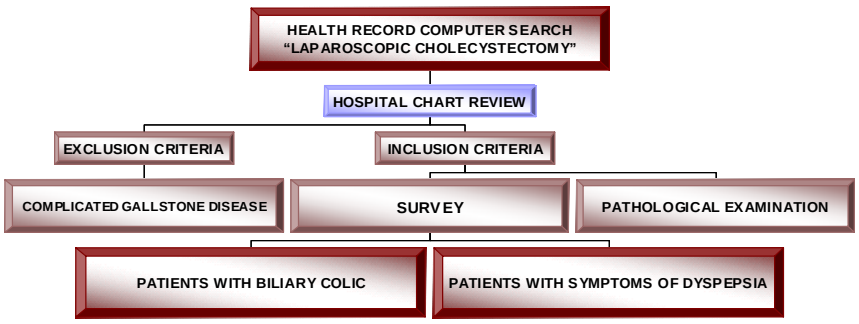
The study protocol was approved by the Biomedical Research Ethics Board at the University of Saskatchewan (Appendix E). An ethics application was submitted to the ethics committee. In addition, a study proposal, consent form, a letter from the treating surgeon, and the questionnaire were submitted concurrently. All patients were informed about the nature and objectives of the study and informed consent was obtained.

4.3 Patient Identification

A computer search by procedure, “laparoscopic cholecystectomy”, was performed by the Health Records Manager at the Royal University Hospital Health Records with the Saskatoon Health Region database. An advantage was that the specified group of interest was accessible in a timely and efficient manner. The Health Records Manager had exclusive access to the database

and this was a limitation as this was accessible during business hours only. The address of each patient obtained from the chart review may not have been the current address which was another limitation. The computer search identified patients who had laparoscopic cholecystectomy (key words) in Saskatoon from the period of January 2004 to June 2005. The follow-up period was January 2005 to June 2006. This search included all three hospitals in the Saskatoon Health Region: Royal University, St. Paul's, and City Hospital.

Figure 1: Study Design



4.3.1 Inclusion Criteria

All patients greater than 18 years of age, who had laparoscopic cholecystectomy in the Saskatoon Health Region, uncomplicated gallstone disease and patients with acute cholecystitis were included. Patients with uncomplicated gallstone disease were defined as biliary colic and cholelithiasis and those patients with acute cholecystitis were included. For this study, acute cholecystitis was defined as uncomplicated gallstone disease as there is a discrepancy in the preoperative clinical findings with intraoperative findings and microscopic examination of gallbladder specimens.

4.3.2 Exclusion Criteria

The exclusion criteria involved patients with complicated gallstone disease. Any one of the following were considered as complicated gallstone disease and were excluded: previous

common bile duct stones (choledocholithiasis), obstructive jaundice, cholangitis, gallstone pancreatitis, cholecystoenteric fistula, gallbladder neoplasm, previous biliary/pancreatic surgery, open cholecystectomy and previous gastric surgery.

4.4 Data Extraction

Medical charts from patients that had laparoscopic cholecystectomy in the Saskatoon Health Region were obtained from each hospital by computer search by procedure (laparoscopic cholecystectomy) and admitting diagnoses. Primary exclusion was done by excluding patients through the admitting diagnoses identified by the search (Figure 1). A survey of the charts was done by the author to apply the inclusion criteria and to complete the secondary exclusion. This group of patients was eligible for data abstraction. Then a questionnaire was mailed out to this patient group, based on the address derived from the patient's medical chart, from the University of Saskatchewan Department of Surgery with a description of the study, consent form and an accompanying letter supporting the study from the treating surgeon. The mailings and questionnaire was administered by an outside commercial business that ensured maintenance of confidentiality as a term of the agreement.

The chart review was used to obtain the data pertaining to the following variables: age, gender, preoperative ultrasound abdomen results, surgeon's preoperative and postoperative (intraoperative) diagnosis, type of surgery (urgent/emergent or elective) and surgical accession number.

4.5 The Survey Questionnaire

The survey (Appendix C) that was administered contained the validated dyspeptic score by Buckley et al. (17). This survey contained two aspects: before and after treatment. The questionnaire contained the following preoperative variables: duration of symptoms, frequency of

symptoms, gastroscopy (results and timing), Buckley's dyspeptic score, hospitalized with fever and gallbladder attack, medical history, and medication use (over the counter and prescribed). The postoperative variables were: time since laparoscopic cholecystectomy, satisfaction with surgery, visits to physicians, procedures (gastroscopy, ERCP), investigations (U/S or CT scan abdomen), medication use, diarrhea, and Buckley's dyspeptic symptom score items. The questionnaire also included questions that would determine if a patient had acute cholecystitis, or endoscopy for peptic ulcer disease. Patient satisfaction with the procedure was measured on a three point scale: not satisfied, satisfied or very satisfied. Complete cessation of symptoms was tabulated as a postoperative Buckley score of 6 or less.

4.5.1 Timing of Mailing

The first surveys were sent out and were followed by a second mailing approximately three weeks later. This was a reminder for subjects and to encourage participation to increase patient enrollment into the study. The dates of the study were extended to include those patients who had laparoscopic cholecystectomy during the period of August 2003 to December 2003 and June 2005 to October 2005 to increase enrollment. For those surveys that were returned to senders (sent back to author unopened), the phone book was used to identify a current address and then the survey was resent.

4.6 The Validated Dyspepsia Score

The information from the questionnaire provided a means to calculate the validated dyspepsia score. A five point Likert scale was used. The total Buckley symptom score is calculated by the sum of individual severity, frequency and duration scores for each of the following symptoms: epigastric pain, heartburn, belching/burping and bloating. Each item was scored on a scale:

severity 1-5, frequency 1-4, and duration 1-3. The preoperative and postoperative Buckley scores was calculated by simple addition of all item scores.

4.6.1 Identification of Patients with Dyspepsia

Using the validated dyspeptic score as defined by Buckley et al (17), a score of 16 or greater defined those patients with symptoms of dyspepsia. A score of 6 or less defined normal patients that were asymptomatic with respect to dyspepsia. As such, the study analysis used these two cut points.

4.7 Pathological Examination

Specimens were located based on surgical accession number derived from the medical chart review. An employee was hired from the pathology department to locate the specimens and provided them to the pathologist. These specimens were located at all three hospitals in the Saskatoon Health Region. The individual specimens were on individual slides with the surgical accession number as the only identifying information.

Microscopic pathological examination of all gallbladder specimens were done to identify gallbladder morphology by a single pathologist who was blinded to the early (original) pathological report and to the surgeon's diagnosis. In addition, the pathologist did not know the ultrasound and intraoperative findings. This was correlated with the preoperative ultrasound results later by the author.

4.7.1 Classification of Gallbladder Pathology

The classification of gallbladder pathology was standardized according to the following: acute cholecystitis, chronic cholecystitis and normal gallbladder. Acute cholecystitis included acute gangrenous cholecystitis and subacute cholecystitis. Chronic cholecystitis included cholesterolosis. This classification was used by the pathologist to review the gallbladder

specimens accordingly. This classification is most commonly used amongst most surgical textbooks and the literature.

4.8 Data Management

Data was recorded on paper (Appendix F) then entered into a computerized database (Microsoft Excel). Statistical analysis included a power analysis to determine sample size. To estimate sample size with an alpha error of 0.05 and a power of 90% (2 sided test), we would require a minimum of 59 subjects per group to detect a difference of 15% with respect to postoperative satisfaction in 2 groups. We estimate satisfaction from surgery for Group I to be 75% and 90% for Group II one year post laparoscopic cholecystectomy.

Paired Student's T-test was used for intragroup analyses. Independent Samples T-test was used to compare means for two groups. Pearson's Chi-square was used to test the significance of the relative frequencies of observed events that were measured as categorical outcomes. The McNemar test, a nonparametric test uses the chi-square distribution, was used to test changes in response for "before and after" designs. Wilcoxon Rank Sum test, a nonparametric analog of the paired T-test, was used to compare changes over time for outcomes measured on Likert (ordinal) scales. It is based on the order in which the observations from two samples fall. Sample size calculations were based on the literature and the pilot study (Appendix B). A p-value <0.05 was used to indicate a significant difference.

4.9 Response Rate Calculation

A variety of options are available for response rate calculations and these are summarized by the American Association of Public Research (AAOPI) (31). For the purpose of this study, the response rate calculation #5 (RR#5) as defined by the AAOPI (31) was used. It estimates that there are no eligible cases among those cases of unknown eligibility. As well, AAOPI define the

"not eligible" criteria for mail surveys to include those that are returned to senders. Therefore the calculation is as follows:

$$RR\#\ 5 = \frac{\text{Completed surveys}}{\text{Completed surveys + Non Responders + Refusals}} \quad (4.1)$$

This seems reasonable and was a conservative approach to a response calculation.

CHAPTER FIVE

RESULTS

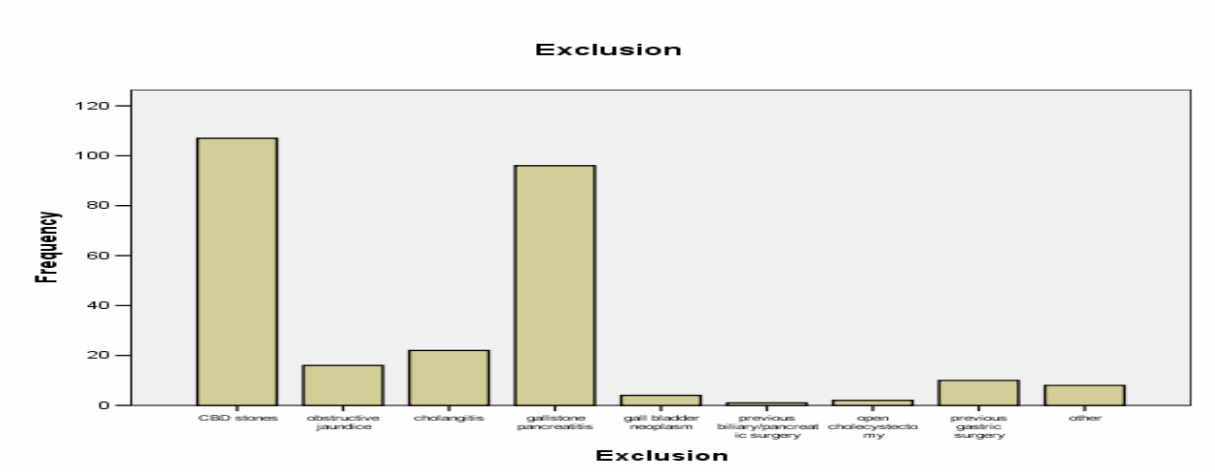
5.1. Surgeon Participation and Procedures

Eighteen out of 19 (95%) surgeons who perform laparoscopic cholecystectomy consented to participation in the study. From August 2003 to October 2005, there were 1208 laparoscopic cholecystectomies performed in the Saskatoon Health Region. One thousand one hundred and fifty-five medical charts were reviewed.

5.2 Description of Patients who were Excluded

In total, 266 (22.0%) patients were excluded based on primary and secondary exclusion criteria (Figure 2). The patients that were excluded had: 107 (40.2%) common bile duct stones (choledocholithiasis), 16 (6.0%) obstructive jaundice, 22 (8.3%) cholangitis, 96 (36.1%) gallstone pancreatitis, 4 (1.5%) gallbladder neoplasm, 1 (0.4%) previous biliary/pancreatic surgery, 2 (0.8%) open cholecystectomy, 10 (3.8%) previous gastric surgery, and 8 (3.0%) other.

Figure 2: Excluded Patients Based on Diagnosis



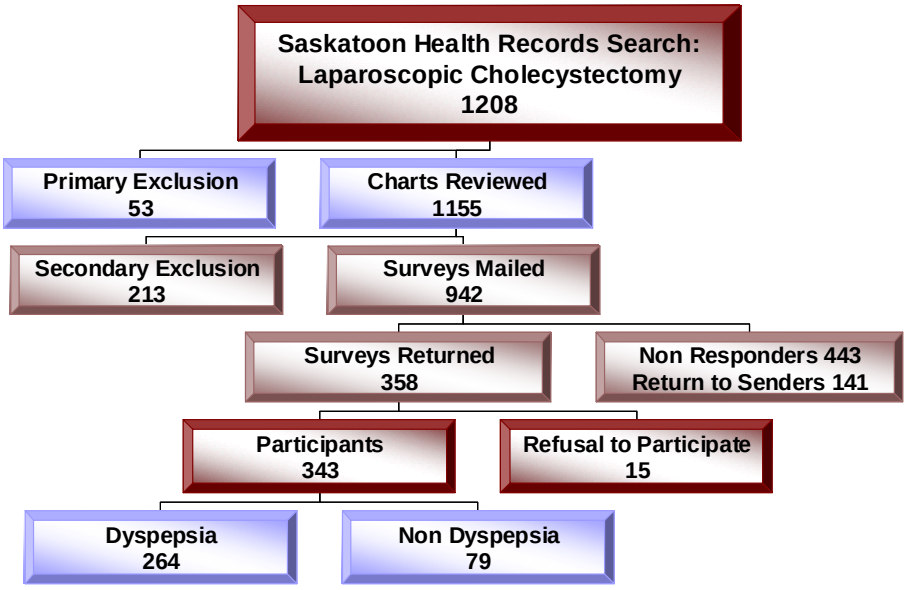
5.3 Survey Distribution and Response Rates

The study period was 5 months. After the primary exclusion criteria were applied, 1155 medical charts were reviewed and then the secondary exclusion criteria were applied. A total of 942 patients were eligible combining the first, second, and third mailings (Figure 3). Survey questionnaires were mailed to these patients. The number of surveys sent in the first round was 680. After 4 weeks, surveys were sent to those who did not respond. A total of 249 patients responded to the survey and were entered in the study after two mailings.

We expanded the dates to obtain more patients because we were short of our required sample size. A second computer search for laparoscopic cholecystectomy was done by health records for the following time periods: September 2003 to December 2003 and July 2005 to September 2005. Primary exclusion was done based on diagnoses and then a second chart review with secondary exclusion was completed by the author. A third mailing was sent after 1 month. Two hundred and sixty two surveys were mailed. After 4 weeks, surveys were sent again to those who did not respond (fourth mailing). For patients who were “return to senders”, current addresses were acquired from directories and were included in the fourth mailing. This yielded 9

additional study participants and a total of 94 additional patients were included in the study for a total of 343. A total of 15 patients refused to participate in the study. The total number of "return to senders" and non responders were 141 and 443 respectively. The "return to senders" are those that were mailed back by the postal service as undeliverable, therefore considered ineligible (out of scope). The total response rate was 42.8% with non responders included in the denominator.

Figure 3: Study Design Results



5.4 Nonresponder and Return to Senders compared to Study Participants

We compared the nonresponder patients' and the return to sender patients' data to the study participants in Table 1. From the table, the two groups are for the most part very similar except for age (p=0.008).

Table 1: Demographic and Clinical Data Comparison of Non Responders/Return to Senders (NR/RS) vs. Study Participants (SP)

Item	**NR/RS N=584**	**SP N=343**	**p-value***
Age	46.1 ±16.8	50.8 ±15.2	0.008
Gender			
Males	145 (24.8%)	93 (27.1%)	0.434
Females	439 (75.2%)	250 (72.9%)	
Results Preop U/S abdomen			0.731
Gallstones	484 (82.9%)	267 (77.6%)	
Acute chole	88 (15.1%)	59 (17.2%)	
No stones	4 (0.7%)	9 (2.6%)	
Type of Surgery			0.533
Emergent	126 (21.6%)	73 (21.2%)	
Elective	221 (37.8%)	130 (37.8%)	
Urgent	237 (40.6%)	140 (40.7%)	
Preoperative Diagnosis			0.458
Gallstones	133 (22.8%)	75 (21.8%)	
Biliary colic	294 (50.3%)	162 (47.1%)	
Acute chole	108 (18.5%)	69 (20.1%)	
Postoperative Diagnosis			0.635
Gallstones	127 (21.7%)	73 (21.2%)	
Biliary colic	290 (49.7%)	161 (46.8%)	
Acute chole	111 (19.0%)	71 (20.6%)	

*Pearson Chi square test except for Age (Independent Student's t-test)

5.5 Characteristics of Study Groups

Characteristics of all study participants are displayed in Table 2. The mean age of the study participants was 50.8 years (range: 18-90). The majority of the study sample consisted of females (72.7%). Most patients (97.4%) had gallstones on ultrasound. One hundred and forty one (41.1%) patients experienced diarrhea after surgery.

Table 2: Demographic and Clinical Data of all Patients

Characteristic	Patients N=343
Age	50.8 ±15.2
Gender	
Male	93 (27.1%)
Female	250 (72.7%)
Duration of symptoms (months)	32.4 ±66.5
Preop Gastroscopy	65 (18.9%)
Results for Preop Gastroscopy:	
Abnormal	35 (10.2%)
Normal	29 (8.4%)
Hospitalized with fever and GB episode	36 (13.6%)
Medical history	
DM	25 (7.3%)
CAD	26 (7.6%)
Stroke	4 (1.2%)
Results for Preop U/S abdomen:	
Gallstones	267 (77.6%)
Acute chole	59 (17.2%)
No stones	9 (2.6%)
Type of surgery:	
Emergent	73 (21.2%)
Urgent	130 (37.8%)
Elective	140 (40.7%)
Preop Diagnosis	
Gallstones	75 (21.8%)
Biliary colic	162 (47.1%)
Acute chole	69 (20.1%)
Postop Diagnosis	
Gallstones	73 (21.2%)
Biliary colic	161 (46.8%)
Acute chole	71 (20.6%)
Timing of surgery from onset of symptoms:	
12 months	78 (22.7%)
18 months	112 (32.6%)
24 months	142 (41.3%)
36 months	9 (2.6%)
Satisfaction	
Not satisfied	18 (5.2%)
Satisfied	99 (28.8%)
Very Satisfied	224 (65.1%)
Diarrhea (Postop)	141 (41.1%)
Pathology (microscopic)	
Acute chole	194 (56.4%)
Chronic chole	117 (34.0%)
Normal	31 (9.0%)

The two groups: Patients with gallstones and symptoms of dyspepsia (Group I) and those patients with gallstones and without symptoms of dyspepsia (Group II) are compared in Table 3. Two hundred and sixty four patients (77.0%) were in Group I and 79 patients (23.0%) were in Group II. There was no statistically significant difference between the two groups in terms of age, gender, duration of symptoms, preoperative gastroscopy, past medical history, urgency and timing of surgery. After surgery, there was a statistical difference in patients having postoperative diarrhea in Group I (45.5%) compared to Group II (26.6%) ($p<0.001$).

Table 3: Demographics and Clinical Data of Group I patients (Dyspeptic) and Group II (Non Dyspeptic)

Characteristic	Group I N=264	Group II N=79	p-value*
Age	51.1 ±15.6	49.8 ± 13.8	0.25
Gender			
Male	67 (25.4%)	26 (32.9%)	0.43
Females	197 (74.6%)	53 (67.1%)	
Duration of symptoms (months)	36.4 ±71.5	19.2 ±43.8	0.10
Preoperative Gastroscopy	56 (21.2%)	9 (11.4%)	0.542
Abnormal	29 (11.0%)	6 (7.6%)	
Normal	26 (9.8%)	3 (3.8%)	
Hospitalized with fever and GB episode	36 (13.6%)	12 (15.2%)	<0.001
Medical history			0.283
Diabetes Mellitus	18 (6.8%)	7 (8.9%)	
Coronary Artery Disease	18 (6.8%)	8 (10.1%)	
Stroke	4 (1.5%)	0	
Preoperative U/S			0.108
Gallstones	201 (76.1%)	66 (83.5%)	
Acute cholecystitis	49 (18.6%)	10 (12.7%)	
Surgery			0.420
Emergent	55 (20.8%)	18 (22.8%)	
Urgent	104 (39.4%)	26 (32.9%)	
Elective	105 (39.8%)	35 (44.3%)	
Preoperative Diagnosis			0.783
Gallstones	55 (20.8%)	18 (22.8%)	
Biliary colic	123 (46.2%)	39 (49.4%)	
Acute cholecystitis	57 (21.6%)	12 (15.2%)	
Postoperative Diagnosis			0.581
Gallstones	55 (20.8%)	18 (22.8%)	
Biliary colic	122 (46.2%)	39 (49.4%)	
Acute cholecystitis	59 (22.3%)	12 (15.2%)	
Timing of surgery			0.571
12 months	62 (23.5%)	16 (20.3%)	
18 months	84 (31.8%)	29 (36.7%)	
24 months	109 (41.3%)	33 (41.8%)	
36 months	8 (3.0%)	1 (1.3%)	
Satisfaction			0.738
Not satisfied	15 (5.7%)	3 (3.8%)	
Satisfied	85 (32.3%)	14 (17.7%)	
Very Satisfied	162 (61.4%)	62 (78.5%)	
Diarrhea Postoperative	120 (45.5%)	21 (26.6%)	<0.001
Pathology			0.108
Acute cholecystitis	143 (54.2%)	51 (64.6%)	
Chronic cholecystitis	99 (37.5%)	18 (22.8%)	
Normal	21 (8.0%)	10 (12.7%)	

*Chi square test except for Age, Duration of symptoms (independent student's t-test); Diarrhea and Hospitalization with fever and GB episode (McNemar Chi Square test)

5.6 Comparison of Total Preoperative to Total Postoperative Buckley Scores

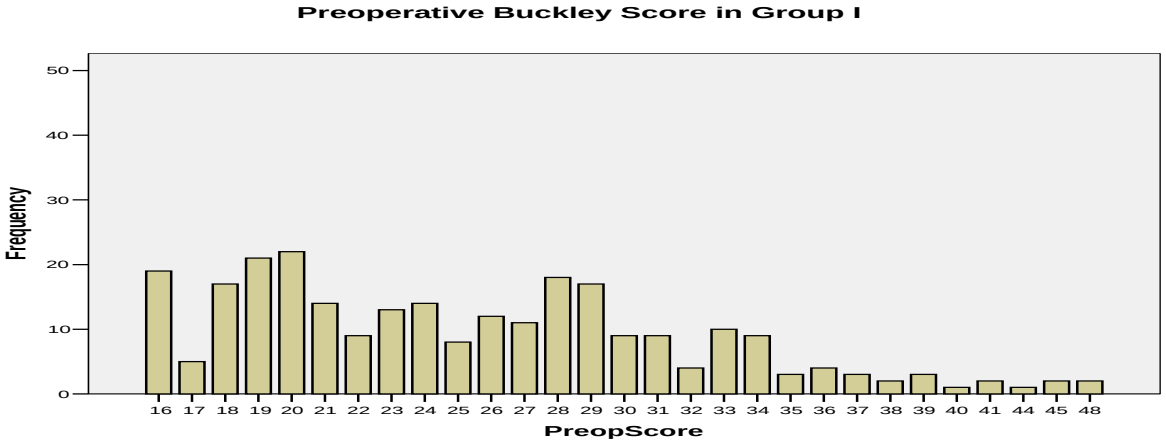
Mean cumulative scores of each group are shown in Table 4. For both groups, there was a substantial change in scores between the preoperative and postoperative Buckley scores which was statistically significant (p-value 0.001). Figures 4 and 5 show the distribution of Buckley scores before and after surgery for Group I and Group II. These figures reinforce visually the substantial change in scores between the preoperative and postoperative Buckley scores for both groups. Figure 5b, shows that 44 patients (55.7%) in Group II had postoperative scores less than 6.

