THE ROLE OF PROPHYLACTIC NASOGASTRIC TUBE DECOMPRESSION IN PATIENTS UNDERGOING ABDOMINAL SURGERY AS SEEN AT MUHIMBILI MEDICAL CENTRE.

A CLINICAL STUDY OF 240 PATIENTS

BY

DR. MABULA D.P.M. MCHEMBE
MD (DAR - 1995)

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CERTIFICATION

The Undersigned certify that he has read and hereby recommend for acceptance by the University of Dar es Salaam a dissertation entitled: *The role of prophylactic nasogastric tube decompression in patients undergoing abdominal surgery as seen at Muhimbili Medical Centre, Dar es Salaam, Tanzania,* in partial fulfillment of the requirements for the degree of master of medicine, General Surgery.

Prof. M.R. Aziz (MBchB, Mmed.)

Supervisor

DECLARATION

I hereby declare that this study is original work done by me. I sincerely acknowledge and appreciate the contributions of other people used in writing this book. This study has neither been submitted for publication anywhere nor has it been submitted for the award of any degree in any other college.

Signature: ----------

ACKNOWLEDGEMENTS

This work is a product of the collaboration and dedicated efforts of a wide range of people whom I wish to extend my sincere thanks.

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DEDICATION

This work is dedicated to my parents. My father showed me the importance of education and made sure I made it. My mother offered a good support. It is dedicated also to my wife Siriel for her encouragement, acceptance, tolerance, help and understanding and to my son Ntunga who saw me through the struggle.

ABSTRACT:

Title: The role of prophylactic nasogastric tube (NGT) decompression in patients undergoing abdominal surgery.

Objective: To study the importance of inserting or not inserting a nasogastric (Ryle`s) tubes (NGT) prophylactically in patients undergoing abdominal surgery.

Material and methods:

All patients undergoing elective and emergency abdominal surgery in surgical wards at Muhimbili Medical Centre, with either biliary, gastric, duodenal, intestinal, peritoneal and other intra-abdominal surgical conditions, between February 1999 and November 1999, were prospectively randomised to one of the following groups: group I: those in whom the nasogastric tube was retained after surgery (controls); group II: those in whom the nasogastric tube was removed three to six hours postoperatively. The patients were monitored for the time of resumption of bowel movement, abdominal distension and vomiting, anastomotic leakage, wound infection, wound dehiscence, pneumonia, atelectasis, discomfort, length of hospital stay and deaths. Exclusion criteria included those who had oesophagectomy and those who were unconscious at the time of admission. Bowel movement was considered active when the patient passed flatus/stool or both and had no abdominal distension or vomiting. These were the indications to stop intravenous fluids, start ambulation and

consider discharge home. Nasogastric tube re-insertion was indicated in those who developed gross abdominal distension or vomiting more than three times in group II.

Results:

Two hundred and forty consecutive patients were studied, 120 patients in group I (86 males and 34 females, mean age 36.78 years [range 12-76 years]), and 120 patients in group II (100 males and 20 females, mean age 38.96 years [range 12-83 years]). Both group I and II patients were similar in age, case distribution and type of surgery. One hundred and fifteen patients (95.8%) were treated successfully without NGT decompression (group II).

In group II patients, there were three (2.5%) deaths (one due to septicaemia, the second because of cardiac arrest and the third due to metastatic gastric malignancy),and one case of anastomotic leak (0.8%). There were no cases of pneumonia, wound dehiscence, wound infection, or delay in return of gastrointestinal function, but two patients required re-insertion of the NGT. In the control group (group I), there were nine (7.5%) deaths, (three from severe haemorrhage, another three because of septicaemia, one dead of severe acute pancreatitis, one because of cardiac arrest, and one because of severe peritonitis and history of local herbs intoxication), sixty six patients (55%) had discomfort due to the NGT, three (2.5%) wound dehiscence, one patient each (0.8%) had wound infection and anastomotic leakage and no

patient had pneumonia or atelectasis. Three patients required NGT re-insertion after initial removal. All deaths in both groups were not related to the presence or absence of NGT.

Conclusion:

The routine use of NGT decompression in post-abdominal surgical patients is unnecessary, does not appear to provide any substantial benefit, and significantly increases patient discomfort. The findings of this study indicate that routine use of NGT should be eliminated except in selected circumstances, such as gross abdominal distension or excessive vomiting.

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CHATER ONE.

INTRODUCTION

A nasogastric tube (NGT) is a hollow cylindrical tube of soft rubber or plastic, inserted through a nostril, down the oesophagus into the stomach, for instilling liquid foods or other substances or for withdrawing air or gastric contents[1]. There are several types of nasogastric tubes, these includes the Ryle's (commonly used), Einhorn's, Maurice-Lee, Miller-Abbott and Cantor's tubes to mention a few.

The history of abdominal decompression dates back a long time. John Hunter (1728-1793) devised a stomach tube for the administration of stimulants to persons undergoing artificial respiration. More than 100 years later, Gross and Einhorn (1909) introduced the duodenal tube.[2] Gastrostomy was first proposed by Egenberg (1839) a Norwegian, as a justifiable operation when dealing with an oesophageal carcinoma. In 1849, Sedillot attempted the first gastrostomy but the patient did not survive. In 1876 Verneuil reported the first successful gastrostomy and attributed the result to careful suturing of the visceral to the parietal peritoneum with silver wire. Bisgard (1942) advocated jejunal intubation with the tube brought out as a gastrostomy. Horsley (1939) suggested this manoeuvre for decompression following a Billroth I gastrectomy[2].

Gastrostomy remained a method of gastrointestinal decompression until the introduction of the nasogastric tube by Levin in 1921 and its use has remained relatively unchallenged until recently. In 1926 Mc Iver[3], demonstrated that postoperative abdominal distension is due to swallowed air and can be prevented by a nasogastric tube. In the 1930s many surgeons adopted suction via an indwelling nasogastric tube, which had been popularized, by Wangensteen and Paine in the conservative management of intestinal obstruction, paralytic ileus and as part of routine postoperative care of patients after elective gastric and other abdominal operations[4]. Thereafter, nasogastric tube decompression has remained in use almost routinely in all patients who undergo major abdominal surgery. Nasogastric decompression following abdominal surgery, as a prophylactic measure for prevention of nausea, vomiting and abdominal distension is standard in most centers, and many believe that intestinal decompression via a nasogastric tube is mandatory following such surgery.[5,6] The concept being that, postoperative ileus which develops after most abdominal operations causes distension of the stomach, small as well as large intestines, and is related to an increased incidence of complications, including wound infection and wound dehiscence[6]. However, for several decades now there has been doubt regarding the justification for routine gastric decompression in the immediate postoperative period after

abdominal operation. The reason for that is, when a tube is left in position after operation it is often there as a safety valve, to ease the surgeon's mind rather than for any actual good that it confers on the patient.[7,8] Despite being used frequently, nasogastric tubes have many problems and complications which include, discomfort (often the patient is more distressed by the tube than by the painful incision), interference with ventilation of the lungs, and coughing to clear secretions, dryness of the mouth and pharynx from mouth breathing, necrosis of the nares and oesophagitis from reflux around the tube which lies across the gastro-oesophageal junction breaking the barrier normally provided by the lower oesophageal sphincter. Other complications include vomiting around the tube, fluid depletion and electrolyte derangement, which results in loss of H^+, Cl^-, K^+ and Na^+ and has to be replaced by intravenous fluids. Nasal bleeding, sinusitis, otitis media, parotitis, laryngitis, necrosis of the pharynx, retropharyngeal abscesses, and oesophageal stricture have all been reported as complications.[9]