Table 4a: Comparison of Buckley Total Scores: Preoperative vs. Postoperative (Group I) - Median, (Mode)

	Group I		p-value*
Item	**Preop**	**Postop**	
Scores	24 (20)	12 (4)	0.001

* Paired Student's T-test

Figures 4: Total Preoperative and Postoperative Buckley Scores for Group I



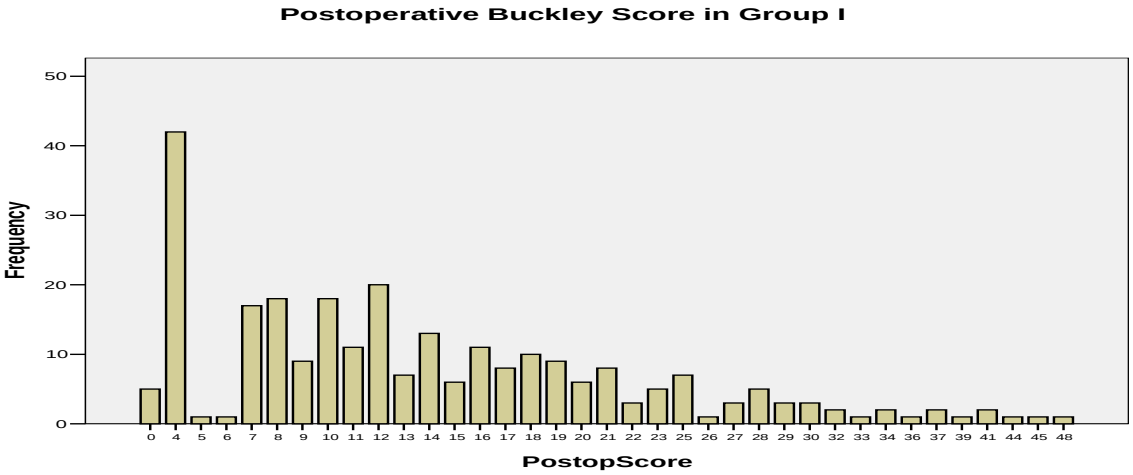
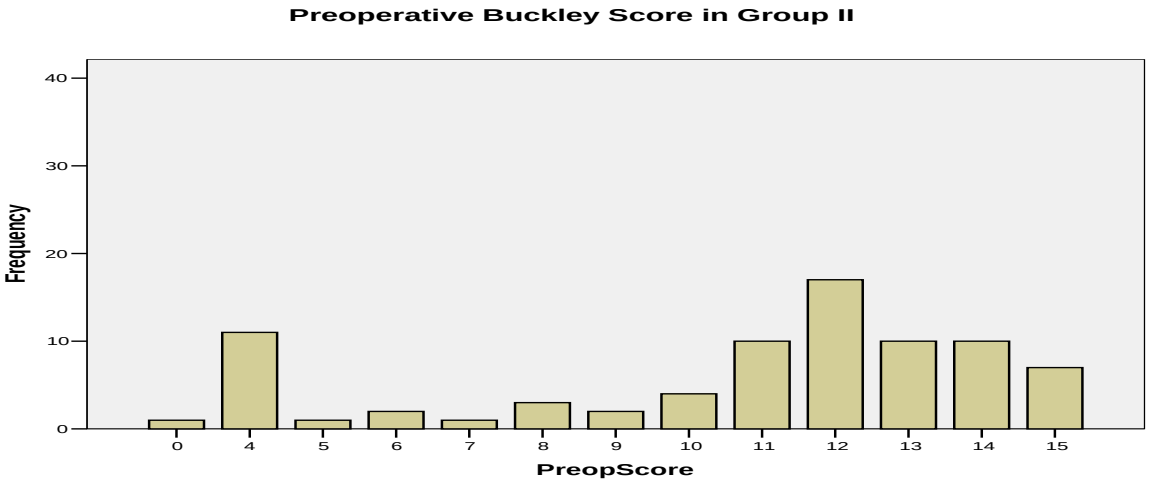


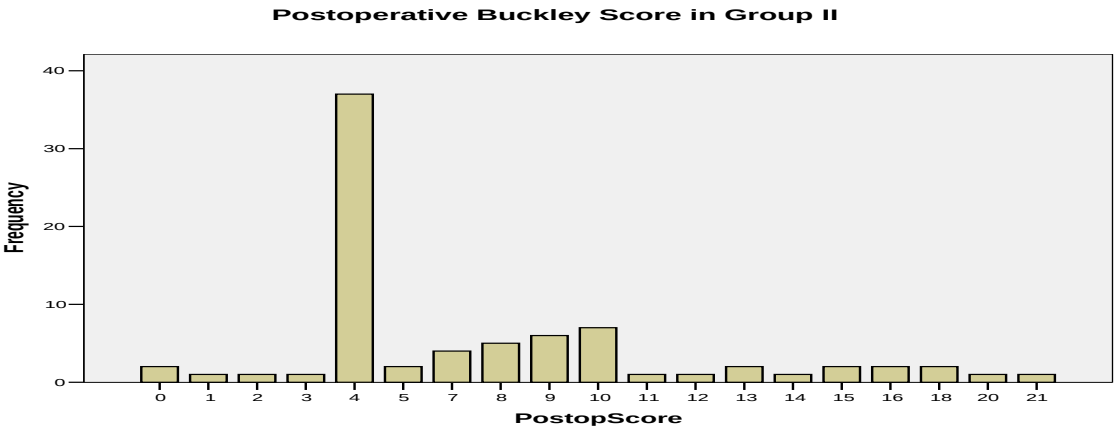
Table 4b: Comparison of Buckley Total Scores: Preoperative vs Postoperative (Group II) - Median, (Mode)

	Group II		p-value*
Item	**Preop**	**Postop**	
Scores	12 (12)	4 (4)	0.001

* Paired Student's T-test

Figure 5: Total Preoperative and Postoperative Buckley Scores for Group II





5.7 Analysis of Group I (Dyspeptic) Buckley scores and Satisfaction after Surgery

Table 5 shows the distribution of patients in Group I classified based on postoperative Buckley scores less than or equal to 6 and larger than 6. The majority of patients (81.4%) in Group I had scores larger than 6 after surgery.

Table 5: Buckley Postoperative Scores in Group I (Dyspeptic)

Buckley Postop Scores in Group I (Dyspeptic)

Score		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=6	49	18.6	18.6	18.6
	>6	215	81.4	81.4	100.0
	Total	264	100.0	100.0	

Table 6a: Buckley Postoperative Scores in Group I (Dyspeptic)

Buckley Postop Scores in Group I (Dyspeptic)

Score		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-6	49	18.6	18.6	18.6
	7-15	119	45.1	45.1	63.6
	16-48	96	36.4	36.4	100.0
	Total	264	100.0	100.0	

Table 6b: Satisfaction After Surgery in Group I (Dyspeptic)

Satisfaction in Group I (Dyspeptic)

Satisfaction		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no answer	2	.8	.8	.8
	not satisfied	15	5.7	5.7	6.4
	Satisfied/very satisfied	247	93.6	93.6	100.0
	Total	264	100.0	100.0	

The majority of patients in Group I did not achieve complete symptomatic relief 1 year after surgery as defined by a postoperative Buckley score of less than 6 (Figure 4, Tables 5,6a). Only 18.6% of Group I patients achieved a Buckley score between 0 and 6 after laparoscopic cholecystectomy. Thirty six percent of Group I patients were still dyspeptic (scores>16) 1 year after laparoscopic cholecystectomy. However, the majority, 179 patients (67.8%) had Buckley scores of 16 or less after surgery (Table 6a). Based on satisfaction 1 year after surgery (Table 6b), 93.6% of Group I patients were either satisfied or very satisfied.

5.8 Comparison of Preoperative to Postoperative Buckley Scores for each Symptom

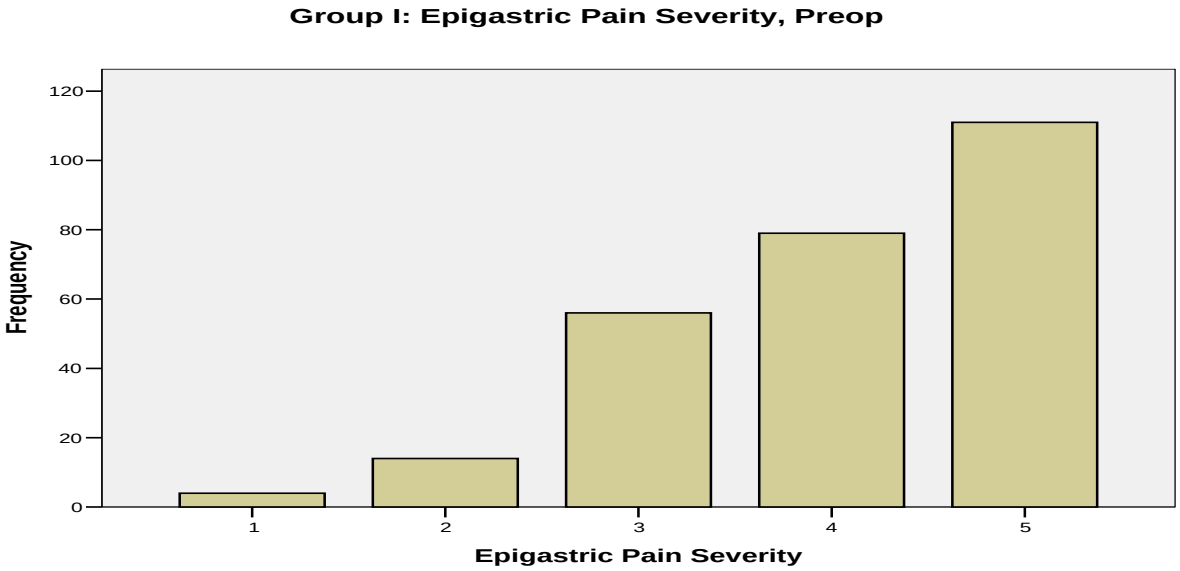
Tables 7 (Figures 6-17) and 8 (Figures 18-29) show the before and after surgery Buckley scores for each symptom for Groups I and II. Group I patients were found to have a significant improvement in all the symptoms: epigastric pain, heartburn, belching/burping and bloating ($p<0.001$). For the patients in Group II, epigastric pain in terms of severity, frequency and duration decreased after surgery and this was statistically significant ($p<0.001$). The other symptoms: heartburn, belching/burping and bloating were not significantly different before and after surgery.

Table 7: Comparison of Buckley scores for Group I: Dyspeptic (median values)

Item	Preop	Postop	*p-value	see Figure
Epigastric pain				
Severity	4	1	<0.001	6
Frequency	1	0	<0.001	7
Duration	3	0	<0.001	8
Heartburn				
Severity	3	2	<0.001	9
Frequency	1	1	<0.001	10
Duration	2	1	<0.001	11
Belching/Burping				
Severity	2	2	<0.001	12
Frequency	1	1	<0.001	13
Duration	1	1	<0.001	14
Bloating				
Severity	3	1	<0.001	15
Frequency	1	0	<0.001	16
Duration	2	0	<0.001	17

*Wilcoxon Rank Sum test

Figure 6: Comparison of Buckley Preoperative and Postoperative scores for Epigastric Pain Severity - Median Values: Group I (Dyspeptic)



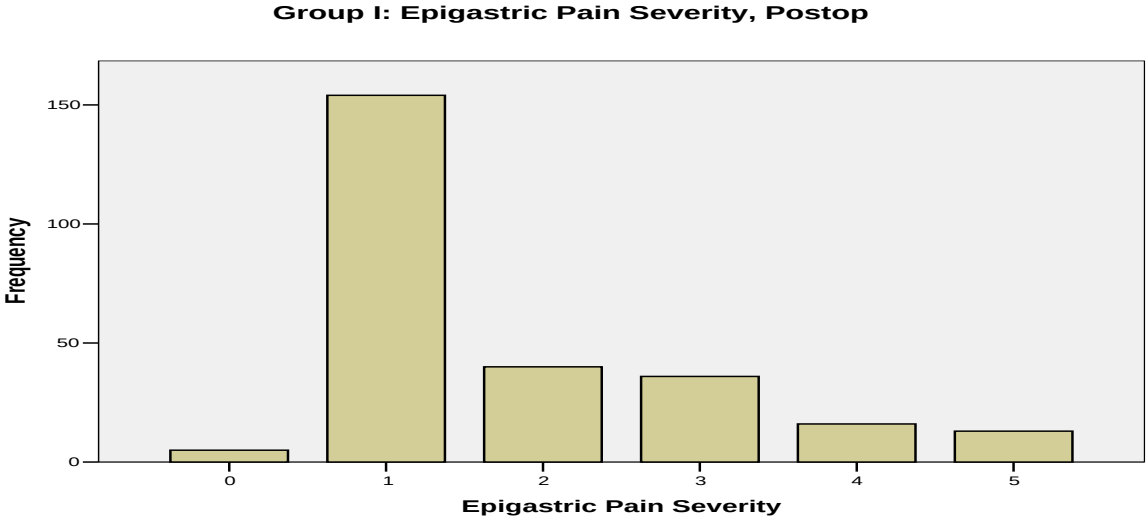
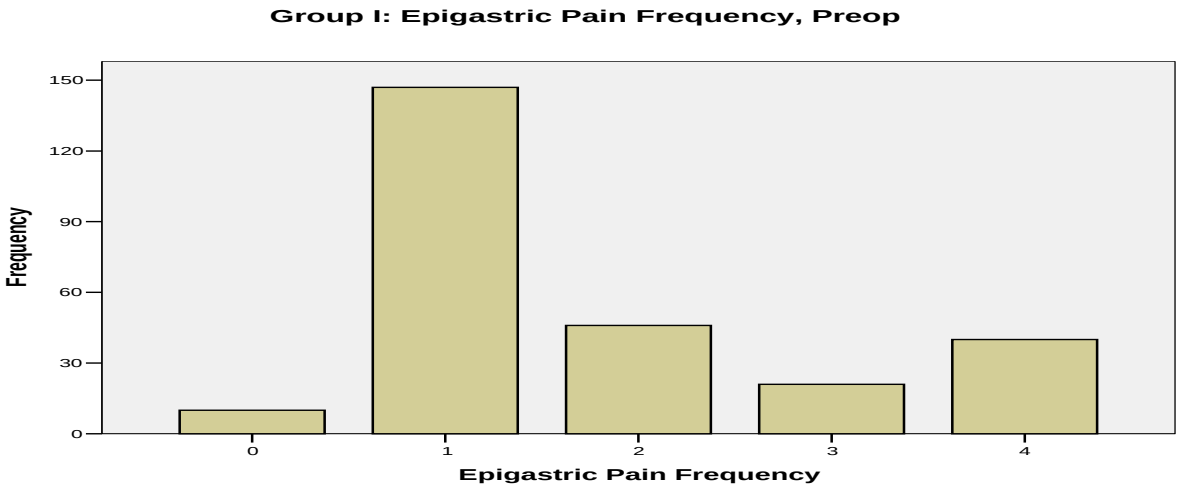


Figure 7: Comparison of Buckley Preoperative and Postoperative scores for Epigastric Pain Frequency - Median Values: Group I (Dyspeptic)



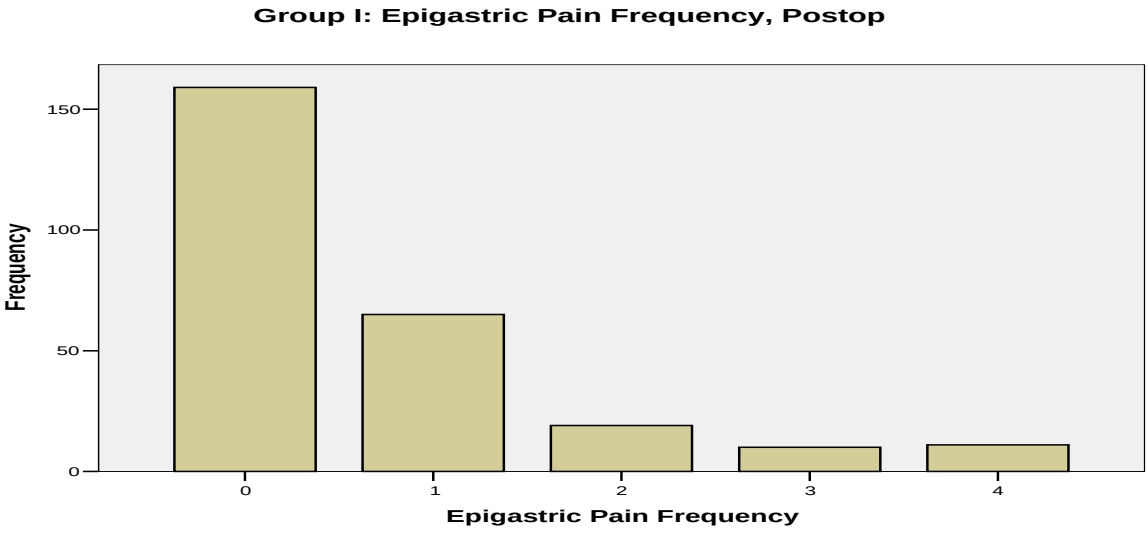
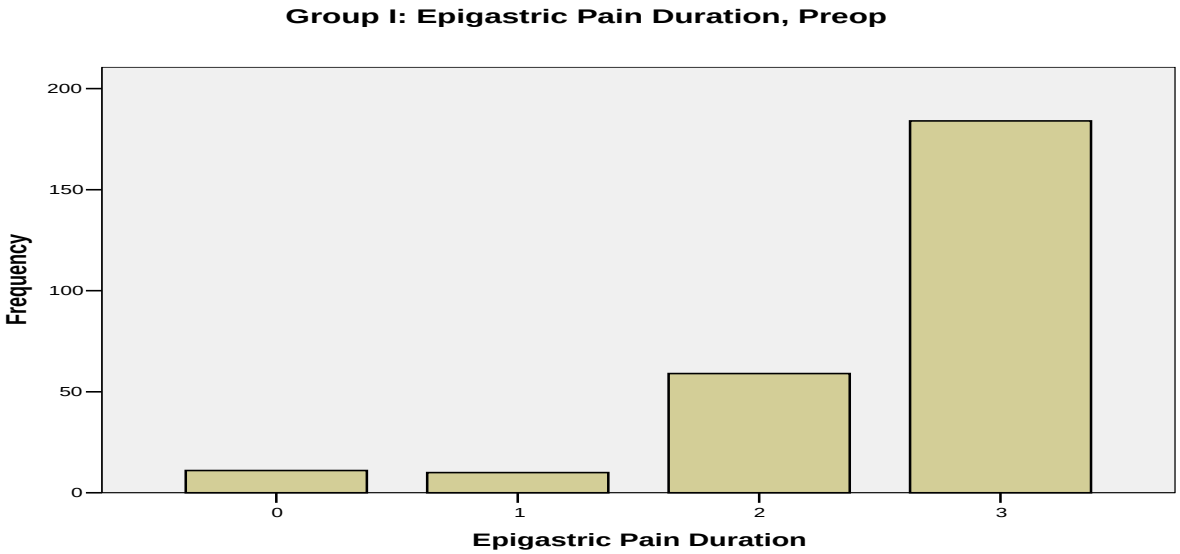


Figure 8: Comparison of Buckley Preoperative and Postoperative scores for Epigastric Pain Duration - Median Values: Group I (Dyspeptic)



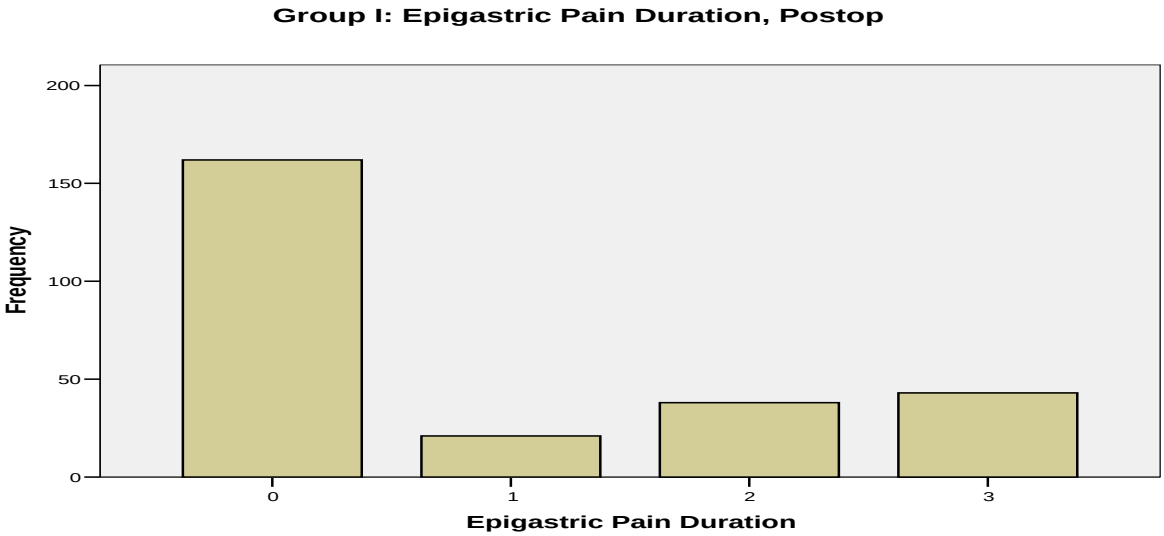
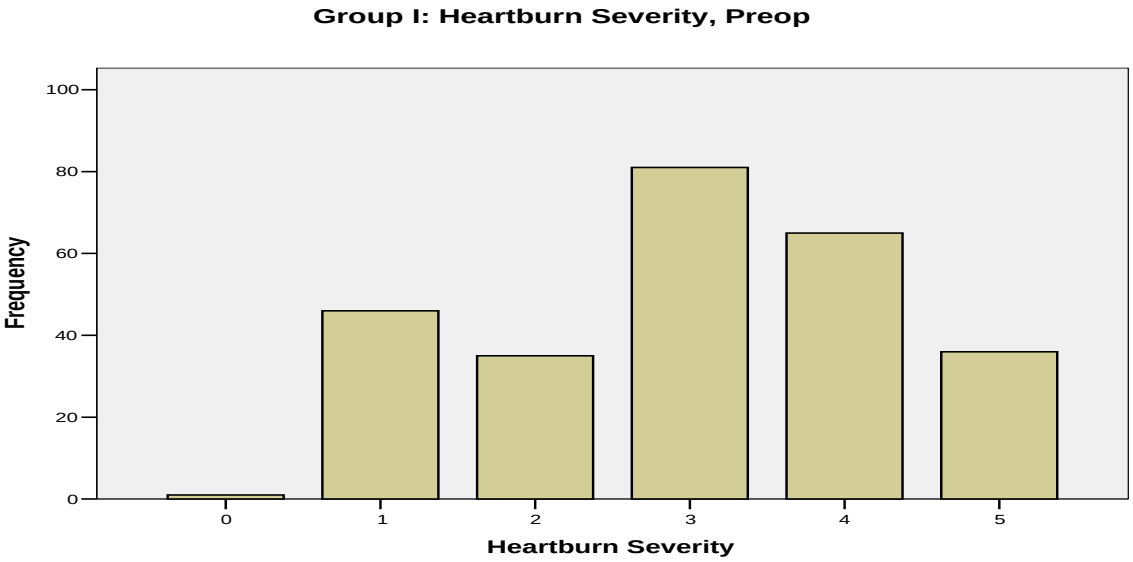


Figure 9: Comparison of Buckley Preoperative and Postoperative scores for Heartburn Severity - Median Values: Group I (Dyspeptic)



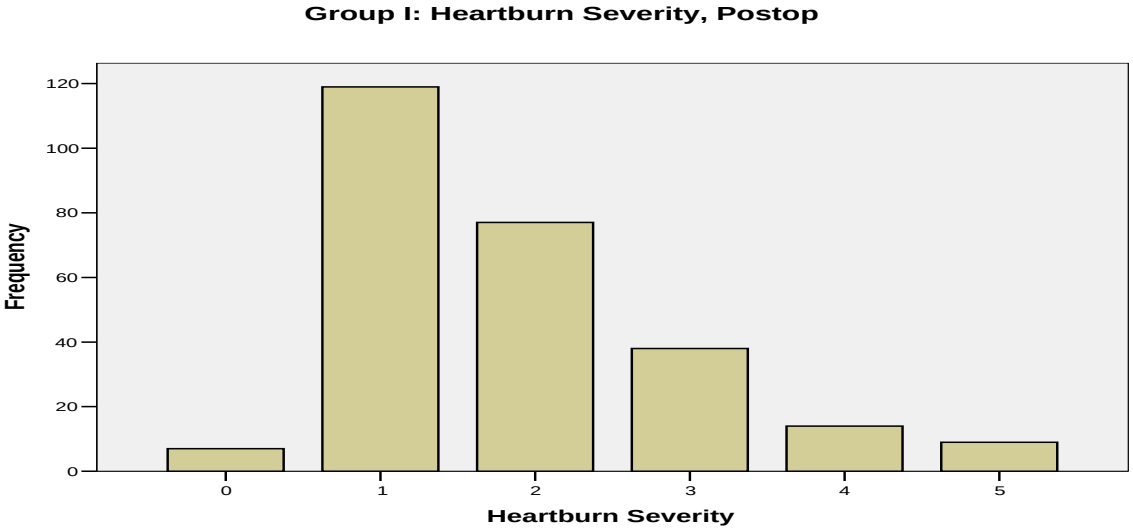
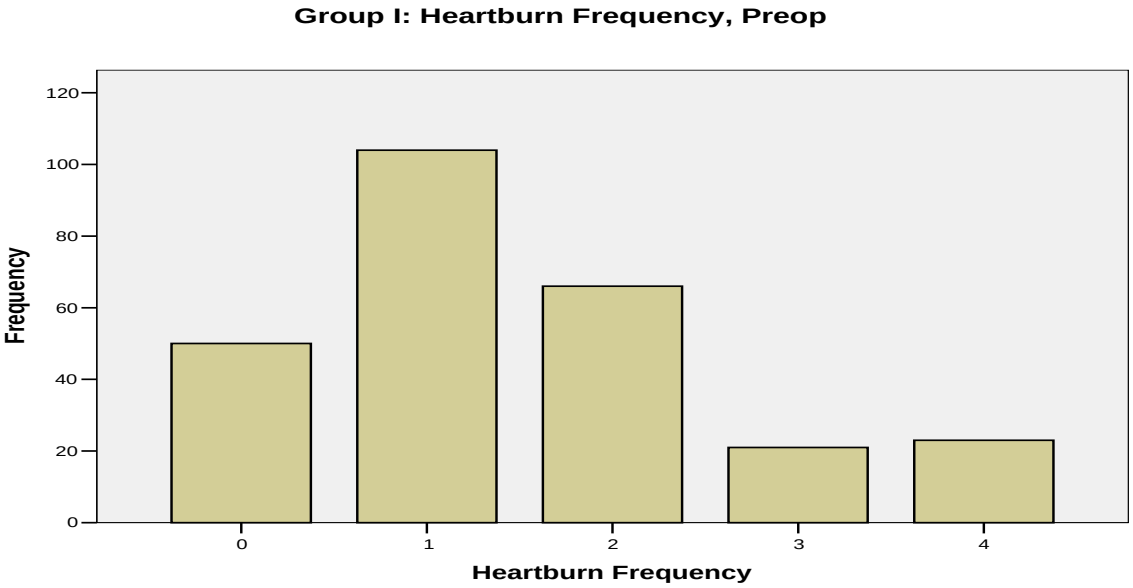


Figure 10: Comparison of Buckley Preoperative and Postoperative scores for Heartburn Frequency - Median Values: Group I (Dyspeptic)



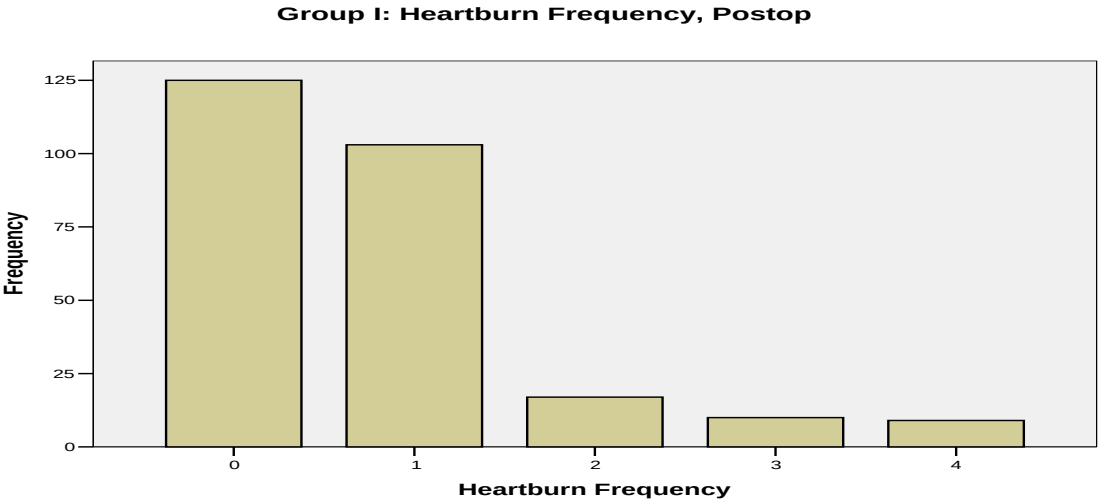
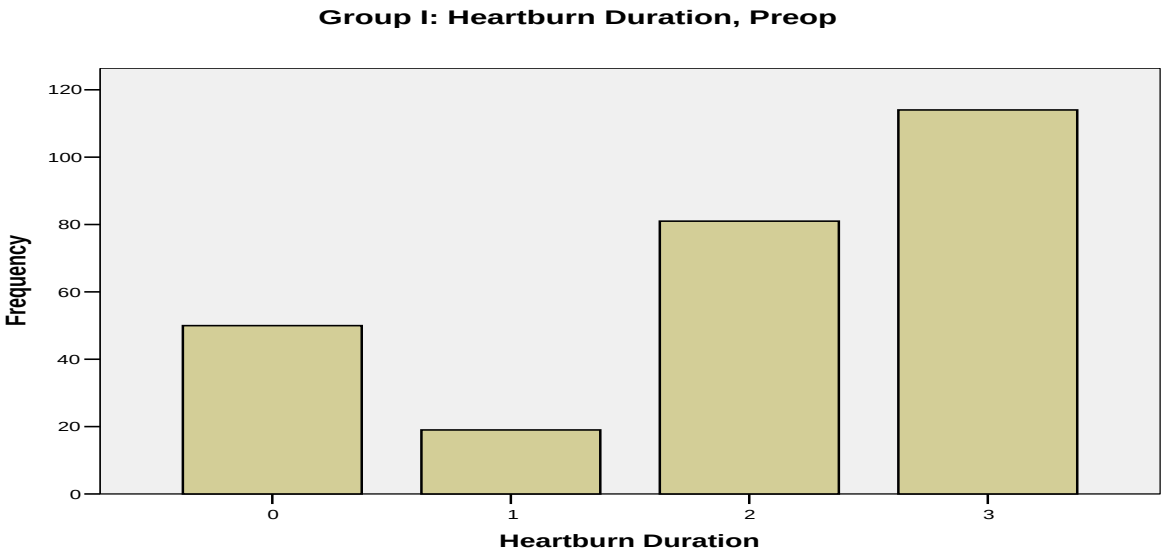


Figure 11: Comparison of Buckley Preoperative and Postoperative scores for Heartburn Duration - Median Values: Group I (Dyspeptic)



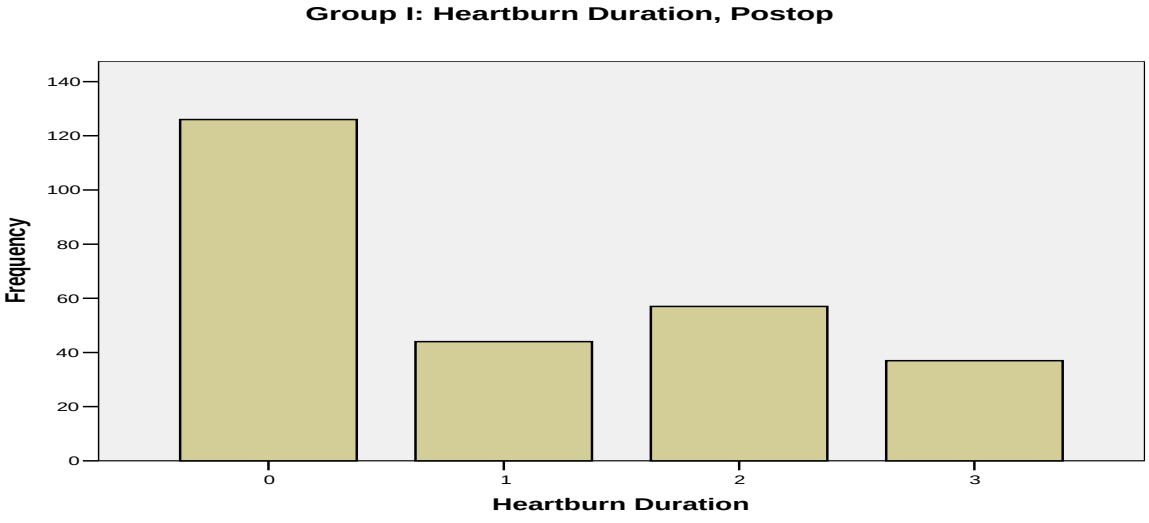
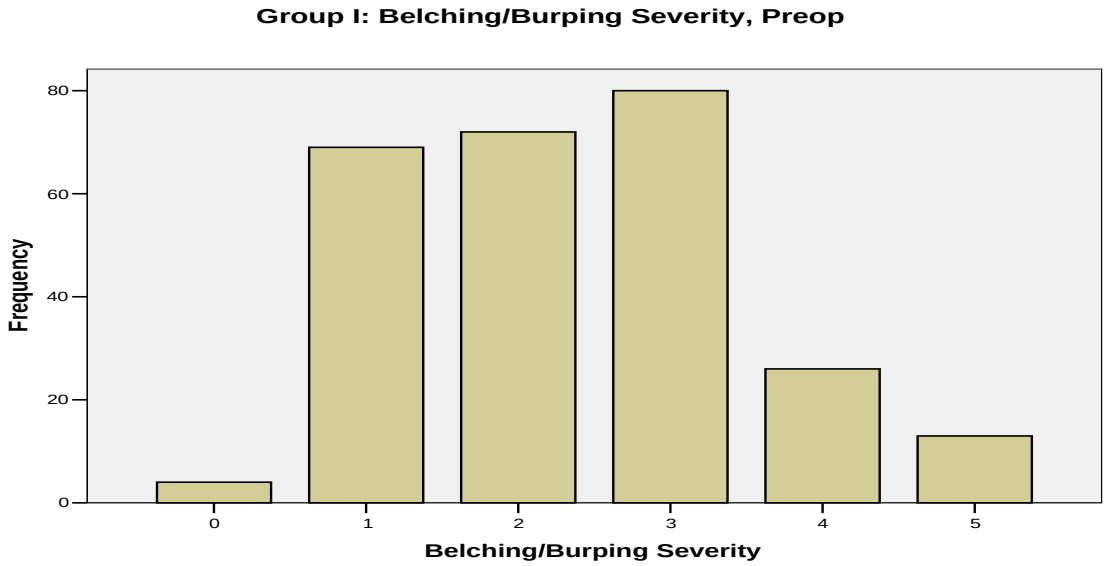


Figure 12: Comparison of Buckley Preoperative and Postoperative scores for Belching/Burping Severity - Median Values: Group I (Dyspeptic)



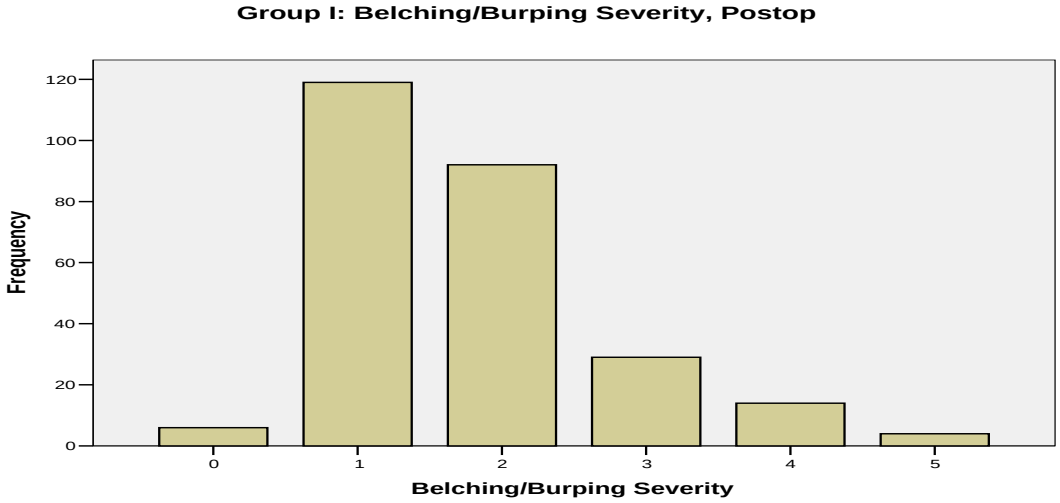
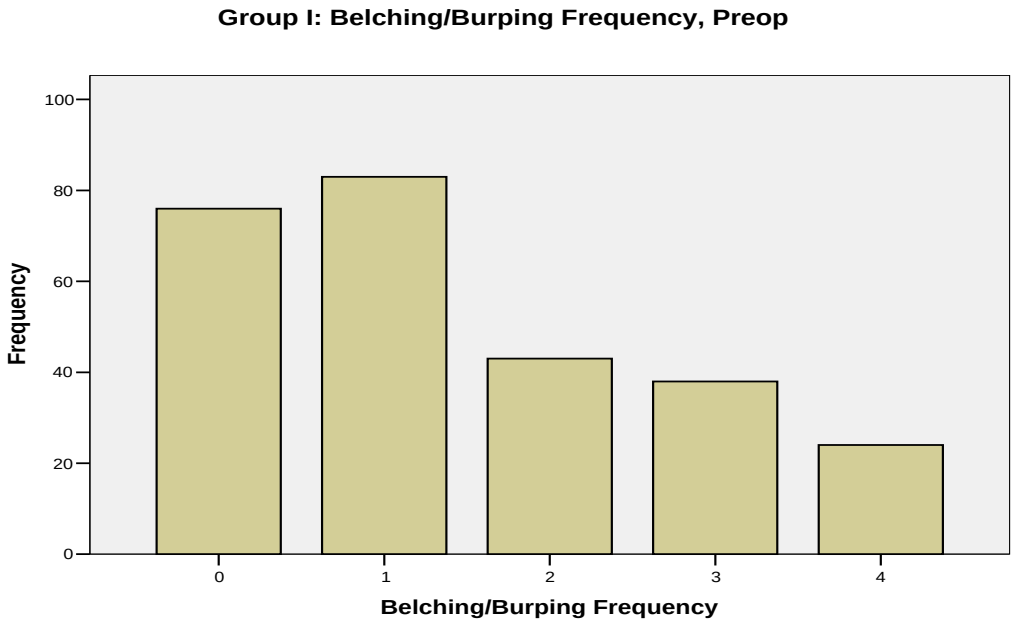


Figure 13: Comparison of Buckley Preoperative and Postoperative scores for Belching/Burping Frequency- Median Values: Group I (Dyspeptic)



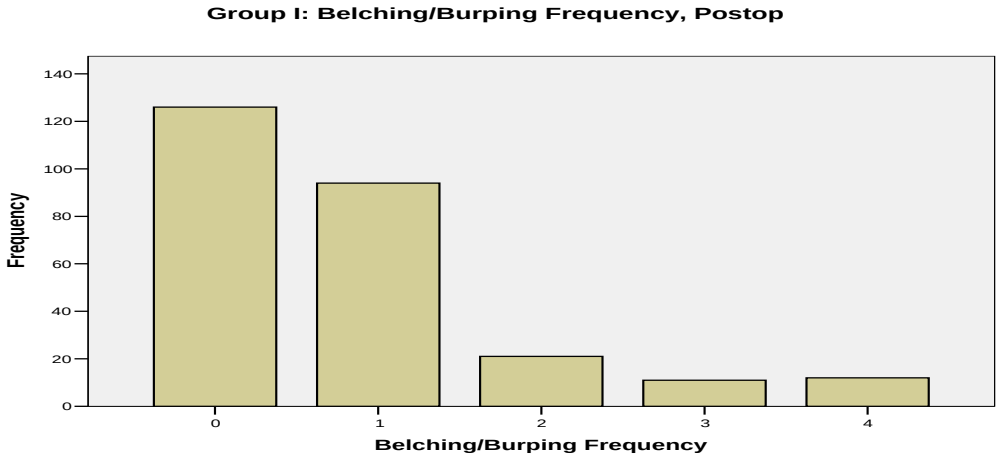
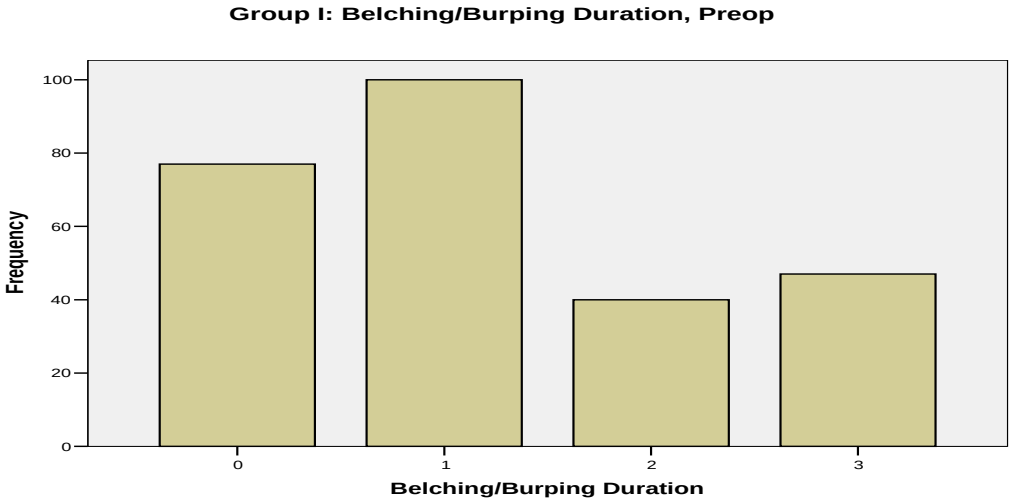


Figure 14: Comparison of Buckley Preoperative and Postoperative scores for Belching/Burping Duration - Median Values: Group I (Dyspeptic)



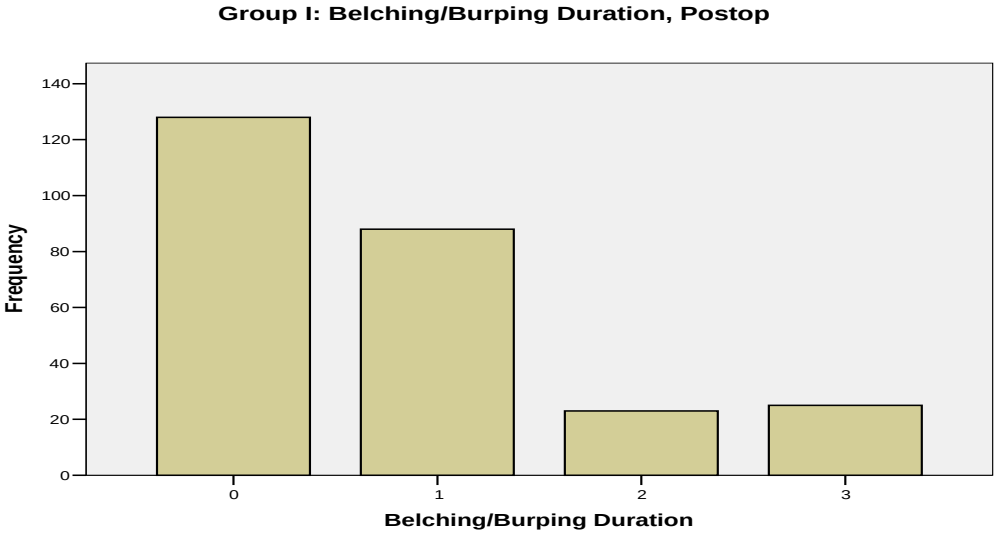
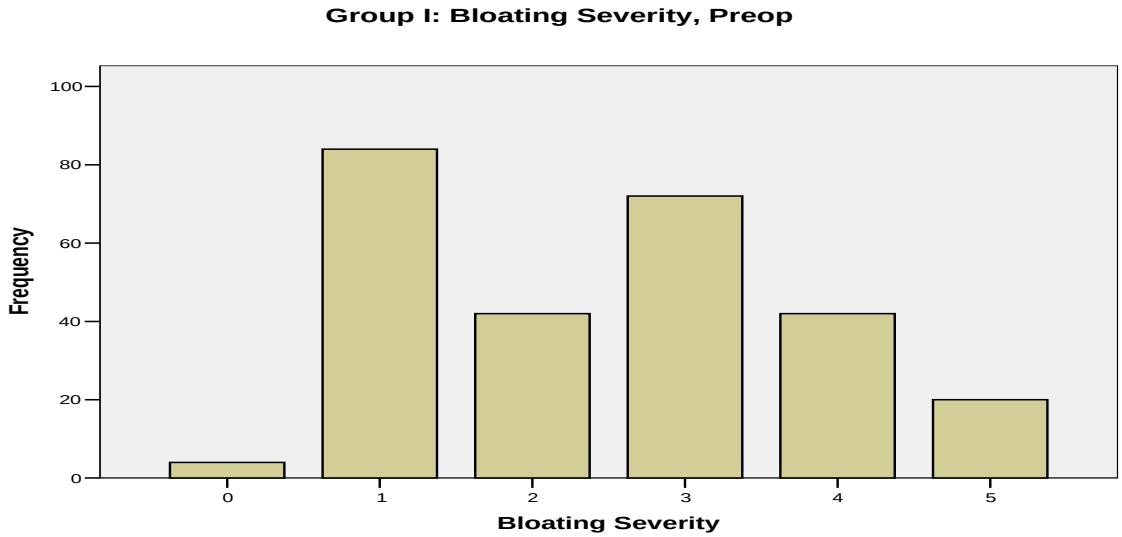


Figure 15: Comparison of Buckley Preoperative and Postoperative scores for Bloating Severity - Median Values: Group I (Dyspeptic)