A normal adult secretes approximately 8 litres of fluid daily into the digestive tract. This is made up of saliva, gastric juice, bile, pancreatic secretions and succuss entericus. In the presence of obstruction or distension, the volume may be significantly increased as demonstrated by Landor[9]. However, Gerber *et al* have shown that the volume of aspirate

obtained by nasogastric tube in patients with paralytic ileus ranges from 500 to 1000ml.[10] This is usually replaced by 1,000ml of parenteral solution. If this premise is correct, the intestinal tract should also be able to absorb the remaining fraction of total secretions besides that removed by the nasogastric tube.[10,11] Peristalsis is important in propagation of intestinal contents, but ceases or becomes markedly diminished in the presence of peritonitis or following extensive intestinal manipulation in major abdominal surgery. This phenomenon that may also occur in other non-surgical conditions is known as paralytic ileus, and is easily recognized by the clinician by abdominal distension, constipation and absence of bowel sounds on auscultation. Paralytic ileus assumes added importance when accompanied by abdominal distension. The treatment of this condition in the past included enterostomy, abdominal stapes, use of parasympathomimetic drugs, enemas, oxygen inhalation and spinal anaesthesia[10]. The most universally accepted treatment of paralytic ileus is gastrointestinal suction. Paralytic ileus may be looked upon as a diagnostic aid and a therapeutic tool rather than a disease; diagnostically a quiet abdomen is of value as are rigidity and tenderness in signifying the presence of pus, gastric juice or other irritating fluids in the peritoneal cavity; or that something has gone wrong following an abdominal operation. Therapeutically, the cessation of intestinal motility demonstrate

another, of the many body defense mechanisms against bowel perforations, as peristalsis slows, it allows the leaking intestinal contents to be walled off. This is preferable to having the intestine slither about the abdomen normally, spreading pus and substituting a generalized peritonitis for localized abscess.[8]

Following an operation in which a segment of the intestine has been resected, the abdomen becomes quiet. Paralytic ileus allows fibrin to seal the anastomosis while the intestine is at rest. It would be less satisfactory if peristaltic waves continued to grind through the fresh anastomosis and jeopardize the result by increasing the possibility of leakage.[11] Abdominal distension in postoperative patients may be due to one of several causes, including peritonitis, gastrointestinal obstruction and acute gastric distension. A similar type of distension may occur if a patient is fed before there is satisfactory gastrointestinal motility or before a gastrointestinal anastomosis has become functional.[12,13] Gerber and his *associates* have suggested that air that is swallowed only with deglutition or talking is very minimal to cause gross abdominal distension.[10] Nasogastric tubes therefore are chiefly concerned with the removal of swallowed air from the stomach. Hence, maintaining patients on parenteral fluids postoperatively and administering nothing orally prevents gaseous distension. If oral intake is withheld until a patient is hungry or passing flatus and peristalsis

audible, a nasogastric tube decompression would not be necessary[11]. The mere prophylactic presence of a tube in the gastrointestinal tract has never been shown to promote peristalsis and there is no logical reasons why it should. Moreover a nasogastric tube decompresses the stomach only and not the small bowel[5]. Therapeutic suction can serve the purpose of relieving gastric distension, by aspirating fluid and gas from the stomach. The advantages of treating postoperative patients without using nasogastric tubes are numerous. Such patients will require less house staff and nursing care, will need less fluid intravenously per day and may have fewer pulmonary complications. Several studies have revealed comparable results for either use or non-use of a nasogastric tube.[11,14,15,16] In 1958 a study by Gerber *et al* raised doubt about the routine use of nasogastric tube after surgery. They studied 300 consecutive cases with paralytic ileus in which suction was withheld, and compared them with 300 similar cases in which some form of intestinal suction was used. The results in both groups were similar.[10] There were 36 deaths (12%) in intubated patients and 23 deaths (7.6%) in non-intubated patients moreover the cause of deaths in both was not related to the presence or absence of the tube. In 1980 a study in United States of America of 150 patients who underwent elective abdominal operations to see the incidence of postoperative pneumonia, showed twenty three patients (15%) with

nasogastric tube developed pneumonia; compared to 2(1.5%) without nasogastric tube.[5] Thus the incidence of pneumonia was ten times greater in patients with nasogastric tube than in those without it. Another review in 1985 of 200 patients to study the role of nasogastric tube aspiration versus administration of cimetidine, the results showed that, in patients who were intubated there was significant longer time to passage of flatus, bowel movement and discontinuation of intravenous fluid administration ($P<0.05$).[6] In addition the duration of postoperative stay increased from 11.4 to 14.1 days in the intubated patients.

Rationale of this study:

This is a prospective study of 240 patients done at Muhimbili Medical Centre over a period of ten months and includes both elective and emergency surgical cases, requiring laparotomy due to intra-abdominal conditions (including simple and complicated obstructed hernia). The aim of the study was to find out whether nasogastric tube decompression in all patients undergoing abdominal operation is of any significant importance postoperatively. The working hypothesis was that most patients undergoing elective or emergency abdominal surgery do not need prophylactic nasogastric tube decompression postoperatively.

OBJECTIVES:

i) Main objective:

The general objective of this study was to determine the role of prophylactic nasogastric tube decompression in abdominal surgery as seen at Muhimbili Medical Centre.

ii) Specific objectives:

- To compare the rate of complications between the two groups.
- To determine the mortality rate in both groups.
- To determine whether there is a difference in the return of bowel activity between the two groups in both emergency and elective cases.
- To compare the number of days spent in bed postoperatively prior to the start of ambulation between the two groups as a measure of hospital stay.

CHAPTER TWO.

LITERATURE REVIEW:

Clinical anatomy of the alimentary canal:

The alimentary canal (gastrointestinal tract) is a muscular tube about 9 metres (30 feet) long, which passes through the body's ventral cavity. Although it is specialized in various regions to carry out particular functions, the structure of its wall, the method by which it moves food and the type of innervation is similar throughout its length.[17] It consists of the mouth with its associated salivary glands, the pharynx, oesophagus, stomach, small intestine with its associated glands (pancreas, liver and biliary system) and the large intestine (i.e the caecum, ascending, transverse, descending and sigmoid colon, rectum and the anal canal). The wall consists of four distinct layers, mucous membrane (mucosa), submucosa (consisting of blood vessels, lymphatics, and nerves), muscular layer (with inner circular and outer longitudinal muscles responsible for movement of the tube) and serous layer (serosa), which is an outer covering composed of the visceral peritoneum, formed of epithelium on the outside and connective tissue beneath (except the oesophagus, the rectum and the anal canal). Cells of the serosa secrete serous fluid that keeps the bowel outer surface moist.[17]

Blood Supply:

The vessels that nourish the alimentary canal and serve to remove absorbed products of digestion from the intestines penetrate the muscularis externa and form a large plexus in the submucosa. From the submucosa, branches extend through the muscularis mucosae and lamina propria and into the villi. Each villus receives, according to its size, one or more branches that form a capillary network just below its epithelium. At the tips of the villi, one or more venules arise from these capillaries and run in the opposite direction reaching the veins of the submucosal plexus. The lymph vessels of the intestine begin as blind tubes in the core of the villi. These structures despite being larger than the blood capillaries, are called lacteals, and run to the region of lamina propria above the muscularis mucosae, where they form a plexus. From there they are directed to the submucosa, where they surround lymph nodules. These vessels anastomose repeatedly and leave the intestine along with the blood vessels.

The innervation of the alimentary canal:

The nerve supply of the alimentary canal is formed by an intrinsic and an extrinsic component. The intrinsic component is constituted of groups of neurones that form the myenteric (Auerbach's) plexus, present between the outer longitudinal and the inner circular layer of the muscularis externa, and the submucosal (Meissner's) plexus in the submucosa. The plexus contains some sensory neurones that receive information from nerve endings near the epithelial layer and in the smooth muscle layer regarding the composition of the intestinal content (chemoreceptors) and the degree of expansion of the intestinal wall (mechanoreceptors). The other nerve cells are effectors and innervate the muscle layers and hormone secreting cells. The intrinsic innervation formed by these plexuses is responsible for the intestinal contractions that occur in the absence of the extrinsic innervation. The extrinsic innervation is formed by parasympathetic cholinergic nerve fibres that stimulate the activity of the intestinal smooth muscle and by sympathetic adrenergic nerve fibres that depress intestinal smooth muscle activity.[18]

The gastrointestinal tract has three major functions:-

a) Absorption of digested food material and intestinal secretions.

b) Secretion of saliva, mucus, gastric juices, pancreatic juices, bile, intestinal juices, enzymes and hormones.

c) Movement (motility) or muscular activity for mixing and propelling intestinal and food contents.