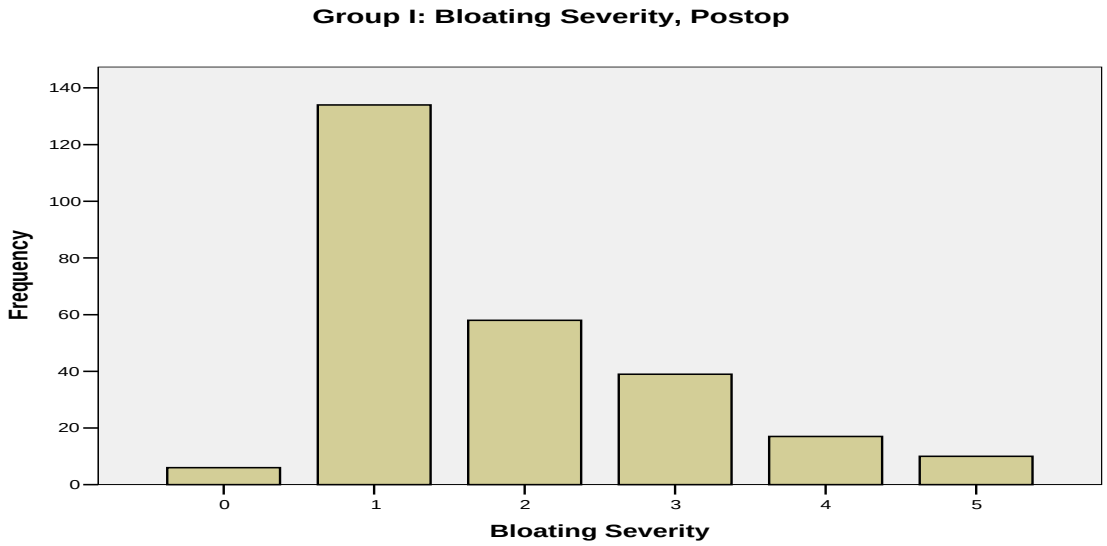
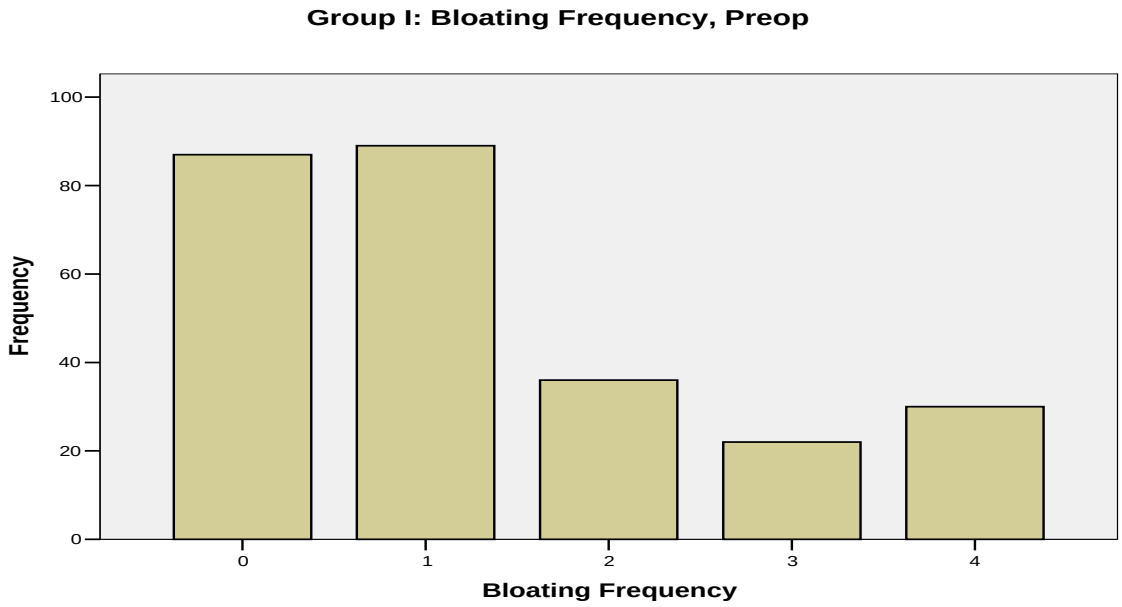


Figure 16: Comparison of Buckley Preoperative and Postoperative scores for Bloating - Median Values: Group I (Dyspeptic)



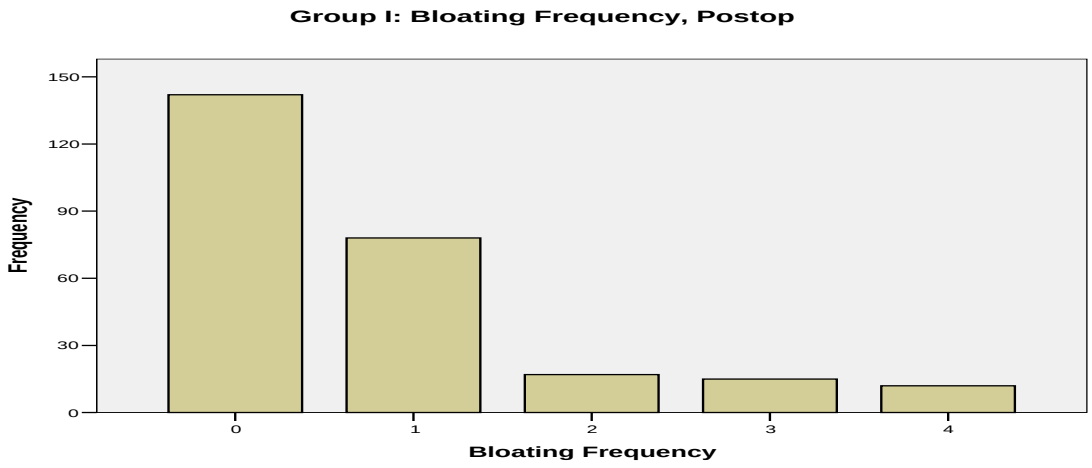
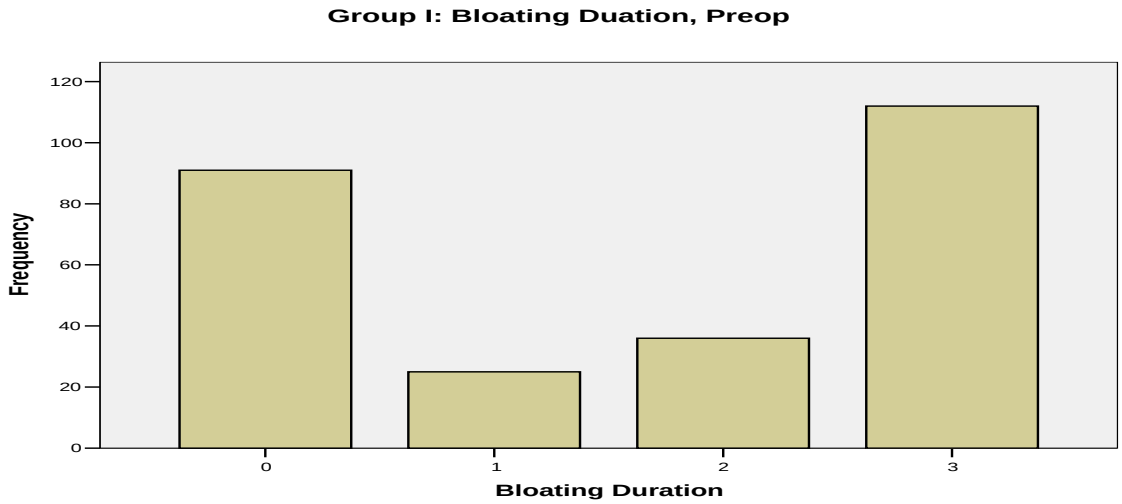


Figure 17: Comparison of Buckley Preoperative and Postoperative scores for Bloating Duration - Median Values: Group I (Dyspeptic)



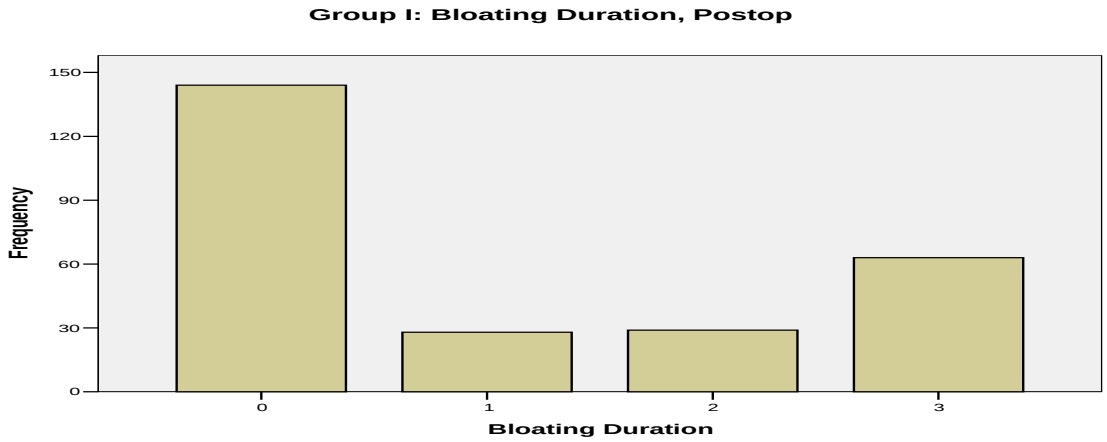
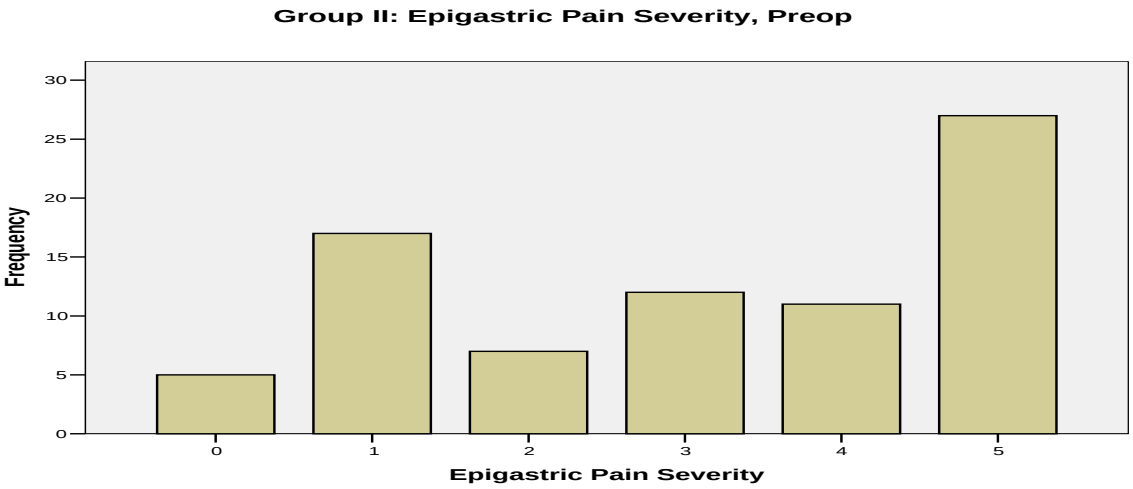


Table 8: Comparison of Buckley scores for Group II: Non Dyspeptic (median values)

Item	Preop	Postop	*p-value	see Figure
Epigastric Pain				
Severity	3	1	0.001	18
Frequency	1	0	0.001	19
Duration	2	0	0.001	20
Heartburn				
Severity	1	1	0.71	21
Frequency	0	0	0.36	22
Duration	0	0	0.30	23
Belching/Burping				
Severity	1	1	0.35	24
Frequency	0	0	0.46	25
Duration	0	0	0.11	26
Bloating				
Severity	1	1	0.10	27
Frequency	0	0	0.33	28
Duration	0	0	0.18	29

*Wilcoxon Rank Sum test

Figure 18: Comparison of Buckley Preoperative and Postoperative scores for Epigastric Pain Severity- Median Values: Group II (Non Dyspeptic)



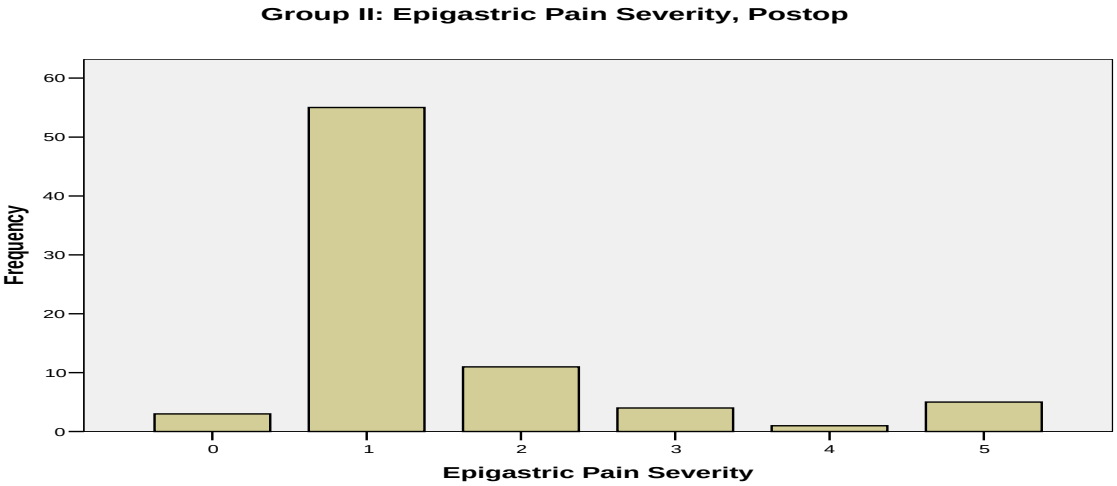
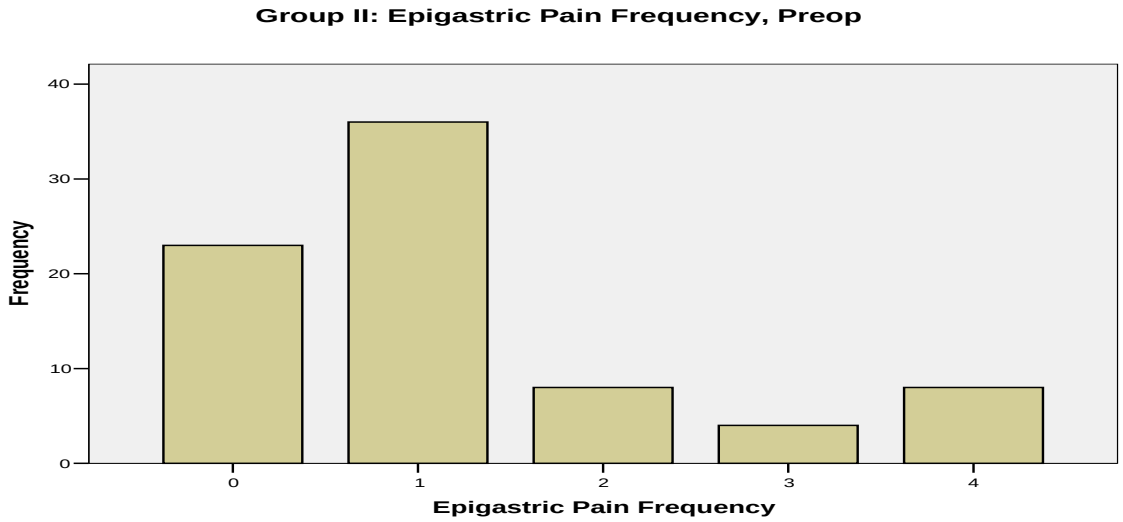


Figure 19: Comparison of Buckley Preoperative and Postoperative scores for Epigastric Pain Frequency- Median Values: Group II (Non Dyspeptic)



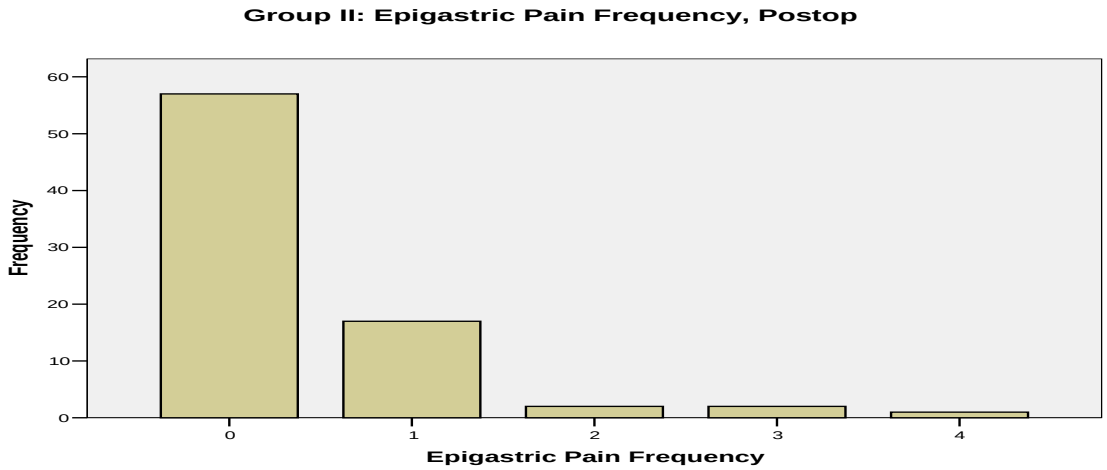
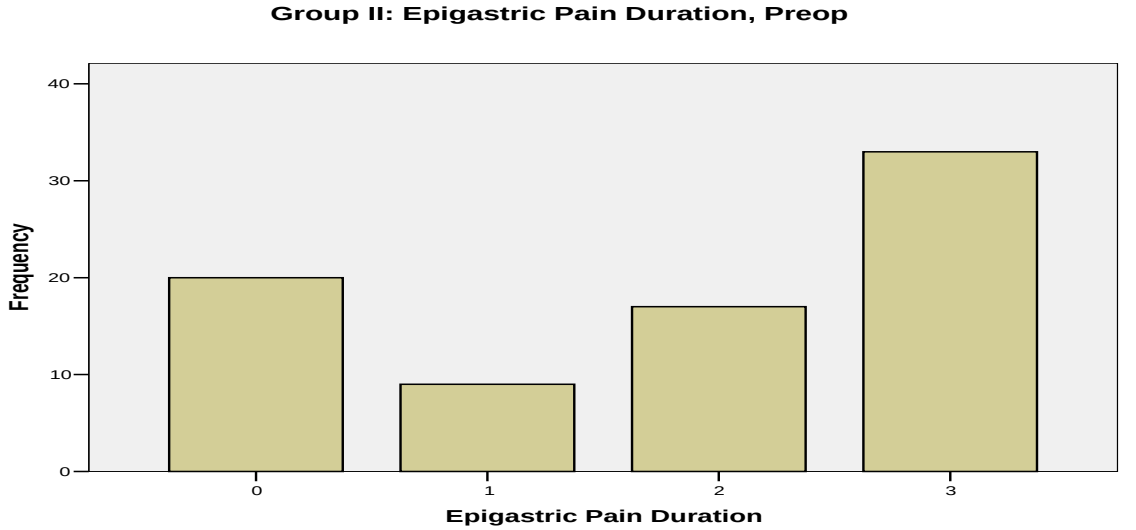


Figure 20: Comparison of Buckley Preoperative and Postoperative scores for Epigastric Pain Duration- Median Values: Group II (Non Dyspeptic)



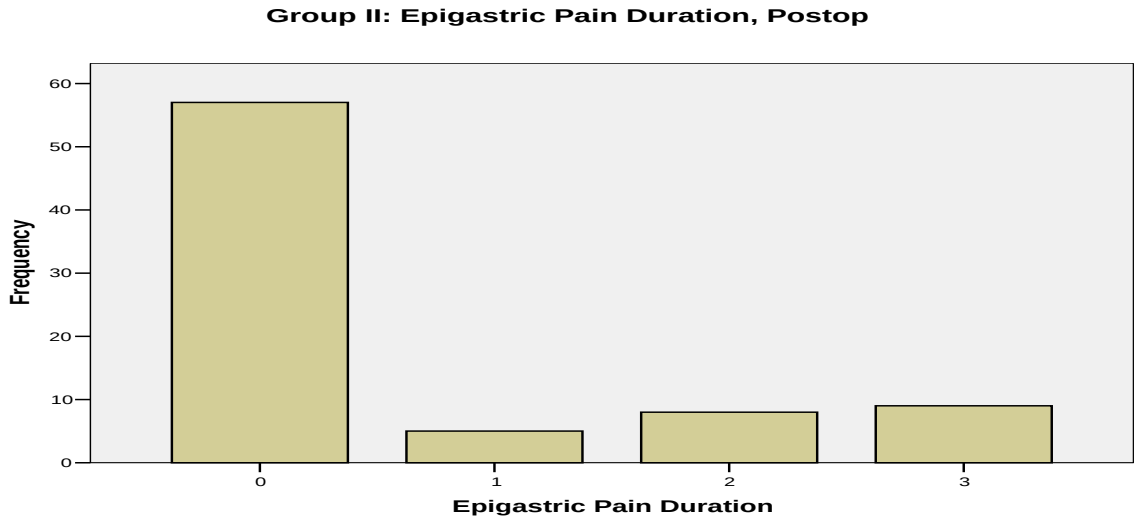
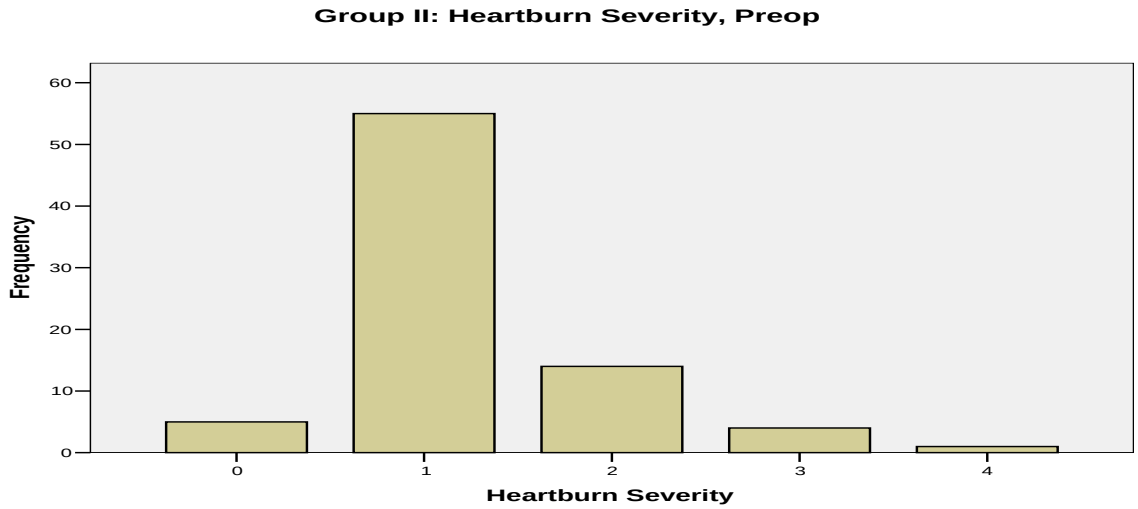


Figure 21: Comparison of Buckley Preoperative and Postoperative scores for Heartburn Severity- Median Values: Group II (Non Dyspeptic)



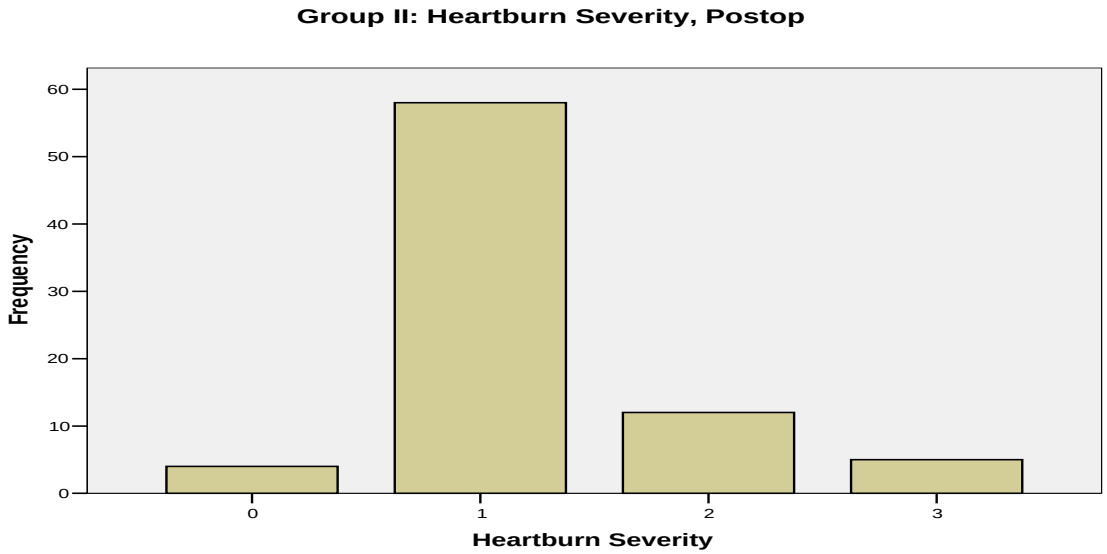
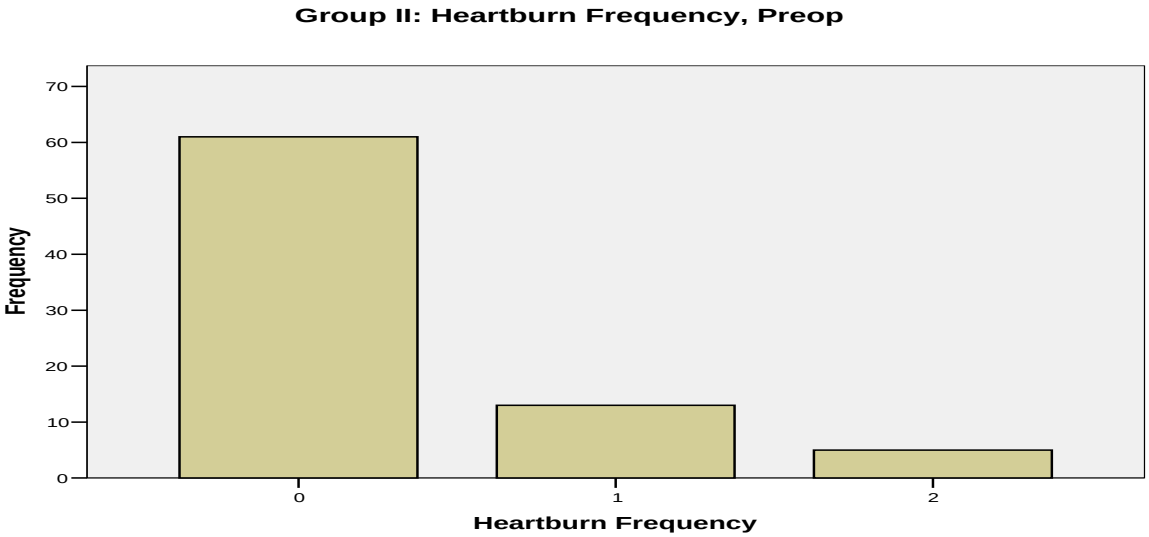


Figure 22: Comparison of Buckley Preoperative and Postoperative scores for Heartburn Frequency- Median Values: Group II (Non Dyspeptic)



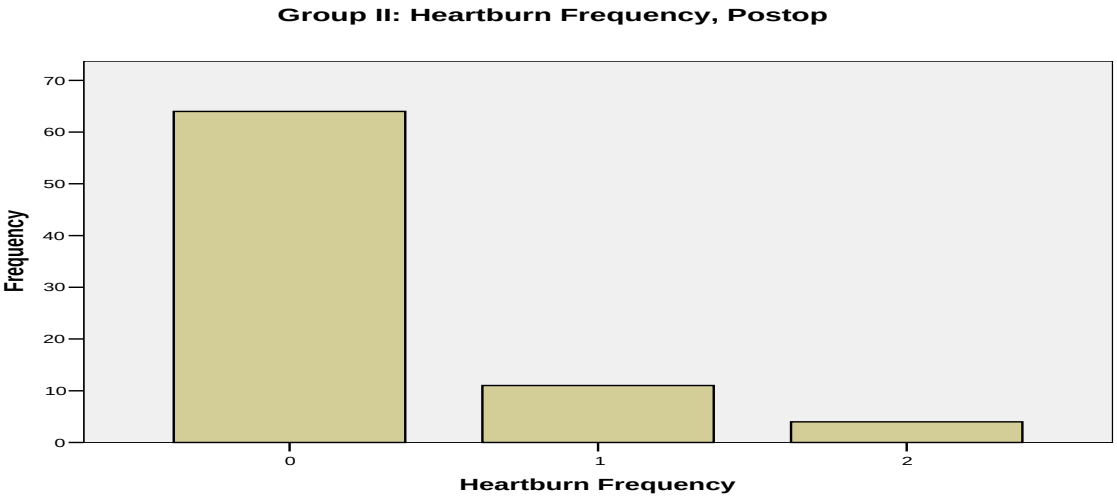
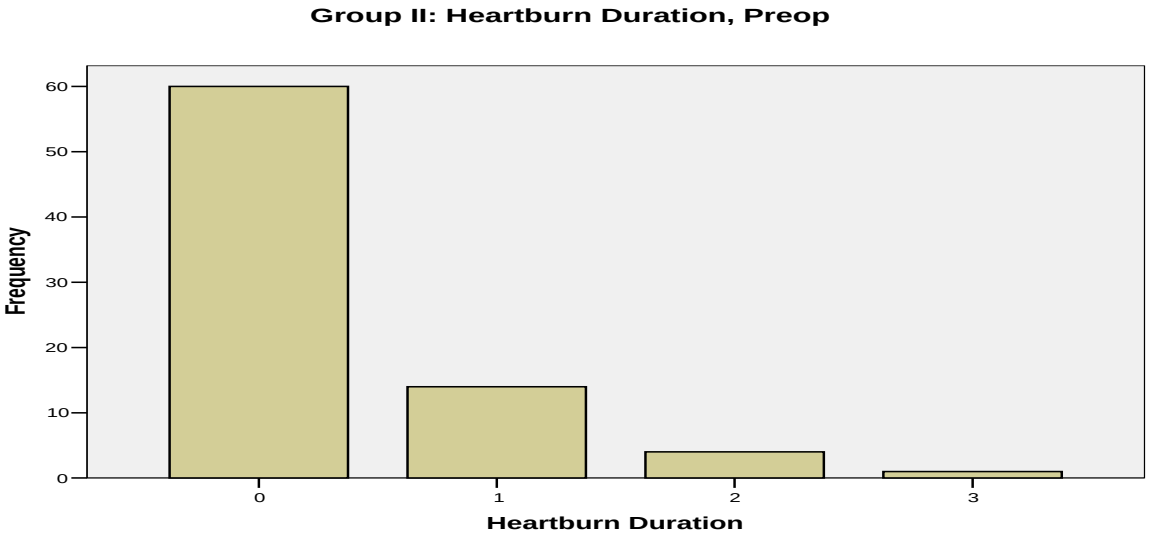


Figure 23: Comparison of Buckley Preoperative and Postoperative scores for Heartburn Duration - Median Values: Group II (Non Dyspeptic)



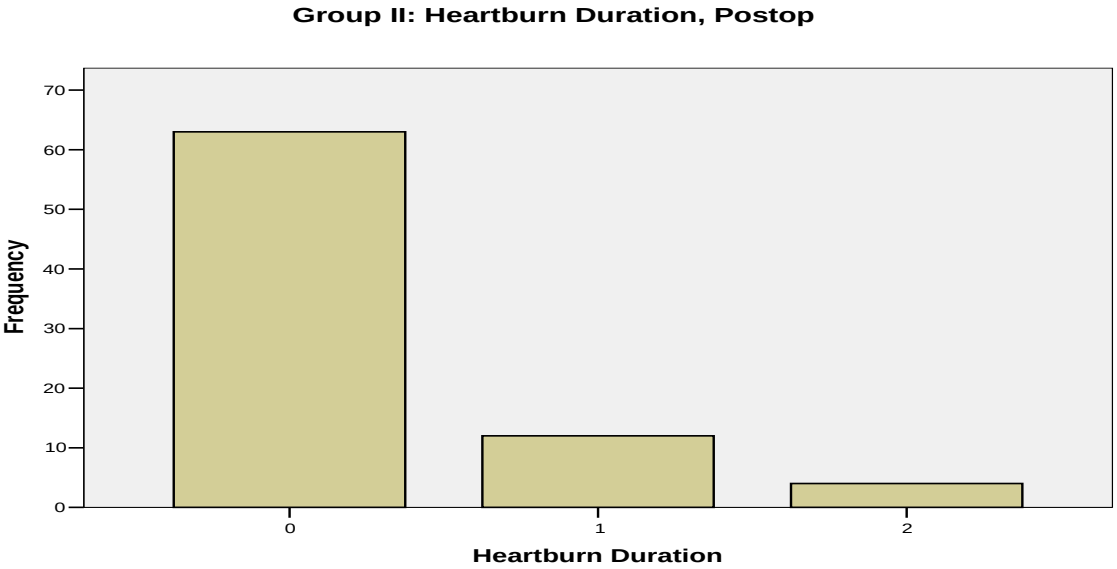
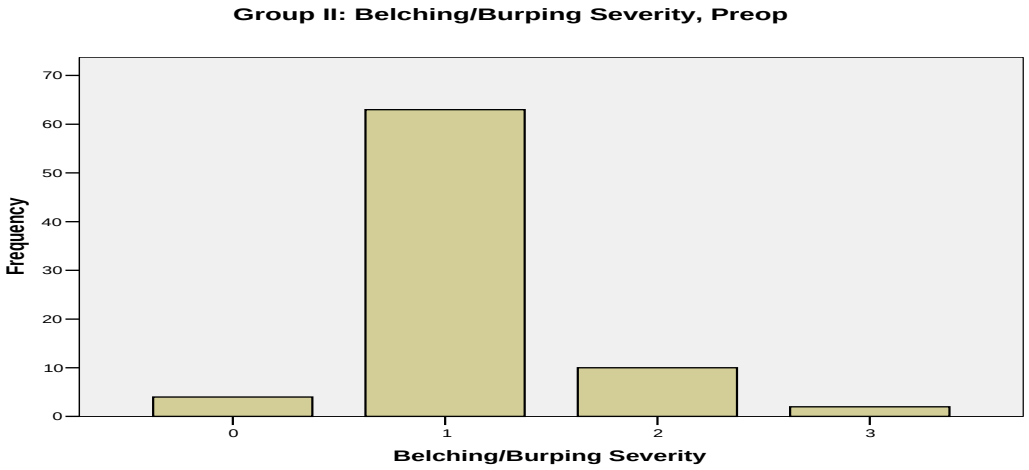


Figure 24: Comparison of Buckley Preoperative and Postoperative scores for Belching/Burping Severity - Median Values: Group II (Non Dyspeptic)



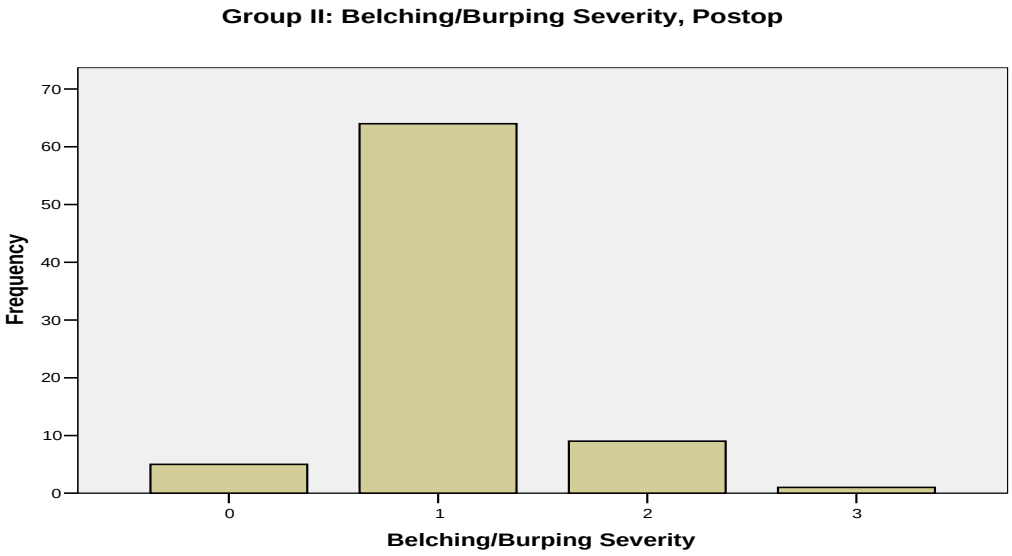
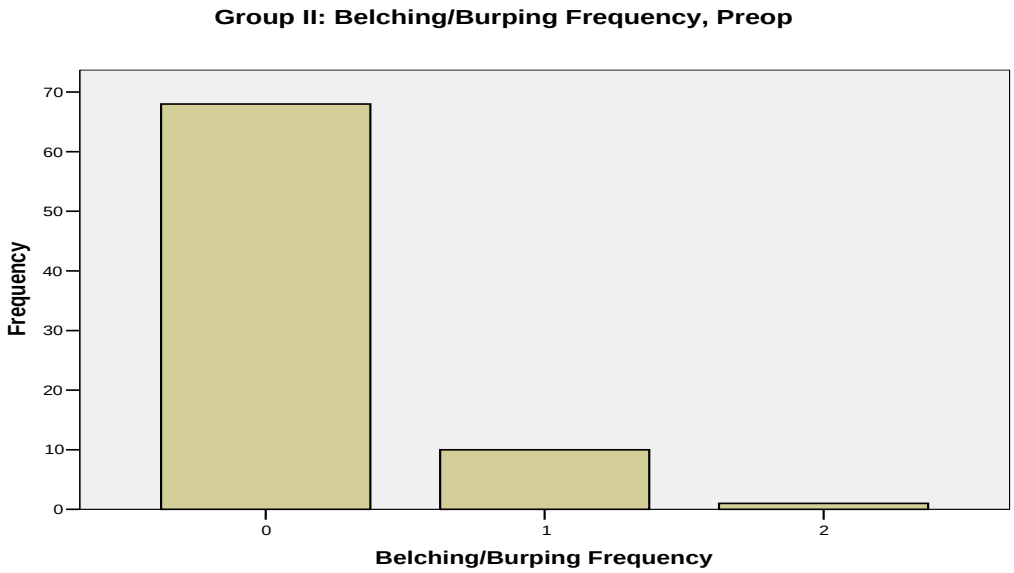


Figure 25: Comparison of Buckley Preoperative and Postoperative scores for Belching/Burping Frequency - Median Values: Group II (Non Dyspeptic)



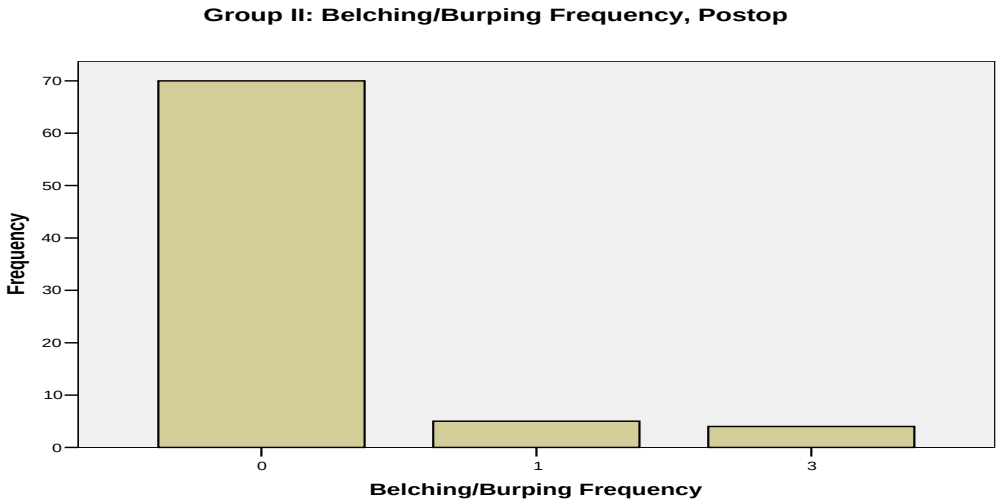
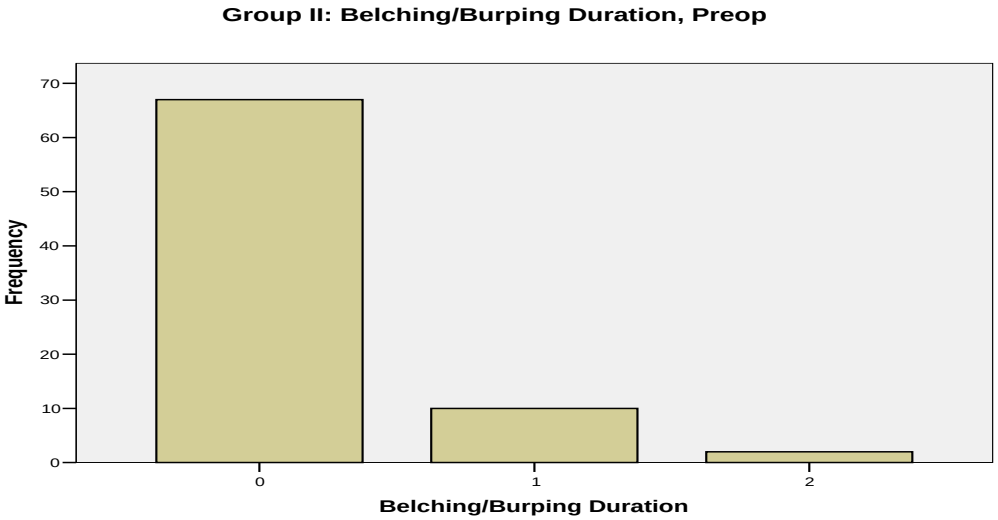


Figure 26: Comparison of Buckley Preoperative and Postoperative scores for Belching/Burping Duration - Median Values: Group II (Non Dyspeptic)



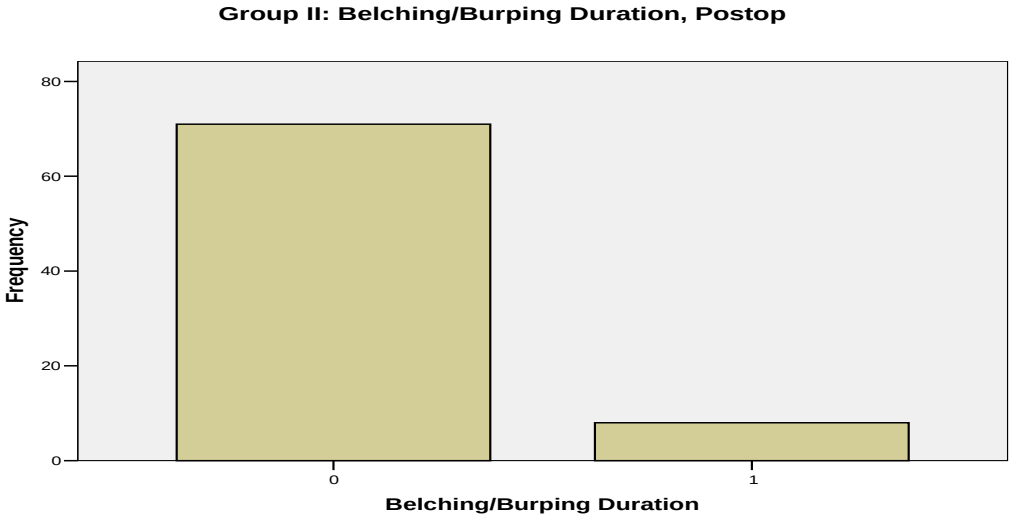
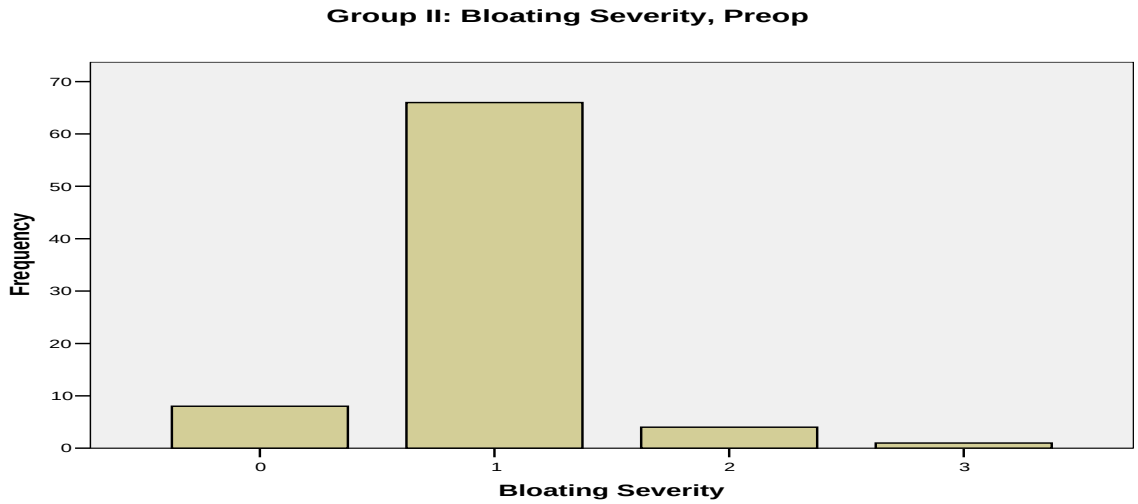


Figure 27: Comparison of Buckley Preoperative and Postoperative scores for Bloating Severity - Median Values: Group II (Non Dyspeptic)



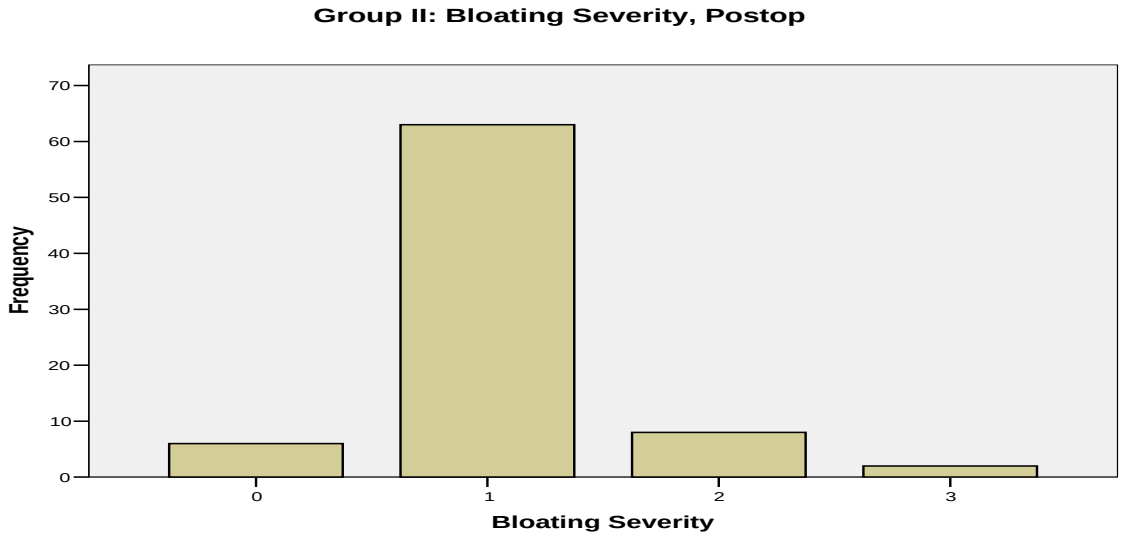
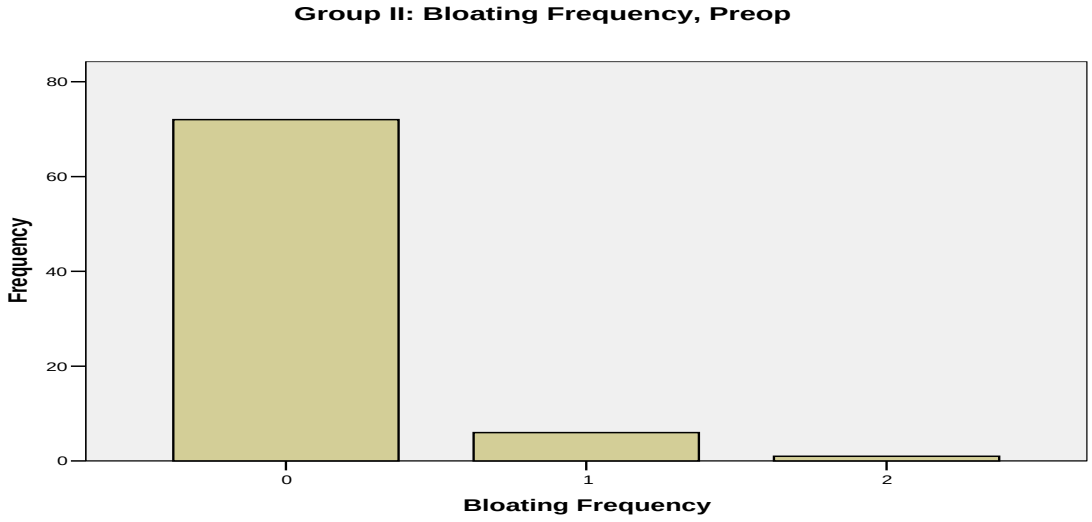


Figure 28: Comparison of Buckley Preoperative and Postoperative scores for Bloating Frequency- Median Values: Group II (Non Dyspeptic)