Secretory function of the gastrointestinal tract:

A normal adult secretes approximately 8,000 milliliters of fluid daily into the digestive tract, made up of saliva (1500 ml), gastric juice (1500-2000ml), bile (500-1000ml), pancreatic secretions (1500ml-2000ml) and succus entericus (2500-3000ml).[11] The secretions vary and are affected by nervous and hormonal factors. Observers have differed regarding the volume of postoperative intestinal secretions, but apparently this varies little from normal. Gerber *et al.*[10] has shown that 500 to 1,000ml fluid are obtained by nasogastric suction from patients with paralytic ileus. This is only a quarter or half of the amount contributed by the salivary gland (1000-1500ml) and the gastric juice (1500-2000ml); one may then ask what has happened to the remaining digestive tract secretions.

The stomach is small and flaccid when empty, and its intraluminal pressure is the same as intra-abdominal pressure in this state. The

stomach of a fasting human being contains a volume of fluid of approximately 50ml or less.[19] Ingestion of food or fluid increases the volume of the stomach without comparable increase in intragastric pressure. Increase in gastric contents stimulates the chemoreceptors and mechanoreceptors hence stimulating gastric motility.[19]

Motility function of the gastrointestinal tract:

The motor functions of the alimentary canal are of two basic types; mixing and propelling movements. Mixing occur when smooth muscle fibres in relatively small segments of the tube undergo rhythmic contractions. When the stomach is full, waves of muscular contractions move through its wall from one end to the other, these waves occur every 20 seconds or so and their action tend to mix food substances with digestive juices secreted by the mucosa.

Propelling movement include a wave like motion called peristalsis (involuntary regular and coordinated smooth muscle contractions). The usual stimulus for peristalsis is an expansion of the tube due to accumulation of food or secretions inside it.[17] Such kind of movement produces sounds that can be heard through a stethoscope applied to the abdominal wall. When peristalsis occurs, a ring of contraction appears in the wall of the tube and as it moves along, it pushes the contents ahead of it.

The motility is effected by the interaction of the enteric nervous system (ENS) which is embedded within the walls of the gut and consist of ganglia, primary interganglionic fibre tracts with secondary and tertiary projections to the intestinal musculature. It is arranged in two plexuses. The myenteric (Auerbach's plexus), located between the longitudinal and circular muscle coats and the submucosal (Meissner) plexus. The ENS is analogous to the spinal cord in that it generates and maintains autonomic gastrointestinal motility under normal physiological condition and which may be disturbed (abnormal motility) by certain disease states[20]. There are four recognized functional components of the ENS. Sensory neurones, interneurones, motor programme including reflex circuits, motor and secretomotor neurones. Secretomotor neurones release acetylcholine and vasoactive intestinal peptide (VIP) which induces secretion and intestinal vasodilatation. Hyperactivity results in diarrhea and hypoactivity causes constipation. Secretomotor neurones are inhibited by somatostatin and opiates. Autonomic function of the ENS is modulated by the central nervous system through the vagus nerve, the fibres of which synapse with the interneurone, sensory input from chemoreceptor, mechanoreceptor (stretch) and thermoreceptor influence the ENS directly and indirectly via the central nervous system, local interruption for example by resection and

anastomosis or extensive manipulation of the intestines inhibits secretomotor neurones.[20]

The reflex and motor circuits contain the programmes for the motility pattern which are affected by the motor neurones of the ENS. The motor neurones (inhibitory and excitatory) influence muscle activity of the gut by the release of neuropeptides, acetylcholine, and substance P for excitatory neuromuscular transmission and vasoactive intestinal peptide and purinergic substances for inhibitory neurotransmission. The smooth musculature of the gut may be regarded as a syncytium in which an intrinsic electrical pacemaker generates action potentials (electrical spikes). Under specified conditions these electrical signals become coupled to mechanical contractions. Although no commands from the motor neurons are necessary to initiate these electrical changes. The ENS modulates the excitability of the intestinal muscular syncytium. Thus responsiveness of the gut musculature to pacemaker system is determined at any particular time (excited or suppressed) by the fasting (interdigestive stage) of these electrical events (spike potentials) spread from muscle fibre and trigger contractions which are collectively called migratory motor complexes (MMC). The contractions usually starts in the stomach at the fundus and travel down the gastrointestinal tract to the colon sweeping interdigestive solids ahead of them. For this reason the MMC is sometimes referred to as

the house keeper of the gastrointestinal tract.[20] In this way the alimentary canal serves three functions: (1) transport of ingested food and fluid through the gut in an orderly fashion and finally the discharge or defecation of unabsorbed residue, (2) Conversion of ingested food to a soluble, absorbable form by grinding and kneading it with the digestive juices, and (3) mixing the luminal contents so that the material in contact with the absorbing surface is constantly renewed, thus increasing the efficiency of absorption by minimizing the distance across which materials prepared for absorption must diffuse.[21,22]

Pathophysiology of Peristalsis and Migrating Myoelectric Complex (MMC):

Peristalsis may be defined as a sequence of events in which a wave of contraction, often preceded by a wave of relaxation, passes down the intestine in an oral to anal direction.[22] The wave of relaxation is not always present. The peristaltic wave starts at a point distended with chyme and passes along the intestines at 1-5cmsec^{-1} for few centimeters before the wave dies out. It has the function of moving the intestinal contents slowly towards the ileocaecal valve.

Stimulus to the peristaltic wave is distension by a bolus of intestinal contents. This activates stretch receptors in the wall of the intestines

whose cell bodies are in the submucosa plexus. Impulses are relayed to the myenteric plexus where the axon terminal of these neurones are thought to release substance p at an interneurone which in turn activates a final neurone by 5-hydroxytryptamine release to cause contraction of both the circular muscle behind the bolus and the longitudinal muscle in front of it. The transmitter of the final neurones is probably acetylcholine, since the receptors on these muscles are of the muscarinic type.[22] Other neurones in the submucosa and myenteric plexus are also activated by collaterals of the mentioned pathways and cause relaxation of the longitudinal muscle behind the bolus and the circular muscle in front of it. The transmitter here may be ATP or VIP released at the nerve endings innervating these muscles. Contraction of circular muscle behind the bolus pushes it into a relaxed area of intestine which stimulate further stretch receptors and the entire process is repeated. As the bolus moves along the intestines it is itself spread out and thus causes reduced activation of the stretch receptors. The peristaltic wave eventually dies out. The intrinsic plexuses of the gut ensure regeneration of the wave and are necessary for a coordinated peristaltic wave to occur. The average speed of passage of intestinal contents along the intestine is 1cm min^{-1} the first remnants of a meal reach the ileocaecal valve within 3-4 hours and the last after 8-9 hours. The intestinal contents move only with each normal

peristaltic wave, a few centimetres at a time, allowing adequate time for absorption to occur. Severe irritation or excessive distension of the small intestine can produce a "peristaltic rush", which is a maintained peristaltic wave which travels through long distances of the alimentary canal in an attempt to rid the intestine of the offending cause.

The migrating myoelectric complex is a complex sequence of electrical activity associated with peristaltic waves that passes down the intestine from the body of the stomach to the ileocaecal valve; it occurs 3-7 hours after the last meal.[22] The complex has four phases:

a) Phase 1; slow waves with no associated action potentials.
b) Phase 2; slow waves with occasional action potentials on their crests, each action potential causing a contraction.
c) Phase 3; each slow wave has an action potential and contraction associated with it.
d) Phase 4, slow waves with no action potentials.

The migrating myoelectric complex starts in the stomach and passes down the intestines at 5cm min^{-1} in the jejunum and 1cm min^{-1} in the ileum. Such that an approximately 40cm of the intestine is affected by the complex at any one time. Phase 3, is the phase of peristaltic contractions that move the contents of the intestines in a caudal direction. At a given active area, phase 3 lasts on average 3 minutes in the duodenum, 7

minutes in the jejunum and 11 minutes in the ileum.[22] An individual migrating complex takes a mean of 90-120 minutes to pass from the stomach to the ileocaecal valve and on its arrival there another complex begins in the stomach. Under normal condition the alimentary canal at any one time contains approximately 100ml of gas.[22] Within the stomach this gas has a composition similar to atmospheric air, for some air is swallowed but this is thought to be only a small percentage of the gas present in the gut. The colonic gas is very variable in composition. It consists of 25-80% nitrogen, 0.1-2.5% oxygen, 0.05-47% hydrogen, 0-26% carbon monoxide and 5-29% carbon dioxide. These differences result from the varying proportions of swallowed air and bacterial gas production. The hydrogen present in the colon is derived from bacterial metabolism of ingested, non-absorbable carbohydrates such as stachyose and raffinose. Two-thirds of the adult population are non-producers of methane and other third have bacteria, which can produce methane from carbon dioxide and hydrogen.[22] All these gases are either expelled through the anus as flatus or absorbed into the circulation. Hydrogen, carbon dioxide and methane can readily diffuse through the intestinal mucosa to the blood. However nitrogen cannot easily be absorbed into the blood as this has a high partial pressure. The amount of flatus produced per day varies between 400 and 1200ml.[22] Certain ingested foods such as beans, cabbage, onions,

cauliflower and corn contains relatively large amounts of unabsorbable carbohydrate which can be fermented by colonic bacteria with gas production causes increased flatus production.

Factors which affect motility of the gastro-intestinal tract:

The alimentary canal is likely to be affected by many pathologies that leads to the affection of the bowel activity and then presents with features of intestinal obstruction (i.e. abdominal pain, vomiting, abdominal distension and absolute or relative constipation). Intestinal obstruction can arise from two major causes:

1) Mechanical and
2) Functional.

Mechanical obstruction may result from disease processes causing a local impairment of contractility (e.g. abscess, scleroderma, crohn's disease, neoplasm, bands and adhesions, intussusception, volvulus and entrapment by hernia sacs). Finally the obstruction may be in the lumen which may be blocked by a foreign body, a gallstone, bolus of incompletely digested material and in the colon, faecal impaction.[22,23] The obstruction may also be functional as in paralytic (adynamic) ileus where there is loss of peristalsis this may occur following different causes:

i) After abdominal surgery:- Where there has been an unnecessary handling of the bowel or undue exposure of the viscera, strong retraction, undue delay in operating may all cause sympathetic storm.

Following simple laparotomy small bowel motility recovers within hours. Transection of the bowel and resection with anastomosis temporarily disturbs slow wave propagation due to increased sympathetic activity and interruption of the myenteric plexuses.[25]

ii) Following crush injuries, retroperitoneal bleeding and spinal fractures. In this states there is increased sympathetic activity, with hyperpolarization of the muscles of the bowel and loss of the slow wave, action potentials and contraction of the smooth muscle.

iii) Following prolonged intestinal distension which leads to intestino-intestinal reflex

iv) Disturbance in electrolyte balance [particularly low potassium (K^+) or calcium (Ca^{2+})]. Hypokalaemia causes hyperpolarization of the intestinal smooth muscle with loss of slow waves and action potentials.[22,23]

v) Toxins:- Bacterial peritonitis produces paralytic ileus both as a result of sympathetic stimulation and the effects of bacterial toxins on the neurones of the myenteric plexuses and oedema of the gut wall.

vi) Mesenteric ischaemia following an arterial embolus or thrombosis or reduced blood flow secondary to a low cardiac output is also associated with adynamic ileus.

vii) Drugs:- Such as atropine will also inhibit peristalsis by blockade of muscarinic acetylcholine receptors. Morphine and its analoque also stimulates segmenting contractions and delay transport.

viii) Intestinal anoxia, atony and distension:- anoxia can result form general or local circulatory failure, prolonged general anaesthesia and distension of the bowel with compression of the veins in its wall or mesentery.

ix) Others:- diabetic neuropathy, hypothyroidism and cold inhibits activity. Psychogenic predisposition in anxious individuals may provoke a neurogenic ileus. Exhaustion of the bowel:- This may result from either preoperative purging or from prolonged mechanical obstruction. After many abdominal operations (and not a few others) peristalsis is inhibited for a short period, this physiological inhibition is not a paralytic ileus. Propulsive movement is absent but intestinal tone is maintained and, unless there were preoperative distension, the gut is flat.[24] Under proper conditions peristalsis returns in 6-12hours, or in about twice that time if the intestine itself has been operated on. [18,24]

This recovery can, and should occur without an intervening period of "meteorism" and gas pains.

Effects of postoperative ileus:

It is seen therefore that peristalsis may be inhibited during and after any abdominal operation ("silent" period) and that this inhibition is caused by reflex sympathetic over activity, which recovers in 6-12 hours. But in case of poor correction of factors which affect alimentary canal motility, this physiological inhibition changes into actual ileus, in which progressive distension of the bowel is of course the dominant morbid factor. Some individuals are air suckers by disposition and will swallow air both before operation (through anxiety) and after it (through discomfort). Such nervous patients are also liable to sympathetic overflow and form a fertile soil for neurogenic ileus and also for postoperative retention of urine. Once air gets into the stomach, it moves very rapidly down the small gut and if it can into the colon. In normal people ingested air can be passed as flatus in 24 minutes.[24] It should be noted that during the "silent" period the failure to eliminate gas as flatus is an additional cause of its accumulation. The distension produces its lethal effects by initiating the following vicious circles:-

i) Irreversible ileus:- The interaction of distension, anoxia and loss of muscular tone terminates in complete paralytic ileus.

ii) Kinking of distended loops:- This introduces a mechanical factor which causes further distension.

iii) Shock syndrome:- Distension of the bowel causes congestion and increased permeability of the capillaries in the wall of the distended bowel. Plasma is freely transudated into the lumen and into the peritoneal cavity. Neither the plasma in the gut, nor the digestive juices which are poured into it, can be reabsorbed; so they are lost whether by vomiting, suction or left in situ. The result is a fall in of blood volume (loss of plasma and tissue fluid) and of essential electrolytes (especially sodium and chlorides). This vicious circle continues by increasing the ileus (from oedema) and by leading to oligaemia, hypoproteinaemia and finally to renal and circulatory failure.[24]

iv) Reflex spread of distension following a local distension with loss of bowel motility.

v) Compression of the thorax:- This predisposes to atelectasis and embolism.

vi) Impairment of caval, portal and peripheral venous flow. Pressure on the great veins may lead to decreased venous return to the heart and venous thrombosis in any of these territories.

However these effects under normal circumstances do not occur because of postoperative ileus being a physiological response and not associated with gross abdominal distension.

Diagnosis of paralytic ileus:

The first stage of physiological inhibition (postoperative ileus) is recognized by the absence of visible or palpable peristalsis and by complete, or almost complete absence of bowel sounds on auscultation. There may and indeed, should be no appreciable distension. After 12-24hours peristalsis returns.[23,24] At first it is irregular and ineffective and may be felt by the patient as a slight, roughly rhythmical intestinal discomfort. In another day or so regular and effective peristalsis shows itself by the return of normal sounds and by the passage of flatus.[24] When the first return of peristalsis is associated with slight or moderate distension of the stomach and intestine, a clinical picture of postoperative meteorism with gas pain develops as a second stage. There is as yet no paralyses, indeed the movements, though infrequent and erratic, are sufficiently turbulent to cause mild colicky pains. But even if the abdomen may at times be noisy, little or no flatus is passed.

The onset of paralytic ileus (pathological ileus) is gradual, the symptoms and signs of complete obstruction supervene on the initial physiological inhibition with or without the intervening period of partial recovery just

mentioned. On the second or third postoperative day the abdomen begins to distend grossly and to become tympanic. The patient complains of a continuous dull discomfort, but there is no colicky pain. No flatus is passed and, unless a suction tube is ~~down~~ done, vomiting becomes frequent. Except when replacement therapy is started promptly, great thirst, dehydration, oliguria and other signs of plasma depletion and shock soon show themselves. The diagnostic sign is complete absence of peristalsis (dead silence on auscultation); at first this may be limited to one part of the abdomen, but before long it becomes general. In the absence of peritonitis the abdominal wall is soft, despite the distension. This differentiates paralytic ileus from mechanical obstruction which presents with:-

i) Colicky pains

ii) Copious vomiting

iii) No flatus and

iv) Increased peristalsis.