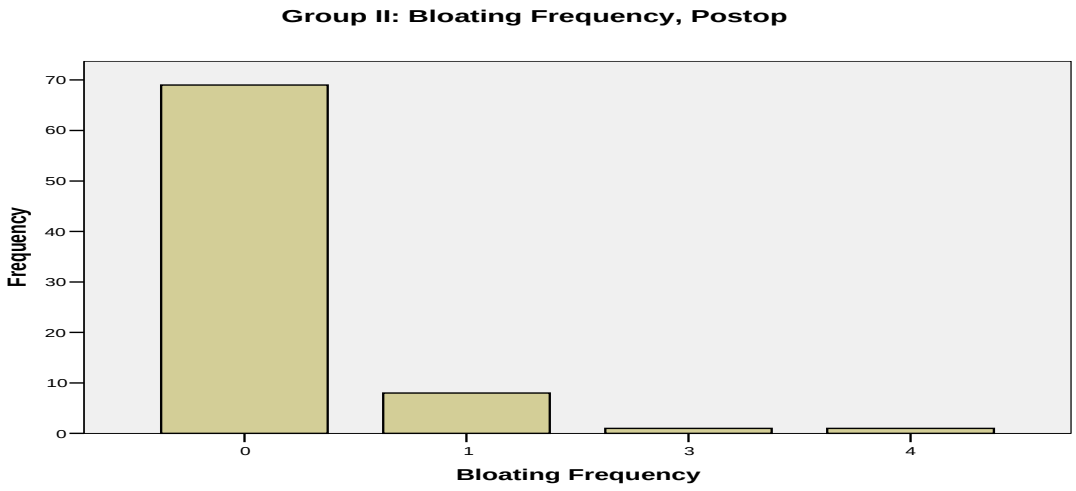
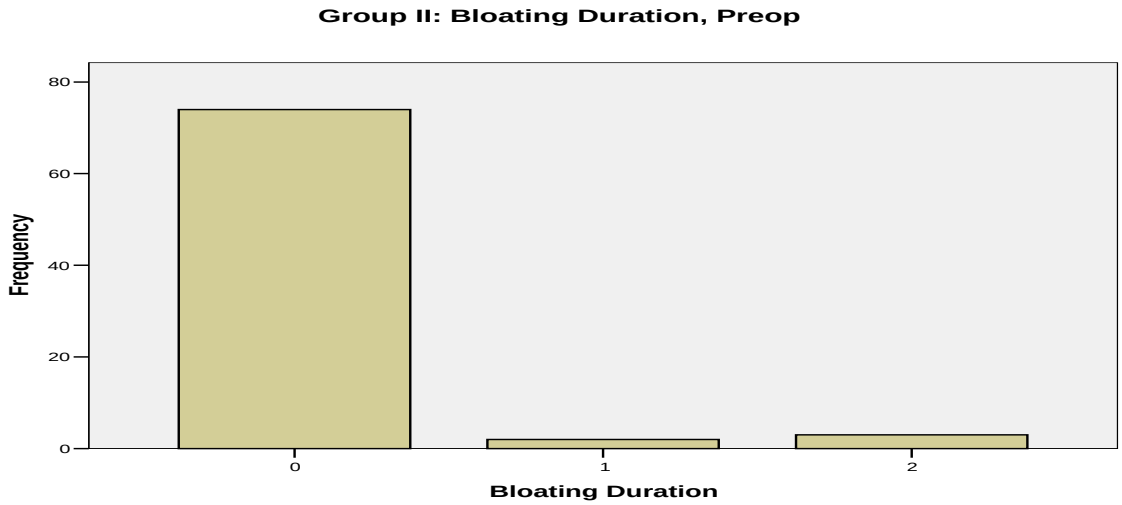
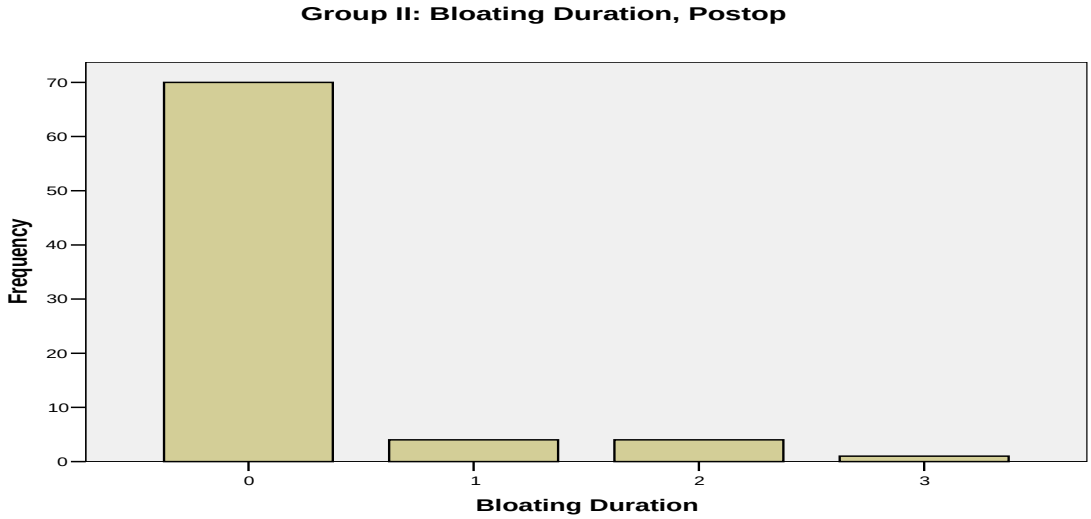


Figure 29: Comparison of Buckley Preoperative and Postoperative scores for Bloating Duration - Median Values: Group II (Non Dyspeptic)





5.9 Comparison of Reduction in Buckley scores

The Gain score analysis between the two groups is shown in Table 9. Epigastric pain (frequency) and belching/burping (severity and duration) were shown not be statistically significant. However, the remainder of the scores were statistically significant, indicating that Group I patients had statistically significant larger reduction in Buckley scores from preoperative to postoperative than Group II patients (p-value<0.03). Table 10 illustrates the change in the sum of each component of the Buckley score (severity+frequency+duration) from preoperative to postoperative. The change for all items was shown to be statistically significant in favor of Group I. However, the clinical magnitude is only large for the epigastric pain component.

Total Buckley Scores for each component (severity+frequency+duration) are shown relative to preoperative and postoperative for Groups I and II in Tables 11 and 12. For Group I, the total Buckley scores are statistically significant from preoperative to postoperative for all components. The clinical magnitude is only seen to be large for the epigastric component. There is only one component that is statistically significant for Group II and that is for the epigastric component (p<0.001) and the clinical magnitude is also large.

Table 9: Comparison of Difference in Buckley Scores by Group: Postoperative-Preoperative (median values) for each item.

Item	Group I	Group II	*p-values
Epigastric pain			
Severity	3	2	0.002
Frequency	1	0	0.093
Duration	2	1	0.03
Heartburn			
Severity	1	0	<0.001
Frequency	0	0	<0.001
Duration	1	0	<0.001
Belching/Burping			
Severity	0	0	0.14
Frequency	0	0	0.001
Duration	0	0	0.89
Bloating			
Severity	0	0	<0.001
Frequency	0	0	0.001
Duration	0	0	<0.001

*Wilcoxon Rank Sum test

Table 10: Difference in Preoperative and Postoperative total Buckley Score (severity+frequency+duration) for each item. Median, (Mode)

Item	Group I	Group II	*p-value
Epigastric Pain	6 (8)	3 (0)	0.017
Heartburn	2 (0)	0 (0)	<0.001
Belching/Bloating	1 (0)	0 (0)	0.035
Burping	0 (0)	0 (0)	0.01

*Wilcoxon Rank Sum test

Table 11: Total Buckley Score for each item (severity+frequency+duration) for Group I

Item	Group I		p-value
	Preop	**Postop**	
Epigastric Pain	9 (9)	1 (1)	<0.001
Heartburn	7 (8)	4 (1)	<0.001
Belching/Bloating	5 (1)	4 (1)	<0.001
Burping	6 (1)	1 (1)	<0.001

*Wilcoxon Rank Sum test

Table 12: Total Buckley Score for each item (severity+frequency+duration) for Group II

Item	Group II		*p-value
	Preop	**Postop**	
Epigastric Pain	7 (9)	1 (1)	<0.001
Heartburn	1 (1)	1 (1)	0.362
Belching/Bloating	1 (1)	1 (1)	0.684
Burping	1 (1)	1 (1)	0.171

*Wilcoxon Rank Sum test

5.10 Duration of Symptoms and Postoperative Buckley Score and Satisfaction after Surgery

The majority of Group I patients (76.1%) had symptoms of dyspepsia longer than 3 months prior to LC (Figure 30, Table 13). Table 14 shows that the majority of Group I patients had symptoms longer than 3 months and had postoperative Buckley scores greater than 6. The majority of Group I patients (66.0%) had postoperative Buckley scores larger than 6 and had preoperative symptoms longer than 3 months. Only 34.9% of Group I patients with symptoms less than and equal to 3 months achieved a Buckley score less than 6 one year after LC. Of all Group I patients (N=63) having symptoms for less than or equal to 3 months, 65.1% had Buckley scores greater than 6 at one year after surgery. Table 15, shows that of 199 Group I patients who had symptoms greater than 3 months, 94.0% were either satisfied or very satisfied after surgery. Table 15 shows a statistically significant difference between the two groups, but the clinical significance is small.

Figure 30: Preoperative Duration of Symptoms vs Postoperative Buckley Scores in Group I (Dyspeptic)

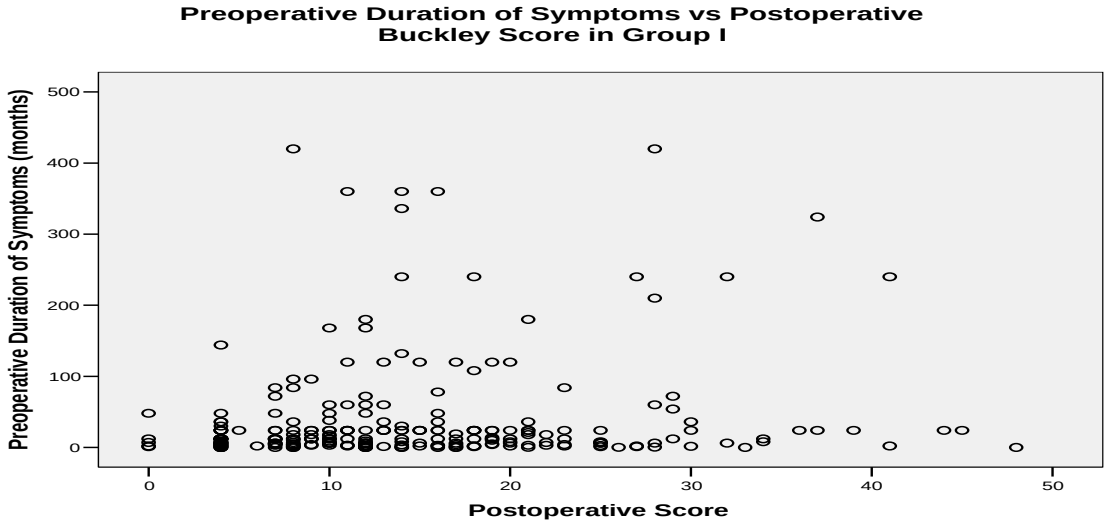


Table 13: Duration of Symptoms in Group I (Dyspeptic Group)

Duration of Symptoms in the Dyspeptic Group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=3 months	63	23.9	23.9	23.9
	> 3 months	201	76.1	76.1	100.0
	Total	264	100.0	100.0	

Table 14: Duration of Symptoms and Postoperative Buckley Score in Group I

Months	Postop Score <=6	Postop Score >6
<=3	22 (34.9%)	41 (65.1%)
>3	26 (13.1%)	173 (86.9%)

p-value=0.087; Chi-square= 2.925

Table 15: Duration of Symptoms and Postoperative Satisfaction in Group I

Months	Satisfied/Very Satisfied	Not Satisfied
<=3	60 (95.2%)	3 (4.8%)
> 3	187 (94.0%)	12 (6.0%)

p-value<0.001; Chi-square= 30.7
removed two cases, no response

5.11 Frequency of Episodes and Postoperative Buckley Score and Satisfaction after Surgery

The frequency of episodes prior to surgery relative to postoperative score and satisfaction from LC are shown in Tables 16 and 17. Eighty two patients (31.3%) had 3 or less episodes prior to LC, while 180 (68.7%) patients had more than 3 episodes prior to LC. Fifty eight patients (70.7%) who had 3 or less episodes prior to LC had postoperative Buckley scores greater than 6. One hundred and fifty six patients (86.7%) had more than 3 episodes prior to LC and had postoperative Buckley scores greater than 6. Of those having less than or equal to 3 episodes, 95.2% were satisfied or very satisfied 1 year after LC. Of those having more than 3 episodes, only 94.0% were satisfied or very satisfied after LC. Table 16 and 17 show that there is a statistically significant difference, but the magnitude of the clinical significance is small.

Patient satisfaction in terms of both subjective response and Buckley scores are shown in Tables 18-20. In both groups, the majority of patients were very satisfied after LC and more than 90% were either satisfied to very satisfied after surgery. However, only 49 patients (18.6%) in

Group I had postoperative Buckley scores less than 6 (complete cessation of symptoms), compared to the 215 patients (81.4%) of Group I who had postoperative Buckley scores larger than 6.

Table 16: Frequency of Episodes and Postoperative Buckley Score in Group I

Episodes	Postop Score <=6	Postop Score >6
<=3	24 (29.3%)	58 (70.7%)
>3	24 (13.3%)	156 (86.7%)

p-value=0.01; Chi-square= 11.011

Table 17: Frequency of Episodes and Postoperative Satisfaction in Group I

Episodes	Satisfied/Very Satisfied	Not Satisfied
<=3	78 (95.1%)	4 (4.9%)
>3	170 (94.4%)	10 (5.6%)

p-value<0.001; Chi-square= 51.011
removed two cases, no response

Table 18: Postoperative Satisfaction in both Groups (I,II) - Very Satisfied vs Satisfied vs Not satisfied

Group	Very Satisfied	Satisfied	Not Satisfied
Group I	162 (61.4%)	85 (32.2%)	15 (5.7%)
Group II	62 (78.5%)	14 (17.7%)	3 (3.8%)

p-value=0.149; Pearson Chi-Square= 6.771

Table 19: Postoperative Satisfaction in both Groups (I,II) – Satisfied/Very Satisfied vs Not Satisfied

Group	Satisfied/Very Satisfied	Not Satisfied
Group I	247 (93.6%)	15 (5.7%)
Group II	76 (96.2%)	3 (3.8%)

p-value=0.023; Pearson Chi-Square= 5.185

Table 20: Postoperative Satisfaction in both Groups (I,II) in terms of Postoperative Buckley Scores

Group	Postop Score<=6	Postop Score>6
Group I	49 (18.6%)	215 (81.4%)
Group II	44 (55.7%)	35 (44.3%)

p-value = 0.71; Pearson Chi-Square= 0.142

5.12 Gallbladder Pathology

The findings on microscopic examination of the gallbladder specimens for the two groups are shown in Table 21. Table 22 shows the results classified according to the presence or absence of chronic cholecystitis. The majority (62.4%) of Group I patients did not have chronic cholecystitis. Group I patients had histologic evidence of acute cholecystitis in 54.2% of cases. However, only a small number (N=21) had normal gallbladders (8.0%). This indicates that 91.6% of patients had cholecystitis (either acute or chronic). Group II patients had histologic evidence of chronic cholecystitis in 22.8% of specimens. Acute cholecystitis was identified in 64.6% of Group II specimens, and 12.7% of Group II specimens were normal. This was statistically significant, but clinically small. Table 23 shows the results classified according to the absence or presence of acute cholecystitis for the two groups. There was no significant difference between the two groups. The most important aspect of this table is the prevalence of acute cholecystitis among Group I which is quite similar to Group II.

Table 21: Pathology of Gallbladder Specimens

Group	Acute Chole	Chronic Chole	Normal
*Group I	143 (54.2%)	99 (37.5%)	21 (8.0%)
Group II	51 (64.6%)	18 (22.8%)	10 (12.7%)

p= 0.448, Chi-Square= 3.7

Table 22: Pathology of Gallbladder Specimens relative to Chronic Cholecystitis

Group	Chronic Chole	No Chronic Chole
*Group I	99 (37.6%)	164 (62.4%)
Group II	18 (22.8%)	61 (77.2%)

p=0.003, Chi-Square=8.6

*One specimen from the dyspeptic group was not retrievable

Table 23: Pathology of Gallbladder Specimens relative to Acute Cholecystitis

Group	Acute Chole	No Acute Chole
*Group I	143 (54.4%)	120 (45.6%)
Group II	51 (64.6%)	28 (35.4%)

p-value=0.728; Chi-square= 2.042

*One specimen from the dyspeptic group was not retrievable

5.13 Correlation of Gallbladder Pathology with Preoperative Ultrasound Findings

One hundred and forty three patients in Group I (54.2%) had histopathological evidence of acute cholecystitis. However, preoperative ultrasound diagnosed acute cholecystitis in only 33 of Group I patients (23.1%). Ninety nine patients with microscopic chronic cholecystitis had preoperative ultrasound exams that showed acute cholecystitis in 14 patients (14.1%). Twenty one patients had normal gallbladders on histopathological examination. Of these specimens, preoperative ultrasound showed acute cholecystitis in 2 (9.5%).

5.14 Analysis of patients with Postoperative Buckley scores of 7 to 15

Table 6a shows that 45.1% of group I patients (N=119) had postoperative scores between 7 and 15. This group represents patients who had symptoms of dyspepsia prior to surgery but after surgery they do not have symptoms of dyspepsia and not asymptomatic as defined by the Buckley score. Table 24 and 25 show the preoperative and postoperative Buckley scores for each group. In Group II, there was a significant statistical difference with respect to epigastric pain

only. In Group I, there was a statistical significant difference in all of the items of the Buckley score. Table 26 shows the change in total Buckley score (severity+frequency+duration) for each item. Group I had a statistically significant difference in terms of epigastric pain reduction. There was a statistically significant difference in terms of reduction in heartburn and belching/bloating, but the clinical magnitude of this difference is quite small.

Table 24: Analysis of Postoperative Buckley Score Patients (7-15): Group I: Dyspeptic

Item	**Preop**	**Postop**	***p-value**
Epigastric pain			
Severity	4 (5)	1 (1)	a
Frequency	1 (1)	0 (0)	a
Duration	3 (3)	0 (0)	a
Heartburn			
Severity	3 (3)	2 (2)	a
Frequency	1 (1)	1 (1)	a
Duration	2 (3)	1 (0)	a
Belching/Burping			
Severity	2 (2)	2 (1)	a
Frequency	1 (0)	1 (0)	a
Duration	1 (1)	1 (0)	a
Bloating			
Severity	2 (1)	1 (1)	a
Frequency	1 (0)	0 (0)	a
Duration	2 (0)	0 (0)	a

*Wilcoxon Rank Sum test, a= <0.001

Table 25: Analysis of Postoperative Buckley Score Patients (7-15): Group II Non Dyspeptic

Item	Preop	Postop	*p-value
Epigastric pain			
Severity	3 (5)	2 (1)	0.001
Frequency	1 (1)	1 (0)	0.07
Duration	2 (3)	1 (0)	0.022
Heartburn			
Severity	1 (1)	1 (1)	0.813
Frequency	0 (0)	0 (0)	0.527
Duration	0 (0)	0 (0)	0.340
Belching/Burping			
Severity	1 (1)	1 (1)	0.739
Frequency	0 (0)	0 (0)	0.317
Duration	0 (0)	1 (0)	0.035
Bloating			
Severity	1 (1)	1 (0)	0.035
Frequency	0 (0)	0 (0)	0.811
Duration	0 (0)	0 (0)	0.257

*Wilcoxon Rank Sum test

Table 26. Of the patients with Postoperative Buckley scores of 7 to 15: the change in symptoms (Group I vs II)

Item	Group I	Group II	*p-value
Epigastric Pain	7 (8)	2 (0)	<0.001
Heartburn	3 (0)	0 (0)	0.032
Belching/Bloating	1 (0)	0 (0)	<0.001
Burping	0 (0)	0 (0)	0.08

*Wilcoxon Rank Sum test

CHAPTER SIX

DISCUSSION

6.1 Correlation of Findings with Objectives and Corresponding Hypotheses

Objective #1. To determine if laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia will achieve complete symptomatic relief. Complete symptomatic relief will be defined as the cessation of symptoms of dyspepsia after laparoscopic cholecystectomy.

Hypothesis #1: Laparoscopic cholecystectomy for patients with gallstones and symptoms of dyspepsia will achieve complete symptomatic relief 1 year post laparoscopic cholecystectomy in 70% of patients.

We expected 70% of Group I patients to have postoperative Buckley scores less than 6 one year after LC. We found this not to be the case (Table 5, 6a). We found that 80% of this group had Buckley scores greater than 6 (table 5, 6a). However, this same group who all had preoperative Buckley scores greater than 16, 179 (67.8%) patients had Buckley scores of 16 or less after surgery, indicating a dramatic improvement after surgery. Our results are very similar to the 70% improvement rate quoted in the literature (7-9). The patients' satisfaction with the results of surgery was found to be either satisfied or very satisfied in over 90% (table 6b). This subjective index does not correlate with the postoperative Buckley scores. This is expected as this

suggests that the pathophysiology for dyspepsia is not solely linked to gallstones. Proposed mechanisms for dyspepsia are visceral hypersensitivity and possibly altered gastric motility (32). Therefore, LC would have a minimal effect on these symptoms.

Objective #2: To compare the change in the preoperative score to the postoperative score and satisfaction after laparoscopic cholecystectomy for the two groups: patients with gallstones and symptoms of dyspepsia and the patients with gallstones and no symptoms of dyspepsia.

Hypothesis #2: Patients with gallstones and no symptoms of dyspepsia would have a greater reduction in the Buckley score and greater satisfaction after laparoscopic cholecystectomy compared to those patients who have gallstones and symptoms of dyspepsia.

Our findings were not consistent with our hypothesis (table 9) because the following symptoms showed a larger change in Buckley scores from preoperative to postoperative for each component in Group I: epigastric pain (severity, duration), heartburn (severity, frequency, heartburn), belching/burping (frequency) and bloating (severity, frequency, duration). This would be expected as the Buckley score is biased in favor of the non dyspeptic group, who by definition, have scores that are less to begin with. This bias may result in a larger change from preoperative to postoperative scores for the dyspeptic group. We then looked at patient satisfaction after surgery and its lack of correlation with the changes in the Buckley score (tables 18-20). Patient satisfaction, although subjective in nature, correlated more with microscopic examination of the gallbladder specimens.

Most patients in Group I had evidence of acute cholecystitis (>50%) which was very surprising, and thus reflects the satisfaction experienced by these patients from having the surgery to have the recurring or acutely inflamed gallbladder removed. When the symptoms of the Buckley score were summed up individually and compared (tables 10-12), there were

statistically significant differences in all items with respect to Group I. As the clinical magnitude of this difference was large for the epigastric pain symptoms and small for the others symptoms. This differs from standard surgical dogma.

Objective #3: To determine the relationship between the duration of preoperative episodes and the probability of complete resolution of symptoms following laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia. Duration measured by the total period of time between onset of symptoms and laparoscopic cholecystectomy.

Hypothesis #3: Early laparoscopic cholecystectomy for patients with gallstones and symptoms of dyspepsia will achieve complete symptomatic relief 1 year post laparoscopic cholecystectomy in 70% of patients. Early laparoscopic cholecystectomy is defined by surgical intervention at or before three months of symptoms.

Our findings for duration of symptoms and postoperative score were not consistent with our expectations (figure 30 and tables 13,14). We expected patients with less than 3 months of symptoms to have complete cessation of symptoms, a postoperative Buckley score of less than 6 after one year. We found that most patients with symptoms for less than 3 months had postoperative Buckley scores greater than 6 (Table 13). However, most of these patients were satisfied or very satisfied with the LC, which again does not correlate well with the postoperative score because of the level of subjectivity. Our findings are similar to the findings of Luman et al (15) who found that most of the patients who had persistent symptoms after surgery had symptoms less than 6 months of duration. Our patient group was larger (N=264) compared to the study done by Luman (N=10). Our findings are consistent with Lublin et al (16) who also found that longer duration of pain experienced preoperatively was predictive of persistent pain after surgery.