X-rays in diagnosis of postoperative ileus reveals gas distension and the cylindrical loops of gas filled ileum, with perhaps a little gas in the colon, make a fairly characteristic picture.[24]

Treatment:

The first point that must be made is that postoperative (neurogenic, physiological) ileus can be prevented to a good extent by routine use of up

to date prophylactic measures. These are directed against the five main cause of post-operative ileus and these are discussed under four headings:-

a) Pre-operative prophylaxis: The essential measures before operation are to allay anxiety, to have an empty stomach and intestine (this can be done by inserting nasogastric tube preoperatively in emergency cases and nil orally to both emergency and elective cases for approximately 8 hours), to correct dehydration and nutritional deficiencies, to avoid anything that may cause anoxia or exhaustion of the bowel (both intraoperatively and postoperatively) to avoid drugs which depress intestinal function; and to guard against peritoneal infection.

b) Most general anaesthetics in common use depresses intestinal tone and movement and so favour the development of neurogenic ileus, especially when their administration is prolonged. Hence avoidance of prolonged exposure to general anaesthetics will reduce the risks of post operative ileus and delayed onset of bowel movement.[24]

c) The main objective must be to reduce stimulation of the sympathetic tone to an absolute minimum, therefore:- i) Speed in operating is of prime importance (ii) Incisions are planned to provide the easiest possible approach (iii) Retraction should be gentle and minimal (iv) Trauma must be avoided with meticulous care; the gentle operator is

less likely to provoke a "sympathetic storm" (v) Undue exposure of viscera is harmful for two reasons: (a) It produces inhibitory impulses and (b) intestine under the pressure of only one atmosphere is prone to distend. Therefore the part of the intestine not required should be supported with warm packs, which will not need to be repeatedly poked in. (vi) Care must be taken to avoid peritoneal cavity soiling.[23,24]

d) Postoperative prophylaxis to avoid postoperative ileus, consists of nil by mouth until it is certain that full peristalsis has returned. In the less serious operations this stage may be reached in 12-hours and there may be no need to give intravenous fluid. But in major cases a period on intravenous fluid is essential.

Treatment of established postoperative ileus:

The old treatment of this condition included enterostomy, abdominal stapes, parasympathetic drugs, enemas, oxygen inhalation and spinal anaesthesia. But in modern times the most universally accepted treatment of paralytic ileus has been gastrointestinal decompression using a nasogastric tube.[4,24] This is carried out by suction through a nasogastric or gastroduodenal tube. The emptying of distended intestines, maintains its tone and blood supply and breaks all the vicious circles already listed as morbid effects of distension. In addition, it removes the dangers of a too

sudden deflation of obstructed gut and makes easier any operation which may be required for the obstructing lesions.[24]

The return of full peristalsis and the free passage of flatus are the signals which show that it is no longer necessary.[24] Intravenous fluids are important during the transient stage to maintain adequate fluid and electrolytes. There are several types of gastro-intestinal tubes, however, the Ryle's tube is the most popular for gastric decompression preoperatively, intraoperatively and postoperatively. It is manufactured in several diameters and varying lengths. The standard length are 30,36 and 42 inches (76, 92 and 107cm); the most commonly used is 92 cm length; the tubes are also made in various diameters and average useful gauge is 15 Charrie`re (0.5cm diameter).[25] There are various modification of the original Ryle's tube; including that are radio-opaque so that the level to which they are passed may be determined by x-ray screening.

To get the patient to swallow the tube successfully without a lot of distress and vomiting, calls for skill, and patience and nurse/doctor can only learn how to do this from practical ward experience. It is necessary to explain to the patient what is to be done. His position is made as comfortable as possible, sitting upright with adequate support from pillows. A bowl and some swabs must be at hand, a "feeder" containing water or saline should also be at hand as a sip of water now and then may facilitate the passage

of the tube and will do no harm. The tube is lubricated with an analgesic jelly and introduced through the nose with great care. The patient is asked to swallow repeatedly, and if he feels he is going to vomit he should stop swallowing, open his mouth and take deep breaths. Most patients will tolerate intubation reasonably well provided that it is done carefully and the tube is introduced gently. There are marks on the Ryle's tube showing the point at which the tip of the tube should enter the stomach in average adults (40cm, from the upper incisor teeth) and the point at which the tube should have reached the pylorus (55cm from the upper incisor teeth). The standard marking rings on a 92cm Ryle's tube are placed at the following approximate positions:-

- One ring at 38cm corresponds to gastro-esophageal junction
- Two rings at 54cm correspond to pyloric sphincter
- Three rings at 67cm correspond to entry of bile duct to duodenum
- Four rings at 82cm correspond to duodeno-jejunal junction.

. Once the tube is in position the proximal end is fixed to the upper lip and then taken around the side of the face and strapped to the temple. A 20-ml syringe is used to aspirate the stomach contents and the amount aspirated must be recorded on the patients fluid balance chart. Unfortunately, gastrointestinal intubation is not an innocuous procedure there are disadvantages inherent in this method of treatment that warrant

close scrutiny. The intubated patient is subjected to series of complications ranging from simple discomfort because of dry mouth and sore throat to severe respiratory problems, oesophageal ulceration and stricture and perforation of the upper intestinal tract. Nasogastric suction also complicates the postoperative care of the patient making it more difficult to maintain fluid and electrolyte requirements. The necessity for replacing the aspirated gastrointestinal secretions has been adequately stressed but no intravenous solution devised can accurately replace the physiological fluid emptied each day. Such loss of water and electrolyte via nasogastric suction is clearly iatrogenic[10]. In a 1980 study in the United States of America of 150 patients who underwent elective abdominal operations to review the incidence of postoperative pneumonia, it was shown that twenty-three cases (15%) with nasogastric tube developed pneumonia; compared to 2 (1.5%) without nasogastric tube.[5] Thus the incidence of pneumonia was ten times greater in patients with a nasogastric tube than in those without it. In another study in 1985 of 200 patients to study the role of nasogastric tube aspiration (and administration of cimetidine) the results showed that there was significant longer time to passage of flatus , bowel movement and cessation of intravenous fluid administration in tube group as compared to the group

with no tube ($p<0.05$). The duration of postoperative stay increased from 11.4 to 14.1 days in the intubated patients.[6]

CHAPTER THREE

METHODOLOGY (PATIENTS AND METHODS):

The study design is a prospective one, conducted in the Department of Surgery of Muhimbili Medical Centre, the largest consultant and teaching hospital in the country. Over a period of 10 months between February, 1999 and November, 1999, a total of 240 cases of both sexes admitted to surgical wards and underwent emergency or elective abdominal operations were collected. Inclusion criteria included operations on the gall bladder, stomach, small and large bowel surgery (such as perforated duodenal ulcer, intestinal obstruction with resection and primary anastomosis), repair of complicated and uncomplicated hernia, gun-shot or stab wound in the abdomen, blunt abdominal trauma with visceral rupture, pancreatitis, peritonitis and rectal cancer surgery.

Exclusion criteria included patients who underwent oesophagectomy (these patients needs nasogastric tube as an absolute indication) and patients in the group of "no nasogastric tube" who develop gross abdominal distension with discomfort or excessive vomiting, (in these patients re-insertion of the nasogastric tube was done and the event recorded). Others are unconscious patients in whom nasogastric tube is indicated to prevent aspiration because of poor or decreased laryngeal

reflexes and patients who are too ill to select the paper for allocation into nasogastric or without nasogastric tube group at the time of admission. Patients were allocated into two groups: group I (those with nasogastric tube) and group II (those without nasogastric tube) and in both groups patients were divided into elective and emergency cases. The procedure of intubating a nasogastric tube was explained to the patient and done as described in the literature review.