Objective #4: To determine the relationship between the frequency of preoperative episodes and the probability of complete resolution of symptoms following laparoscopic cholecystectomy in patients with gallstones and symptoms of dyspepsia. Frequency measured by the number of episodes in the period of time prior to laparoscopic cholecystectomy.

Hypothesis #4: Patients with gallstones and symptoms of dyspepsia will experience complete resolution of symptoms when laparoscopic cholecystectomy is performed prior to or at the third episode.

Similarly we found that the frequency of attacks prior to surgery and postoperative score were not as predicted. More than 70% of patients in Group I with less than 3 attacks prior to surgery had postoperative scores greater than 6 (Table 16). However, the subjective description of satisfaction from surgery does not correlate with the postoperative scores (Table 17). Our finding is similar to the finding of Lublin et al. (16) who identified patients having frequent episodes of pain preoperatively was predictive of persistent pain after surgery.

Our results indicate that patients with symptoms of dyspepsia were content with the surgery because of a reduction in symptoms rather than complete resolution of symptoms. This may be in terms of symptoms reduction which could be decrease in terms of duration, frequency and severity. This may reflect an understanding of the expectations of the patients prior to surgery. The discussion with the surgeon prior to surgery may have included no guarantee that the procedure would cure them of dyspepsia and may only produce a reduction in symptoms. This reduction in symptoms is what our results support. The lack of correlation between the Buckley postoperative score and the patients' subjective satisfaction with LC is obvious. From the patients' viewpoint, satisfaction from LC is important and may be more important than the score.

Objective #5: To determine the differences in pathologic findings between patients with gallstones and no symptoms of dyspepsia versus patients with gallstones and symptoms of dyspepsia.

Hypothesis #5a: Patients with no symptoms of dyspepsia and ultrasonagraphic evidence of gallstones would be found to have no morphological evidence of chronic cholecystitis.

Hypothesis #5b: Patients with symptoms of dyspepsia and ultrasonagraphic evidence of gallstones would be found to have morphological evidence of chronic cholecystitis.

The microscopic examination of the pathological specimens reveals that the majority of patients in Group I did not have evidence of chronic cholecystitis. In addition, the majority of Group II patients did not have evidence of chronic cholecystitis. However, it is clear that the majority of patients in Group I (54.2%) had evidence of acute cholecystitis (Tables 21, 23). This confirms our previous findings and supports that these patients had histopathologic evidence of disease and removal may have improved there symptoms thereby justifying there subjective responses to satisfaction from LC. As previously mentioned, Luman et al (15) found that in patients, who had persistent symptoms after surgery (N=13), 77% had no or mild histological changes of cholecystitis. Our results are more pronounced and are significantly different from Luman et al (15). Our study supports the histopathologic presence of acute cholecystitis in patients with symptoms of dyspepsia and supports LC in this group of patients to achieve a symptomatic reduction that is quite satisfying to the patient.

In Group I patients, there were 119 patients (45.1%) that had postoperative Buckley scores between 7 and 15 (table 6a). This represents a very unique group. All the patients in this group had Buckley scores above 16 before surgery and were defined as dyspeptic After surgery

this group that did not achieve complete symptomatic relief (score <6) and but were not defined to be persisting dyspeptic patients. Tables 24-26 demonstrate that the patients like Group I, benefit from surgery in terms of clinical reduction in epigastric pain as well as a minor reduction in the remainder of the items (p-value<0.001).

The duration of time between onset of symptoms and surgery was on average 36 months for Group I. Intuitively this seems reasonable for these patients did not exhibit both clinical and radiological evidence of acute biliary pathology and therefore were not offered LC early (emergently).

Gerd et al (33) identified diarrhea after laparoscopic cholecystectomy in 12-33% of patients. Our results indicate an overall incidence of diarrhea in both groups of patients to be 41.1% (Table 2), which is higher than other studies (33, 16). Lublin et al (16) found in a 21% incidence of diarrhea after surgery. Our results indicate that the incidence of diarrhea in patients with gallstones and symptoms of dyspepsia (Group I) was 45.5% (Table 3). The accepted mechanism for post cholecystectomy diarrhea seems to be bile salt malabsorption which is relieved by treatment with cholestyramine (33). Group I patients (45.5%) had an incidence of diarrhea after surgery was nearly doubled compared to Group II patients (26.6%). We suggest that post laparoscopic cholecystectomy bile salt malabsorption may exacerbate the dyspeptic patients' preoperative bowel abnormalities.

In summary, patients with gallstones and symptoms of dyspepsia will benefit from LC in terms of symptomatic reduction especially the epigastric pain component and are very satisfied/satisfied after LC.

6.2 Study Strengths

This is the first North American study to investigate the study questions of interest and the largest number of patients to date that was conducted 14 years after LC became the gold standard. This study has the largest sample size and more of a balanced proportion of men to female. This is the first study that used a validated scoring system to properly identify patients with dyspepsia.

The methodology was a retrospective cohort and was the most appropriate choice for the given time period of study. We were fortunate to have the data collection and survey return analysis completed in 8 months. This same study if prospectively conducted would have required a minimum of four years to complete.

6.3 Study limitations

Patient recruitment initially was over a one year period. It was not possible to recruit the desired number of patients in this time period. The number of nonresponders and noncontacts were much higher than anticipated. This may have been a consequence of the nature of our chart review. The mailing addresses were derived from the chart review and may not have been the most current address. We altered the dates to include more patients, acknowledging the potential disadvantage of longer interval between operation and survey response, thus a potential for memory recall bias.

We recognize that the two groups: Group I and II may not be mutually exclusive in terms of symptoms. The Buckley score allowed us to stratify patients into two distinct artificial groups for the purpose of the study. In clinical practice this may not be as easily done. We depended on the Buckley score as this was the only validated tool available to identify patients with dyspepsia.

The Buckley score is not without its imperfections. Future work need to be done to improve the tool and improve its clinical utility.

Our study sample consisted of patients with and without symptoms of dyspepsia. The sample size is larger than the calculated sample size as per the power analysis. This was attributed to the length of time required to accrue the patients. There was a potential risk of making a type II error. However, in our study, we were able to observe statistical significance on the observed outcomes therefore power of the study is not an issue.

In our study we used statistical tests repeatedly and multiple comparisons. There is a potential increase in Type I error that occurs as a consequence when statistical tests are used repeatedly. However, the level of significance is so great (p-value<0.001) on the key findings that the difference being due to chance is unlikely.

The number of nonresponders and noncontacts was quite high (443 and 141 respectively). Nonresponders are those that a questionnaire package was sent to and was not returned. This implies, either the respondent received the questionnaire and did not respond, or did respond and did not return or the respondent may not have even been at the address to receive the package (away for the period of study). The noncontacts are those that a questionnaire package was sent and the postal carrier returned to the author due two main factors: person has moved or not the correct address. Collectively, this number is more than the actual number of study participants (343), and has the potential to considerably bias our results and conclusions. We were fortunate to abstract data from the chart review in relation to this group of participants and compare these characteristics to our study population in Table 1. We found that the two groups were similar in more than 90% of the items and only differed statistically in the age item. The study participants

(mean age=51 years) was slightly higher than the nonresponder and noncontact group (age=46 years). This table was good for the basic features but not for outcomes.

The questionnaire's content and nomenclature may have posed a difficulty in understanding and patients may have responded inappropriately. The glossary was provided to detail the descriptions of procedures (CT scan, gastroscopy, ERCP etc) to help alleviate this. It is important to note, that during procedures such as gastroscopy and ERCP, most physicians use some type of sedation that mostly impairs patients from recalling the experience. Again, the majority of our patients are middle aged and fairly devoid of systemic ailments (Alzheimer's, dementia, stroke etc.). At the same time, the questionnaire was sent during the periods of June and August, this is the time where most people are on holidays and could have affected response rate.

The questionnaire was self administered. It contained sections pertaining to before and after surgery. It is possible that patients may have ignored the "after surgery" and answered the same questions as per prior surgery. This could have a significant impact on our results. Conducting this study prospectively would minimize this.

Memory recall may have been a concern. We felt that gallbladder attacks are quite painful and most people do not forget such pain. The mean age was 50 and this patient group is middle aged and with minimal to no co morbidities and probably have little concern for memory recall. Also, because our time interval was longer than 1 year post surgery, this may have had an impact on the patient's ability to recall. However, during the data collection and survey collection period, there was no patient that had written on the returned survey, that they could not recall there symptoms accordingly.

6.4 Future Research

The same study can be conducted prospectively over 5 year period using the same survey protocol to investigate the same research questions. This would lower the memory recall bias completely and allow us to follow patients over the one year time interval. Prior to LC and at the time of consent for LC, the questionnaire would be distributed. One year follow up with the patients after LC would be easily done with a more valid and current mailing addresses. In addition, the use of a quality of life index to determine qualitatively how patients are postoperatively.

The long term sequelae of LC in patients with uncomplicated gallstone disease and symptoms of dyspepsia would be important to investigate. Long term follow up is unavailable in this particular group and it would be interesting to see how these patients do after 10 or 20 years after surgery.

The postoperative diarrhea experienced by patients was much higher in Group I than Group II. We were unable to characterize the extent of this complication for this was not the focus of our study. We identified this as a key finding as this does exceed the quoted literature value. Future research is needed to identify the character (watery vs. loose), frequency, severity, duration, affect on quality of life and treatment of this complication.

CHAPTER SEVEN

CONCLUSIONS

LC in patients with gallstones and symptoms of dyspepsia does not achieve complete symptomatic (81.4%) relief 1 year after surgery. Group I had a greater reduction in the Buckley score than Group II after LC but had similar rates of satisfaction from surgery. The duration of preoperative episodes of gallbladder had no relation to the outcome of surgery. The frequency of preoperative episodes of gallbladder had no relation to the outcome of surgery. The majority of patients in both Group I (54.2%) and Group II (64.6%) were found to have acute cholecystitis and only a minority had morphological evidence of chronic cholecystitis. Patients with gallstones and symptoms of dyspepsia will benefit from LC in terms of symptom reduction especially the epigastric pain symptom and a great proportion are satisfied or very satisfied after LC.

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APPENDIX A: Questionnaire

Patient identification number:

Part I: ***BEFORE SURGERY***

–PLEASE ANSWER THE FOLLOWING AS YOU HAD EXPERIENCED BEFORE YOUR GALLBLLADDER WAS REMOVED

1. How long did you have your symptoms/pain/discomfort ***before*** your laparoscopic cholecystectomy? Please indicate ***number*** of:

____ Days

____ Weeks

____ Months

____ Years

2. How many gallbladder attacks (abdominal pain) did you have ***prior*** to your laparoscopic cholecystectomy?

□ 1
□ 2
□ 3
□ 4
□ 5

if greater than five attacks, how many?

3. Did you have a gastroscopy (stomach scope) ***before*** your laparoscopic cholecystectomy?

□ Yes
□ No

If Yes,
a) Was it normal or abnormal?

□ Normal
□ Abnormal

b) When was it in relation to your operation (weeks before surgery)?

- ☐ 1 week
- ☐ 4 weeks
- ☐ 8 weeks
- ☐ 12 weeks
- ☐ 24 weeks
- ☐ 48 weeks

4. Have you ever taken over the counter medicines for indigestion or pain in the year ***prior*** to your laparoscopic cholecystectomy?

- ☐ Yes
- ☐ No

5. What prescribed medicines for indigestion were you taking prior to your laparoscopic cholecystectomy?

6. Were you ever hospitalized with a fever during your gallbladder attack?

- ☐ Yes
- ☐ No

7. What other illnesses/conditions do you have, please circle any of the following that applies to you?

- ☐ Diabetes Mellitus
- ☐ Heart disease
- ☐ Stroke

8. Please complete the following section by for each of your ***symptoms*** as described below:

for Severity please refer to the following as a guide to your answer:

none
mild = Can be ignored when you do not think about it
moderate = Cannot be ignored
severe = Influences concentration on daily activities

very severe = Markedly affects daily activities and/or requires rest

1. Epigastric Pain (pain or discomfort localized in the upper abdomen)

a)Severity:

- ☐ none, go to question #2 Heartburn
- ☐ mild
- ☐ moderate
- ☐ severe
- ☐ very severe

b) Frequency of attacks

- ☐ less than 3/week
- ☐ more than 3/week
- ☐ more than 1/day
- ☐ continuous

c) Duration of attacks

- ☐ less than 10minutes
- ☐ 10 to 30 minutes
- ☐ more than 30 minutes

2. Heartburn (burning sensation, usually centered in the middle of the chest, near breastbone)

a)Severity

- ☐ none, go to question #3 Belching/Burping
- ☐ mild
- ☐ moderate
- ☐ severe
- ☐ very severe

b) Frequency of attacks

- ☐ less than 3/week
- ☐ more than 3/week
- ☐ more than 1/day
- ☐ continuous

c) Duration of attacks

- ☐ less than 10minutes
- ☐ 10 to 30 minutes
- ☐ more than 30 minutes

3. Belching/Burping (expel gas noisily from the stomach through the mouth)

a)Severity

- ☐ none, go to question #4 Bloating
- ☐ mild
- ☐ moderate
- ☐ severe
- ☐ very severe

b) Frequency of attacks

- ☐ less than 3/week
- ☐ more than 3/week
- ☐ more than 1/day
- ☐ continuous

c) Duration of attacks

- ☐ less than 10minutes
- ☐ 10 to 30 minutes
- ☐ more than 30 minutes

4. Bloating** (swell up or distended abdomen with liquid or gas)

a)Severity:

- ☐ none, go to PART II
- ☐ mild
- ☐ moderate
- ☐ severe
- ☐ very severe

b) Frequency of attacks

- ☐ less than 3/week
- ☐ more than 3/week
- ☐ more than 1/day
- ☐ continuous

c) Duration of attacks

- ☐ less than 10minutes
- ☐ 10 to 30 minutes
- ☐ more than 30 minutes

PART II: ***AFTER SURGERY***

-PLEASE ANSWER THE FOLLOWING AS YOU ARE AT PRESENT, SINCE YOUR GALLBLLADDER WAS REMOVED

1. How long has it been since you had your laparoscopic cholecystectomy?

- ☐ 12 months
- ☐ 18 months
- ☐ 24 moths

2. Are you satisfied with your laparoscopic cholecystectomy?

- ☐ Not Satisfied
- ☐ Satisfied
- ☐ Very Satisfied

3. Since your laparoscopic cholecystectomy, have you seen your:

a) Family Physician because of pain similar to your gallbladder attacks?

- ☐ Yes
- ☐ No

b) Family Physician because of any problems with your digestion?

- ☐ Yes
- ☐ No

c) Surgeon related to pain or any other problems related to your gallbladder operation?

- ☐ Yes
- ☐ No

If yes, how many times?

4. Since your laparoscopic cholecystectomy, have you had any of the following tests:

a) Gastroscopy?

- ☐ Yes
- ☐ No

b) Endoscopic Retrograde CholangioPancreatography, ERCP?

- ☐ Yes
- ☐ No

e) Ultrasound (U/S) or Computer Tomography (CT) scan of abdomen?

- ☐ Yes
- ☐ No

5. Since your laparoscopic cholecystectomy, have you had to see any other specialists concerning your symptoms/pain/discomfort?

- ☐ Yes
- ☐ No

If yes, type of specialist:

6. Have you taken ulcer medicines since your laparoscopic cholecystectomy?

- ☐ Yes
- ☐ No

If yes, same, more or less?

- ☐ Same
- ☐ More
- ☐ Less

7. Have you been experiencing diarrhea since your laparoscopic cholecystectomy?

- ☐ Yes
- ☐ No

8. What prescribed medicines have you taken since your laparoscopic cholecystectomy?

9. Please complete the following section for each of your ***symptoms*** as described below:

for Severity please refer to the following as a guide to your answer:

none
mild = Can be ignored when you do not think about it
moderate = Cannot be ignored
severe = Influences concentration on daily activities
very severe = Markedly affects daily activities and/or requires rest

1. Epigastric Pain (pain or discomfort localized in the upper abdomen)

a)Severity:

- ☐ none, go to question #2 Heartburn
- ☐ mild
- ☐ moderate
- ☐ severe
- ☐ very severe

b) Frequency of attacks

- ☐ less than 3/week
- ☐ more than 3/week
- ☐ more than 1/day
- ☐ continuous

c) Duration of attacks

- ☐ less than 10minutes
- ☐ 10 to 30 minutes
- ☐ more than 30 minutes

2. Heartburn (burning sensation, usually centered in the middle of the chest, near breastbone)

a)Severity

- ☐ none, go to question #3 Belching/Burping
- ☐ mild
- ☐ moderate

- ☐ severe
- ☐ very severe

b) Frequency of attacks

- ☐ less than 3/week
- ☐ more than 3/week
- ☐ more than 1/day
- ☐ continuous

c) Duration of attacks

- ☐ less than 10minutes
- ☐ 10 to 30 minutes
- ☐ more than 30 minutes

3. Belching/Burping (expel gas noisily from the stomach through the mouth)

a)Severity

- ☐ none, go to question #4 Bloating
- ☐ mild
- ☐ moderate
- ☐ severe
- ☐ very severe

b) Frequency of attacks

- ☐ less than 3/week
- ☐ more than 3/week
- ☐ more than 1/day
- ☐ continuous

c) Duration of attacks

- ☐ less than 10minutes
- ☐ 10 to 30 minutes
- ☐ more than 30 minutes

4. Bloating** (swell up or distended abdomen with liquid or gas)

a)Severity:

- ☐ none, go to question #5
- ☐ mild
- ☐ moderate

- ☐ severe
- ☐ very severe

b) Frequency of attacks

- ☐ less than 3/week
- ☐ more than 3/week
- ☐ more than 1/day
- ☐ continuous

c) Duration of attacks

- ☐ less than 10minutes
- ☐ 10 to 30 minutes
- ☐ more than 30 minutes

5. DO YOU OBJECT TO BEING CONTACTED FOR FURTHER INFORMATION, IF REQUIRED?

- ☐ **YES**
- ☐ **NO**

THE END

APPENDIX B: PILOT STUDY

PURPOSE

To determine the feasibility of the project.

MATERIALS AND METHODS

A retrospective chart review of all laparoscopic cholecystectomies since 2003 performed by two General Surgeons at the Royal University Hospital.

INCLUSION CRITERIA

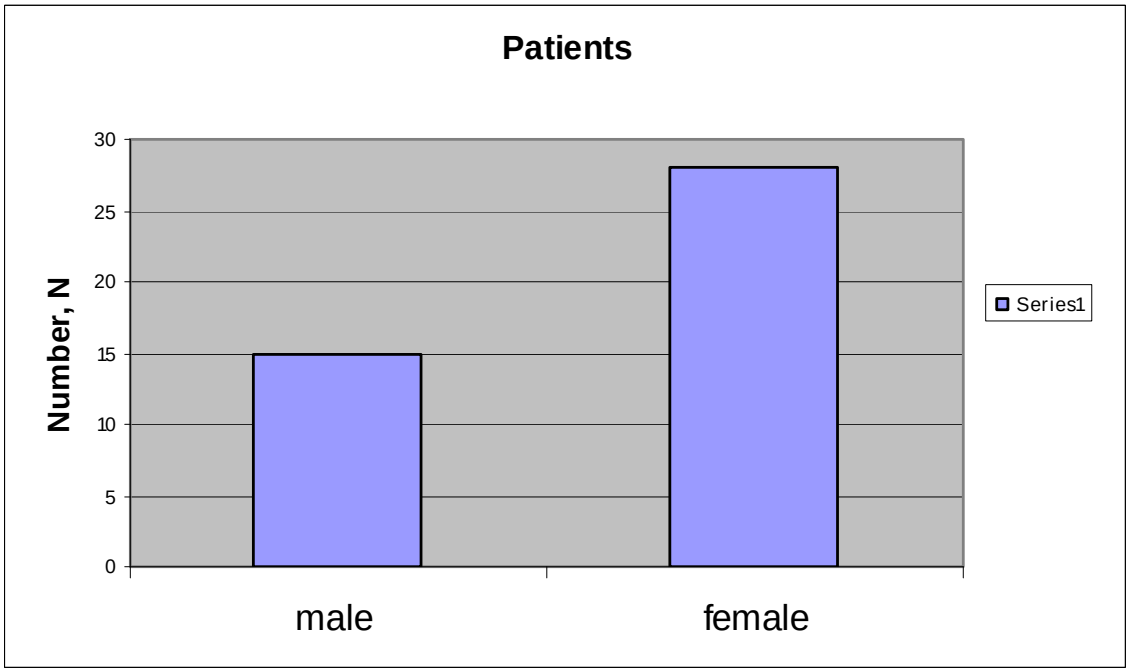
All patients with laparoscopic cholecystectomy who had uncomplicated gallstone disease. Patients will be identified as those with uncomplicated gallstone disease defined as biliary colic and cholelithiasis.

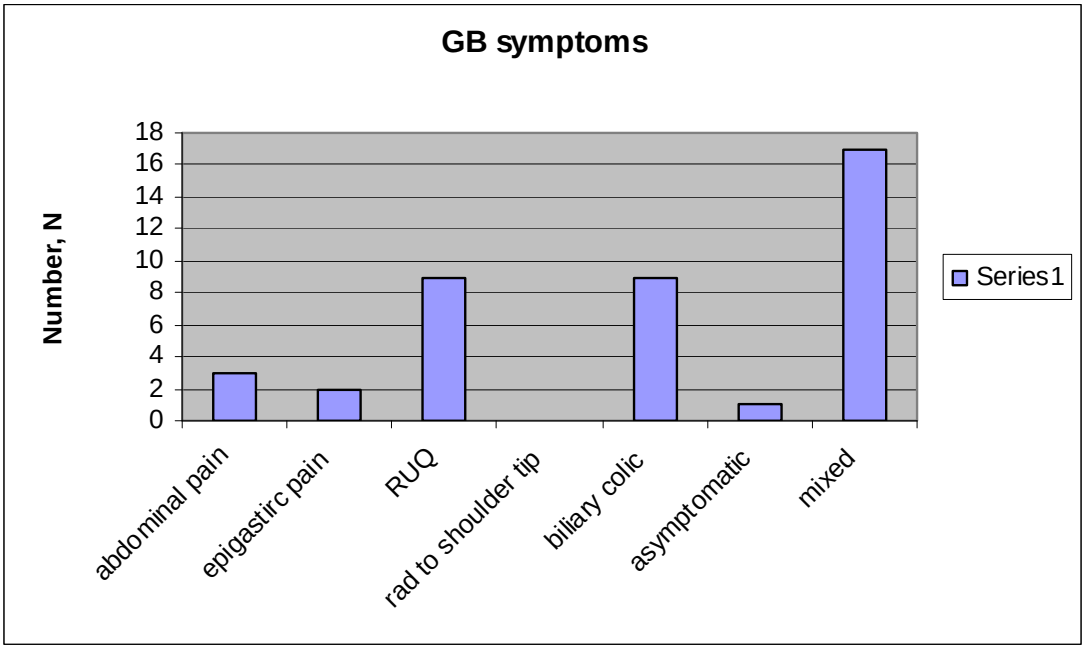
EXCLUSION CRITERIA

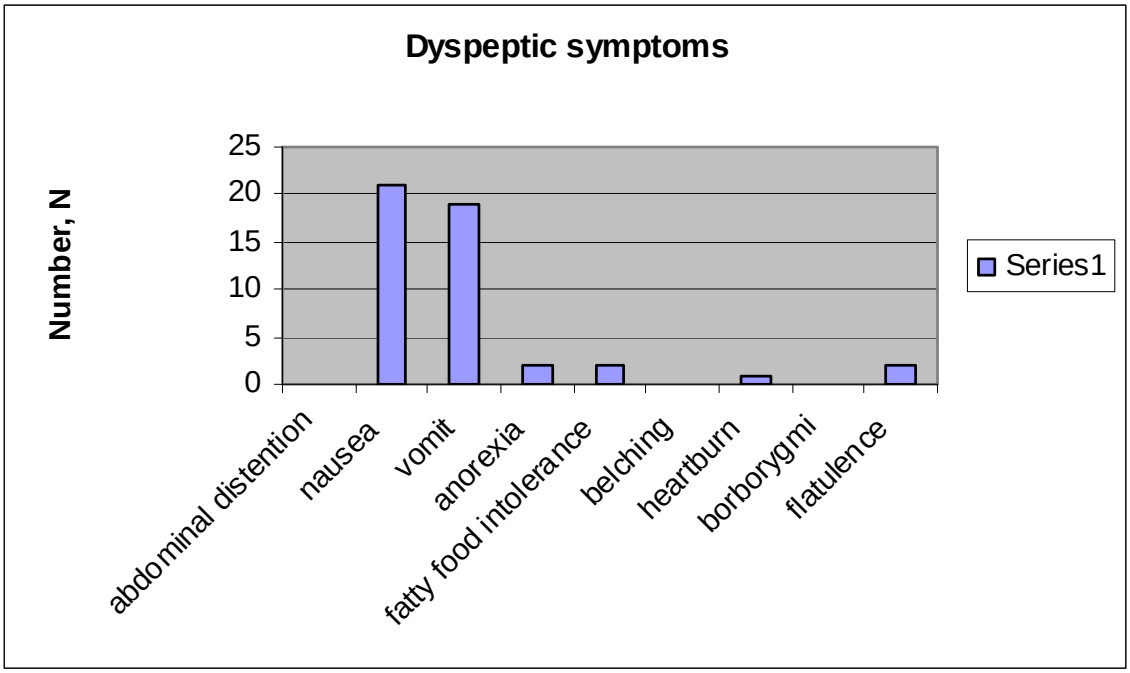
The exclusion criteria involves patients with any one of the following: previous common bile duct stones (choledocholithiasis), obstructive jaundice, cholangitis, gallstone pancreatitis, cholecystoenteric fistula, gallbladder neoplasm, previous biliary/pancreatic surgery, open cholecystectomy, previous gastric surgery. Patients with signs and symptoms of systemic disease: fever, leukocytosis, inflammatory mass and jaundice will also be excluded.

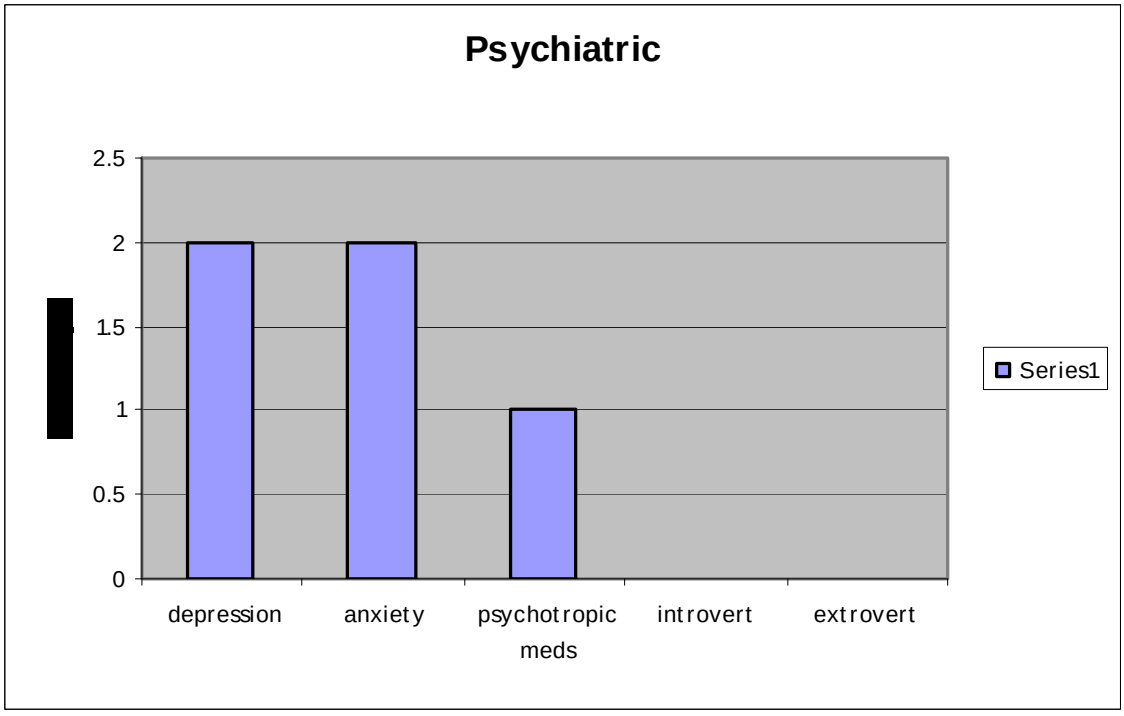
RESULTS (REFER TO GRAPHS)

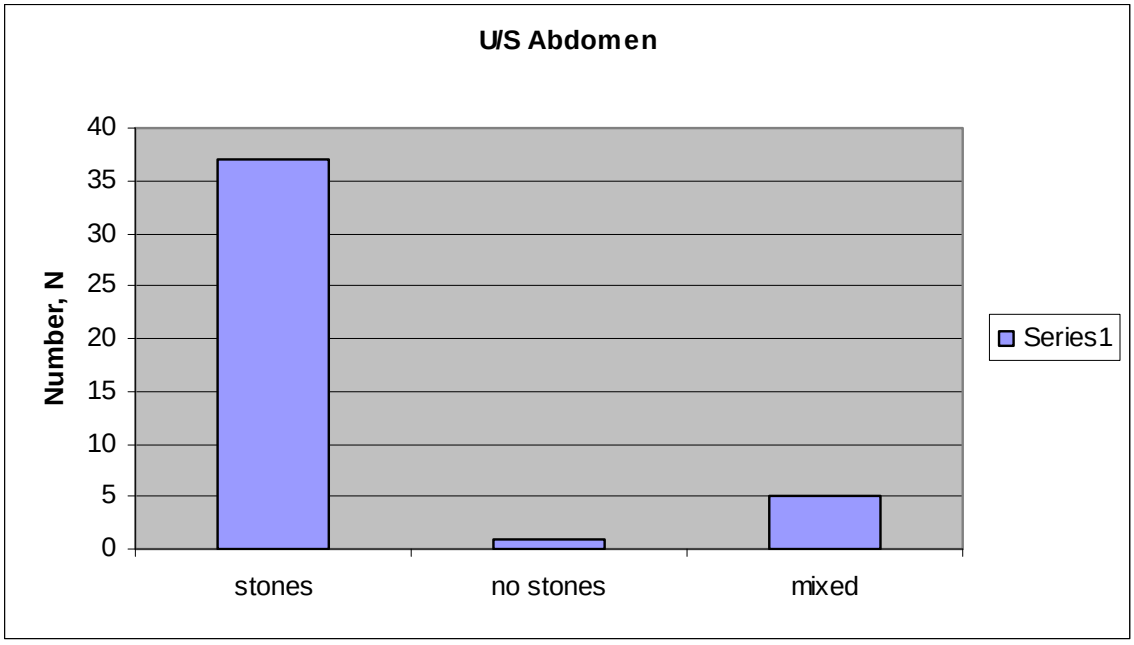
Forty three patients of 119 (36%) patients fit the inclusion criteria. Average age was 46.2 yrs (range 15-88 yrs). Timing of laparoscopic cholecystectomy from onset of symptoms was an average of 13.6 months (range 0.02-72 months. Fifteen (34%) patients were male and 28 (65%) patients were female. Patients who had gallbladder related symptoms were as follows: abdominal pain (14), biliary colic (9), mixed symptoms (17), and 1 was asymptomatic. Patients with dyspepsia were 28. No patients had pain radiating to the shoulder tip. Other dyspeptic symptoms were found as: nausea (21), vomit (18), anorexia (2), fatty food intolerance (2), heartburn (1), and flatulence (2). No patients complained about belching or borborygmi. Psychiatric determinants were found as: depression (2), anxiety (2), and use of psychotropic medications (1). None were introverted or extroverted. Ultrasonagraphy of the abdomen showed that 37 patients had gallstones, 2 had no stones, and 5 had mixed findings. Pathological findings were as follow: 27 had cholecystitis and stones, 5 had cholecystitis, stones and cholesterolosis, 4 had stones, 1 had a polyp, and 8 had mixed findings. Preoperative to postoperative diagnosis ratio were found to be: cholelithiasis 18/16, biliary colic 17/18, acute cholecystitis 5/6, biliary dyskinesia 1/1, and other 2/2. Eighteen patients were diagnosed with biliary colic based on intraoperative findings. Of these 18 patients, 16 (89%) had pathological features consistent with chronic cholecystitis.

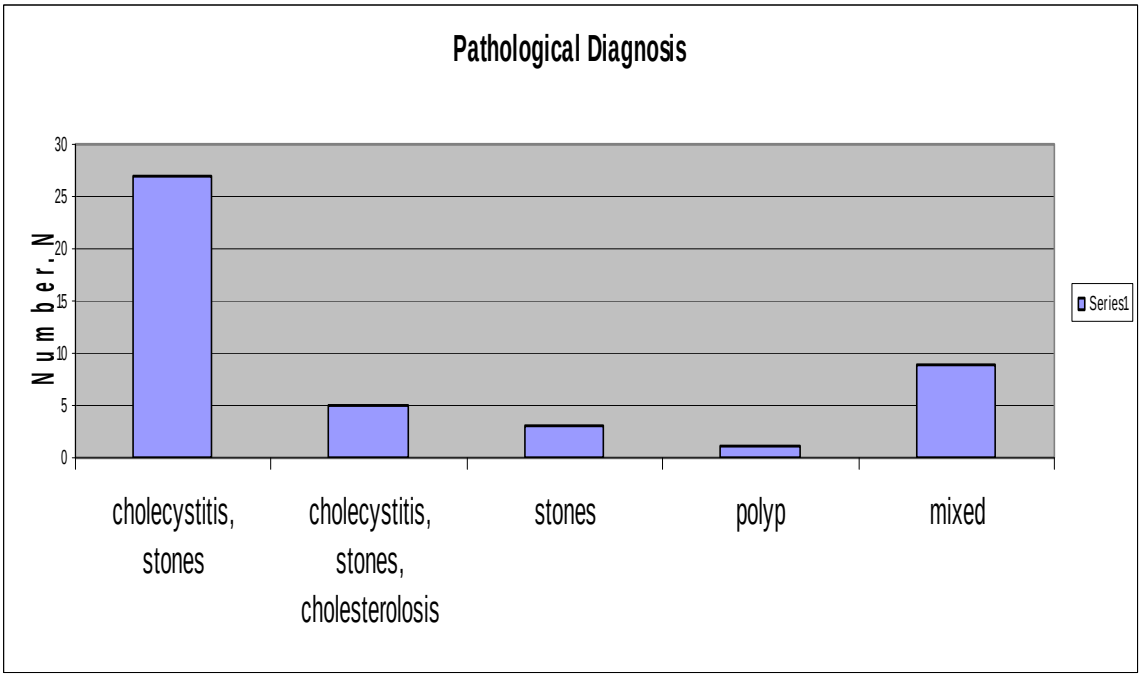

Patients
Number, N
30
25
20
15
10
5
0
male
female
Series1

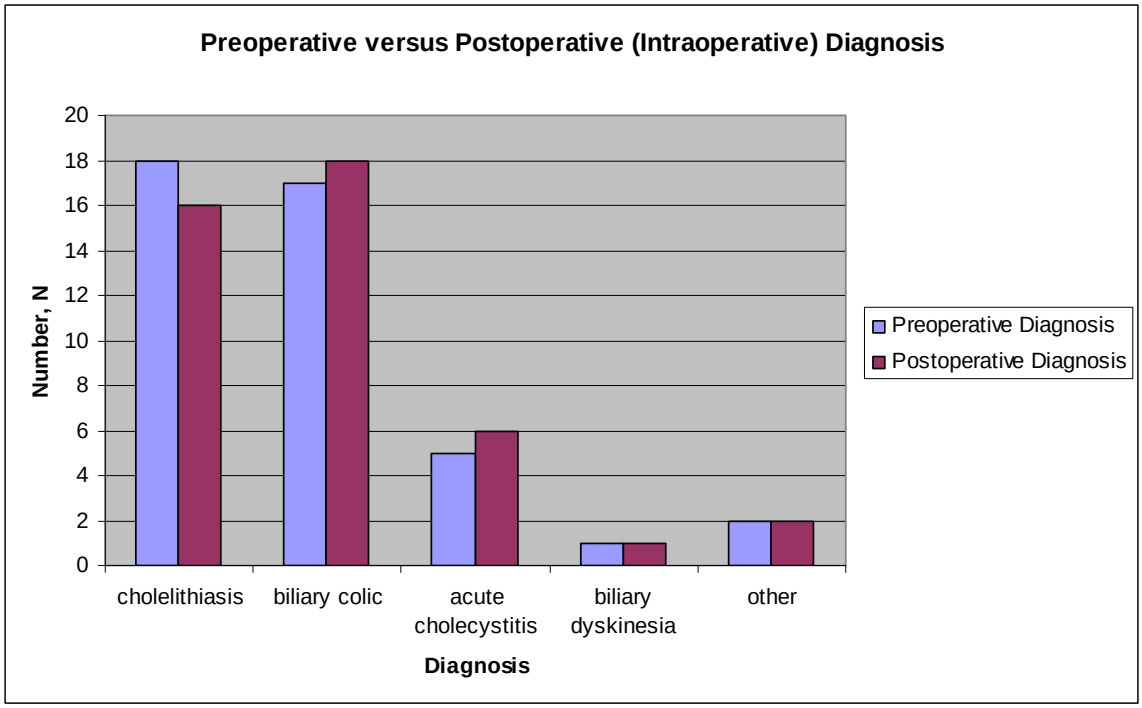

GB symptoms
Number, N
18
16
14
12
10
8
6
4
2
0
abdominal pain
epigastirc pain
RUQ
rad to shoulder tip
biliary colic
asymptomatic
mixed
Series1


Dyspeptic symptoms
Number, N
25
20
15
10
5
0
abdominal distention
nausea
vomit
anorexia
fatty food intolerance
belching
heartburn
borborygmi
flatulence
Series1


Psychiatric
2.5
2
1.5
1
0.5
0
depression
anxiety
psychotropic meds
introvert
extrovert
Series1


U/S Abdomen
Number, N
40
35
30
25
20
15
10
5
0
stones
no stones
mixed
Series1


Pathological Diagnosis
Number, N
30
25
20
15
10
5
0
cholecystitis, stones
cholecystitis, stones, cholesterolosis
stones
polyp
mixed
Series1



CONCLUSIONS

From our pilot study, which selected patients by laparoscopic cholecystectomy, identified patients with symptoms of dyspepsia were included in this group. Secondly, we identified that preoperative clinical findings, ultrasound report and intraoperative observations did not correlate with the pathological diagnosis. The proposed study is feasible.

Appendix C: Research Participant Information and Consent Form

Project title: Laparoscopic cholecystectomy and the dyspeptic patient: Developing a tool to stratify the appropriateness of operative intervention.

Principal Investigators: Drs. Roger Keith and B. Reeder, Dept. of Surgery.

Sub-Investigator: Dr. Samaad Malik, Dept. of Surgery.

You have been invited by your surgeon, because you recently had surgery to remove your gallbladder, to participate in a research project being conducted in the Department of Surgery at the University of Saskatchewan. Your participation is entirely voluntary. It is up to you to decide whether or not to take part in this study. Before you decide, it is important for you to understand what the research involves. This consent form will tell you about the study, why the research is being done and the possible benefits, risks and discomforts.

If you wish to participate, you will be asked to sign this form. If you decide to take part in this study, you are still free to withdraw at any time and without giving any reasons for your decision. If you do not wish to participate, you do not have to provide any reason for your decision. You will not lose the benefit of any medical care to which you are entitled or are presently receiving.

Please read this form carefully and feel free to discuss it with your family, friends and doctor before you decide.

Purpose of the study:

At present, we do not know the best time to remove the gallbladder from patients with gallstone disease. Patients with gallstones have various symptoms. We hope this study will help to identify the best time for gallbladder removal in order to obtain long term patient satisfaction following the operation.

Procedures:

We are asking your permission to review your medical chart to identify the various laboratory tests that were done and to look at the gallbladder pathology report. The chart review will not be used to identify any other features of personal or other health related information. We are also asking you to complete a survey questionnaire about your symptoms and other relevant information before and after your operation. The survey takes approximately 5 minutes to complete. You do not have to answer any questions you are not comfortable answering.

Dr. Samaad Malik, who is a surgical resident in the Department of Surgery at the University of Saskatchewan, will conduct the data analysis. Both the signed consent form and the survey questionnaire should be returned to Dr. Samaad Malik in the self-addressed envelope.

Benefits:

There will be no direct benefits to you for participating in this study. We hope that the information gained from this study can be used in the future to benefit other people with a similar condition.

Risks and discomforts:

There are no physical risks associated with this study.

Confidentiality:

The researchers will protect your privacy and safeguard the confidentiality of information collected about you in this study. While absolute confidentiality cannot be guaranteed, every effort will be made to ensure that the information you provide is kept entirely confidential. Your name will not be attached to any information, nor mentioned in any report, nor made available to anyone outside the research team. It is the intention of the research team to publish results of this study in scientific journals and to present the findings at related conferences and workshops, but your identity will not be revealed.

Voluntary participation / withdrawal

Your participation in this research is entirely voluntary. If you choose to enter the study and then decide to withdraw at a later time, there will be no penalty or loss of benefits to which you are entitled, and your future medical care will not be affected. The data collected about you during your enrolment will be retained for analysis.

Costs and reimbursements:

There is no cost to you for participating in this study. You will not be paid for your participation.

Who to contact for questions about this study:

If you have any questions about this study, you can contact The Principal Investigators, Dr. R. Keith (966-8631) or Dr. B. Reeder (966-7930) or Dr. Samaad Malik, who is in charge of the data analysis at 966-8631.

If you have any questions about your rights as a research subject or concerns about the study, you should contact the Chair of the Biomedical Research Ethics Board, c/o Ethics Office, University of Saskatchewan at (306) 966 4053. Collect calls are accepted.

Consent:

I, _____, have read and understand the above information and agree to participate in the study entitled: **Laparoscopic Cholecystectomy and the Dyspeptic Patient: Developing a tool to stratify the appropriateness of operative intervention**. I understand that my participation is voluntary and that all the information collected will be kept confidential and used only for scientific objectives. I am not waiving any of my legal rights by signing this consent form. I freely consent to participate in this study.

Signature_____ Date_____

APPENDIX D: Surgeon's Letter Head

Dear Person's Name

You are one of my patients who had their gallbladder removed by the Laparoscopic Technique. I am inviting you to participate in a research study, which is described in more details in the accompanying "Research Participant Information and Consent Form". The purpose of this study is to evaluate what is the best time for this operation in patients who have gallbladder pain and/or digestive symptoms.

Your participation is entirely voluntary. If you do not wish to participate, you do not have to provide any reason for your decision. It will not affect your relationship with me and you will not lose the benefit of any medical care to which you are entitled or are presently receiving.

There are two aspects to the study. A medical chart review is required to identify laboratory tests and gallbladder pathology. The chart review will not be used to identify any other features of personal or other health related information. The second aspect of the study is a survey questionnaire which is enclosed. The survey consists of questions about your symptoms and relevant information before and after your operation. It will take approximately 5 minutes to complete. All the information collected for the study will remain completely confidential, and you will not be identified by name in any aspect of the research study. The data and all corresponding information collected will be destroyed after research analysis.

If you agree to take part in this study, your medical chart review will be done by a surgical research associate in the Department of Surgery, Dr. Samaad Malik. Dr. Malik is conducting this study as a requirement for a Masters of Science Degree from the University of Saskatchewan.

A consent form is also enclosed. Your signature is required to indicate your agreement to participate in this study. Please return the signed consent form and the completed survey in the self-addressed, stamped envelope which is enclosed.

I appreciate your contribution to ongoing surgical research in Saskatchewan.

Yours sincerely,

Dr. Surgeon
Appendix E: Ethics

University of Saskatchewan
Biomedical Research Ethics Board (Bio-REB)

23-Feb-2006

Certificate of Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	Bio #
Roger G Keith	Surgery	06-26

INSTITUTION (S) WHERE RESEARCH WILL BE CARRIED OUT

Royal University Hospital
103 Hospital Drive
Saskatoon SK S7N 0W8

SUB-INVESTIGATOR(S)

Samaad Malik
Bruce A. Reeder

SPONSORING AGENCIES

UNIVERSITY OF SASKATCHEWAN

TITLE:

Laparoscopic Cholecystectomy and the Dyspeptic Patient: Develping a Tool to Stratify the Appropriateness of Operative Intervention

ORIGINAL APPROVAL DATE	CURRENT EXPIRY DATE	APPROVAL OF
23-Feb-2006	01-Feb-2007	Researcher's Summary Form, as per re-submission dated 20-Feb-2006 Cover Letter (14-Feb-2006) Research Participant Information and Consent Form (14-Feb-2006) Appendix II -- Questionnaire, as per re-submission dated 20-Feb-2006

CERTIFICATION

The University of Saskatchewan Biomedical Research Ethics Board has reviewed the above-named research project at a full-board meeting (any research classified as minimal risk is reviewed through the expedited review process). The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to governing law. This Approval is valid for the above time period provided there is no change in experimental protocol or in the consent process.

ONGOING REVIEW REQUIREMENTS/REB ATTESTATION

In order to receive annual renewal, a status report must be submitted to the Chair for Committee consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: http://www.usask.ca/research/ethics.shtml. In respect to clinical trials, the University of Saskatchewan Research Ethics Board complies with the membership requirements for Research Ethics Boards defined in Division 5 of the Food and Drug Regulations and carries out its functions in a manner consistent with Good Clinical Practices. This approval and the views of this REB have been documented in writing.

APPROVED.

Michel Desautels, Ph.D., Chair
University of Saskatchewan
Biomedical Research Ethics Board

Please send all correspondence to:

Ethics Office
University of Saskatchewan
Room 305 Kirk Hall, 117 Science Place
Saskatoon, SK S7N 5C8
Phone: (306) 966-4053 Fax: (306) 966-2069

APPENDIX F: CHART REVIEW DATA COLLECTION SHEET

Surgeon		Surgeon		Surgeon		Surgeon	
MRN		MRN		MRN		MRN	
Mr/Mrs/ Dr/Miss		Mr/Mrs/ Dr/Miss		Mr/Mrs/ Dr/Miss		Mr/Mrs/ Dr/Miss	
Last Name:		Last Name:		Last Name:		Last Name:	
First Name:		First Name:		First Name:		First Name:	
Age		Age		Age		Age	
Date of birth		Date of birth		Date of birth		Date of birth	
Address		Address		Address		Address	
Postal code		Postal code		Postal code		Postal code	
City		City		City		City	
Province		Province		Province		Province	
Gender	1- Male	Gender	1-	Gender	1-	Gender	1-
	2- Female		2-		2-		2-
Investigations		**Investigations**		**Investigations**		**Investigations**	
1- gallstones		1		1-		1-	
2- acute chole		2-		2-		2-	
3- no stones		3-		3-		3-	
4- other		4-		4-		4-	
Emergent vs elective		1 or 2		1 or 2		1 or 2	
Date of OR		Date of OR		Date of OR		Date of OR	
Preop diagn		**Preop diagn**		**Preop diagn**		**Preop diagn**	
1- Cholelithiasis		1-		1-		1-	
2- bc		2-		2-		2-	
3- acute chol		3-		3-		3-	
4- biliary dysk		4-		4-		4-	
5- other		5-		5-		5-	
Postop diagn		**Postop diagn**		**Postope diagn**		**Postope diagn**	
		1-					
1- Cholelithiasis		2-		1-		1-	
2- bc		3-		2-		2-	
3- acute chol		4-		3-		3-	
4- biliary dysk		5-		4-		4-	
5- other				5-		5-	
		SAN					
SAN				SAN		SAN	