During the period of this study, all patients in the study were evaluated, counselled with regard to their disease, and finally participated in their management in the form of surgery and follow-up in the wards. For emergency cases a nasogastric tube was inserted preoperatively to empty the stomach and prevent aspiration at induction. Postoperatively the tube was retained in group I (with nasogastric tube) and was removed 3-6 hours postoperatively in group II (without nasogastric tube) this is to give time for the patient to recover well from anaesthesia. Criteria of recovery from anaesthesia are: spontaneous eye opening, oriented and obeys commands. In both groups postoperatively, the following symptoms and signs were looked for: gross abdominal fullness, distension, and vomiting more than three times. In those cases in group II (without NGT) who developed the mentioned symptoms and signs a therapeutic nasogastric decompression was inserted and the event

recorded. In both groups patients were followed-up once every 24 hours and a record kept of complaints and complications related to the use or non-use of nasogastric tube. These included pneumonia, atelectasis, dyspepsia (retrosternal pain), and sore throat.

The nasogastric tube used was a gauge 14-18 Ryle's tube depending on the age of the patient. Single lumen (Ryle's tube) which was placed to gravity drainage and removed based on the following post-operative parameters of recovery:- passage of flatus, amount of aspirate in the drainage bag less than or equal to 100ml in 24 hours, presence of active bowel sounds on auscultation; these were recorded by a registrar or resident in the particular firm. These were also the indication to start ambulation and stop intravenous fluids. Patient discharge thereafter was considered and recorded under the days of hospital stay per patient in both groups. Otherwise all patients were maintained on intravenous fluids until their bowel movement were back.

Type of study, selection of patients and sample size:

This is was an analytical prospective study. Patients were allocated randomly by asking them to pick one of two pieces of paper of similar size, colour and texture; one indicated nasogastric tube (group I) and the other indicated no-nasogastric tube (group II). The procedure for insertion of the nasogastric tube was explained to the patient, and given

a consent form to sign. This work was done on every admitted patient for emergency or elective abdominal condition requiring abdominal surgery. The sample size originated from an epidemiological formula. Using the EPI-Info 6 program. The sample size (n)

$$N = \frac{\{U.[(B_1 (1-B_1) + B_2 (1- B_2)]^{½} + V[B(1-B)]^{½}\}}{(B_2 - B_1)^2}$$

Where: B_1 = proportion of exposed (i.e those with NGT)

B_2 = proportion of not exposed (i.e. those without NGT)

U = One-sided percentage point of the normal distribution Corresponding to 100% the power .

V = percentage point of the normal distribution, Corresponding to the (two sided) significance level.

B = $(B_1 + B_2)/2$

The proportions used for the calculation of sample size are:

Group **I** (those with nasogastric tube) = 15%

Group **II** (those without nasogastric tube) = 1.5%

Power = 95%

Confidence interval = 95%

An adequate sample size was collected as 240 patients; 120 patients in each of the two groups.

Data collection:

This was done by using questionnaires indicated with name, age,

The age range were:

(a) 11 – 35

(b) 36 - 55

(c) >55

sex, type of operation, indication for operation with nasogastric tube/without nasogastric tube, therapeutic nasogastric tube, and onset of bowel activities. The emphasis here was on whether the patient has active bowel sounds and/ or passage of flatus. The days were:-

a) 1 - 2

b) 3 - 4

c) 5 and above

The questionnaire indicated complications related to the use or non use of the nasogastric tube

(i) Respiratory complications – pneumonia, and atelectasis as determined by cough, fever, chest pain, and shortness of breath. These were studied at 24-36 hours and confirmed by a chest x-ray.

(ii) Dyspepsia was defined as epigastric /retrosternal pain

(iii) Abdominal fullness was categorised as mild, moderate and severe.

(vi) Wound dehiscence

(v) Anastomotic leak

(vi) Wound infection

Data processing:

This involved the use of data master sheet to facilitate analysis. All individuals were tallied by hand in terms of age, sex, type of operation indication for operation, with nasogastric/without nasogastric tube (group I/group II); therapeutic nasogastric tube, and the onset of bowel movement. The tally comprised of five subjects who had a particular variable.

Data analysis:

From the data master sheets, simple tables were made with frequency counts for each variable, and relative frequencies were used to compare the two groups. Hence frequency tables were presented and cross-tabulations in form of dummy tables were prepared to show the major relationships and differences between two groups.

Ethical considerations:

The Department of Surgery and the Ethical Committee of the hospital management board approved this. As discussed earlier a review of previous studies showed that mortality was similar in the intubated and non intubated groups, and none of the deaths were related to the use or non use of the nasogastric tube.

RESULTS:

Age and Sex:

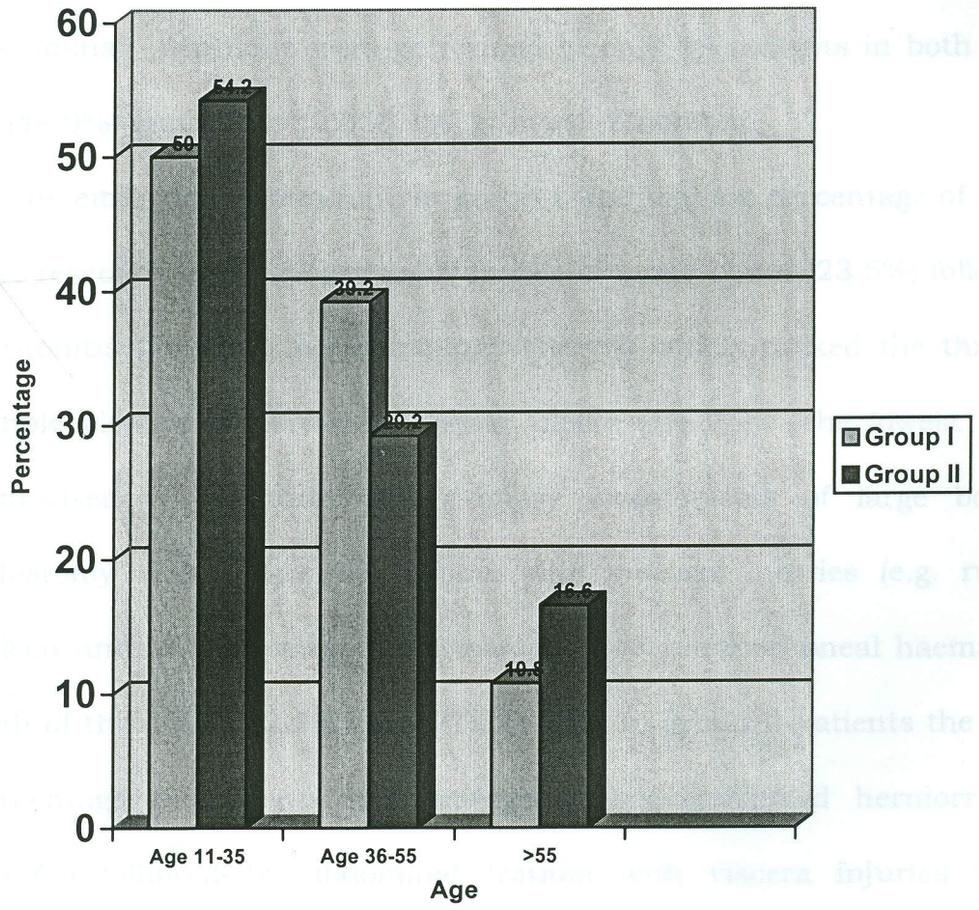
A total of two hundred and forty consecutive patients were studied (one hundred and twenty for each group). Of the 120 patients in group I, 86 patients were males and 34 patients were females, whereas, 100 patients were males and 20 patients were females in group II.

The female to male sex ratio was 1:2.5 for group I and 1:5 for group II patients. The mean age was 36.78 for group I and 38:96 for group II, the youngest patient being 12 years old for both groups and the oldest patient for group I was 76 years and 83 years for group II. (Table 1). In both groups, majority of the patients were under 35 years and only a small proportion were over 55 years of age. Fig. 1, shows the age distribution of 240 patients.

Table 1: Age distribution between group I and II patients (n = 240).

AGE	GROUPS				TOTAL
	I (n)	%	II (n)	%	
11 – 35	60	50	65	54.2	125
36 – 55	47	39.2	35	29.2	82
> 55	13	10.8	20	16.6	33
Total	**120**	**100**	**120**	**100**	**240**

Figure: 1. Shows percentage of age distribution between group I and II.



Types of operations:

Emergency:

Of the 240 patients studied, 191(79.6%) patients underwent emergency abdominal surgery. Out of these 191 patients, 98(51.31%) patients were in-group I and 93(48.69%) patients were in group II. (Table 2a.) Elective abdominal operations were performed in only 49 patients in both groups; 22(44.9%) group I and 27(55.1%) group II. (Table 2b.)

Of the emergency operations in group I, the highest percentage of patients had resection and primary anastomosis of small bowel (23.5%) followed by peritonitis (20.47%), herniorrhaphy (18.4%) which ranked the third, and simple closure of perforated peptic ulcers (13.3%). The lowest number comprised of resection and primary anastomosis of large bowel or colostomy and abdominal trauma with visceral injuries (e.g. ruptured spleen and or liver, mesenteric tear and/ or retroperitoneal haematomas) both of these had 12.2% each. (Table 2a.) In group II patients the highest percentage of patients had emergency uncomplicated herniorrhaphies (26.9%) followed by abdominal trauma with viscera injuries (21.5%), resection and primary anastomosis of small bowel (18.3%) and peritonitis (16.1%). A small percentage of patients underwent simple closure of perforated peptic ulcer and resection plus primary anastomosis or colostomy of large bowel, each of these had (8.6%). (Table 2a.) The

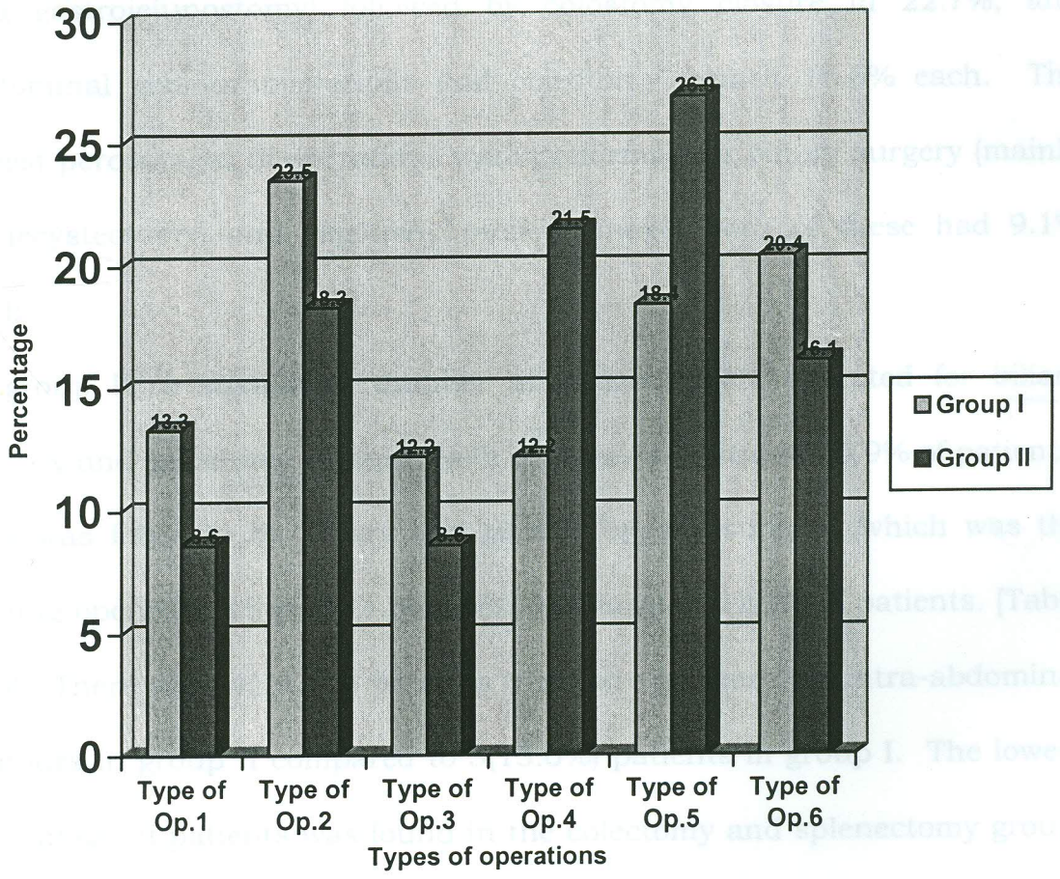
distribution of type of operation is shown in fig. 2a. Generally there were more cases which were operated for emergency herniorrhaphy, followed by small bowel resection, peritonitis, abdominal trauma, closure peptic ulcer perforations and large bowel resection plus anastomosis or colostomy. (Table 2a.)

Table 2(a): The percentage comparison of type of operations between group I and II (n=191).

Types of operation	Groups				Total (N)
Emergency	**I** (n)	%	**II** (n)	%	
1. Simple closure of Perforated peptic ulcer	13	13.3	8	8.6	21
2. * Small bowel resection	23	23.5	17	18.3	40
3. Large bowel resection and primary anastomosis or colostomy	12	12.2	8	8.6	20
4. Exploratory laparotomy for abdominal trauma with viscera injuries.	12	12.2	20	21.5	32
5. Inguinal herniorrhaphy (irreducible)	18	18.4	25	26.9	43
6. Diffuse peritonitis	20	20.4	15	16.1	35
TOTAL	**98**	**100**	**93**	**100**	**191**

* Any patient with both, small and large bowel resection were considered in the "small bowel resection" group.

Figure 2(a): The percentage distribution of types of operations between group I and II.



Key: Types of operations 1. = Simple closure of perforated peptic ulcer.
2. = Small bowel resection. 3. = Large bowel resection and primary anastomosis or colostomy.

4. = Exploratory laparotomy for abdominal trauma with visceral injuries. 5. = Inguinal herniorrhaphy(irreducible).

6. = Diffuse peritonitis.

Elective:

Among the elective cases in group I, the highest number of patients, 31.8% had gastric and biliary bypass surgery (commonly cholecystojejunostomy and gastrojejunostomy) followed by colostomy closure in 22.7%, and abdominal tumour operations and colectomy formed 13.6% each. The lowest percentages of operations were performed for biliary surgery (mainly cholecystectomy) and vagotomy plus drainage; both of these had 9.1% each.

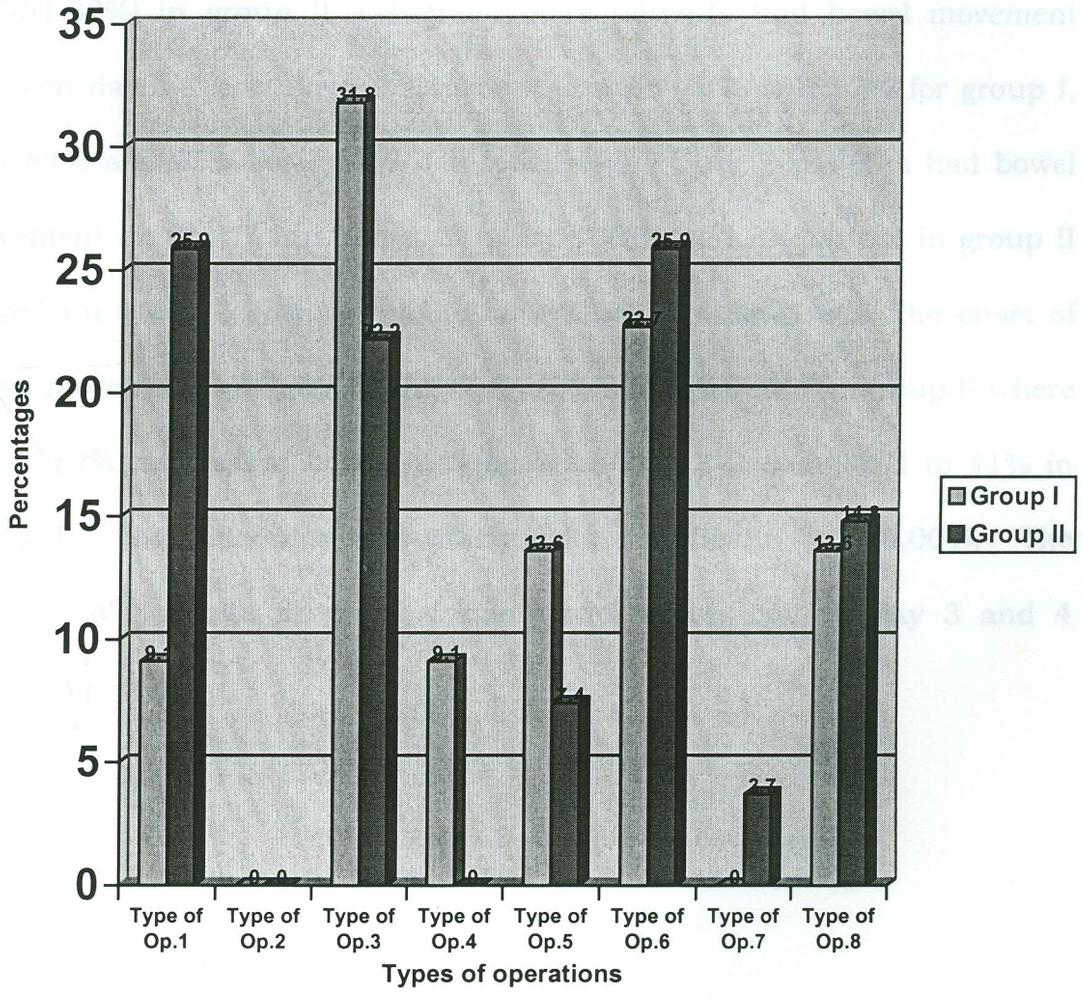
In group II, a significant number of patients were operated for biliary surgery and colostomy closure, each of these constituted 25.9% of patients. This was followed by biliary and gastric bypass surgery (which was the leading operation in group I patients) and formed 22.2% of patients. [Table 2(b)]. There were 4(14.8%) patients who were operated for intra-abdominal tumours in group II compared to 3(13.6%) patients in group I. The lowest percentage of patients was found in the colectomy and splenectomy group; 3.7% and 7.4% respectively. There were two patients in group I who underwent vagotomy and drainage and no patient in both groups underwent gastric surgery. [Table 2(b)] The percentage distribution of elective cases between the two groups is shown in Fig. 2(b). Overall, in both groups I and II there were 13 patients operated for biliary and gastric bypass surgery and 12 patients for colostomy closure. Biliary surgery and

intra-abdominal tumors 9 patients and 7 patients followed these respectively. Colectomy was performed in 5 patients in the two groups and a few underwent vagotomy (2 patients) and splenectomy (1 patient). Table 2(b).

Table 2(b): Percentage comparison of types of operation between group I and II (n=49):

TYPES OF OPERATIONS	GROUPS				TOTAL (N)
ELECTIVE CASES	**I** (n)	%	**II** (n)	%	
1. Biliary surgery	2	9.1	7	25.9	9
2. Gastric surgery	0	0	0	0	0
3. Biliary and gastric by-pass surgery	7	31.8	6	22.2	13
4. Vagotomy and drainage	2	9.1	0	0	2
5. Colectomy	3	13.6	2	7.4	5
6. Colostomy closure	5	22.7	7	25.9	12
7. Splenectomy	0	0	1	3.7	1
8. Abdominal tumours	3	13.6	4	14.8	7
TOTAL	**22**	**100**	**27**	**100**	**49**

Figure 2(b): The Percentage distribution of types of operations between group I and II.



Key= **Types of operations. 1. = Biliary surgery. 2. = Gastric surgery. 3. = Biliary and gastric bypass surgery. 4. = Vagotomy and drainage. 5. = Colectomy. 6. = Colostomy closure. 7. = Splenectomy. 8. = Abdominal tumours.**

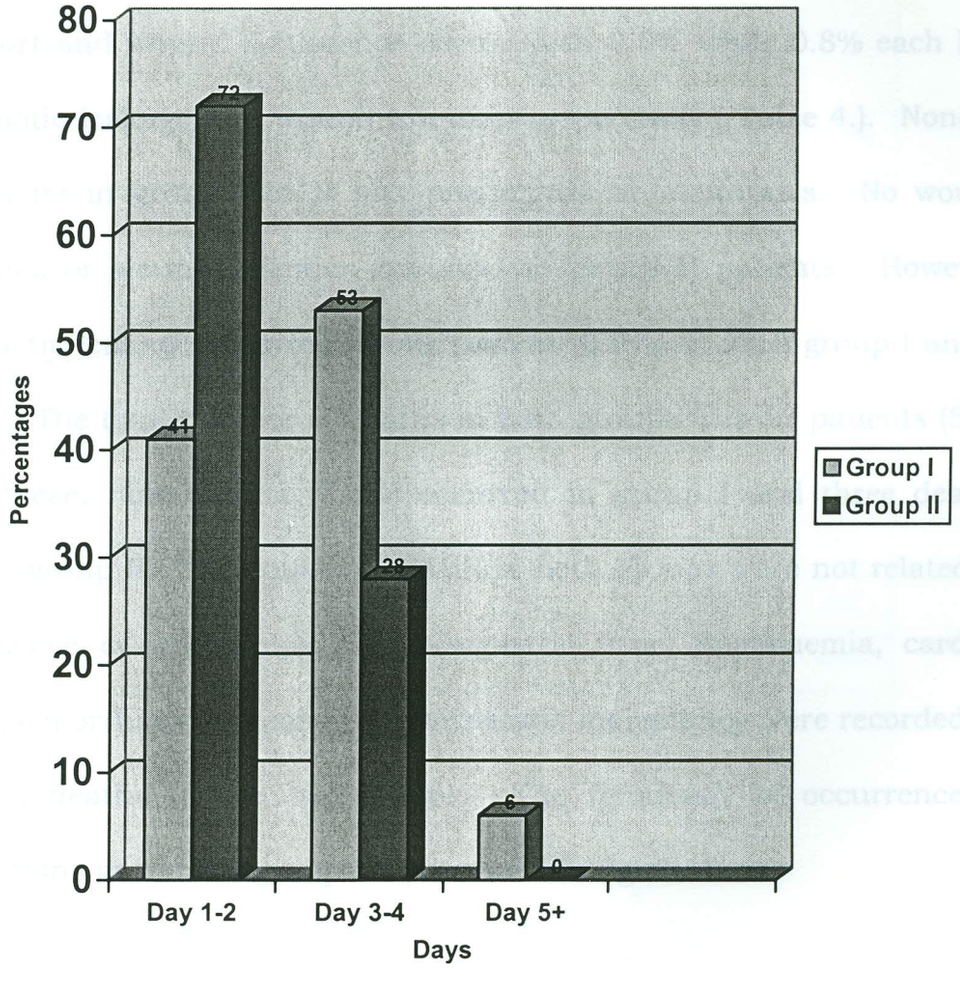
Onset on bowel movement:

With the exception of 12 deaths (i.e. 9 patients in group I and 3 patients in group II), 228 patients were studied, 111 (48.68%) in group I and 117(51.32%) in group II. Generally more patients had bowel movement between day 1-2 and days 3-4 in both groups (41% and 53% for group I, and 84% and 33% for group II respectively). Only 7 patients had bowel movement on day 5 and above in group I (6%) and no patient in group II stayed until day 5 without having active bowel movement. The onset of bowel movement was significantly earlier among patients in group II where about 72% had active bowel movement on day 1-2 compared to 41% in group I. The difference was statistically significant ($p < 0.001$). The majority of patients in group I had bowel movement on day 3 and 4 .(Table.3.)

Table 3: The percentage comparison of the onset of bowel movement between group I and II:

DAYS	GROUPS				TOTAL	
	I (n)	%	**II** (n)	%	(N)	P
1 – 2	45	41	84	72	26	P < 0.001
3 – 4	59	53	33	28	100	P < 0.001
5^{+}	7	6	0	0	69	
Total	**111**	**100**	**117**	**100**	**240**	

Figure 3. Shows the frequency occurrence of the Onset of bowel movement between group I and II.



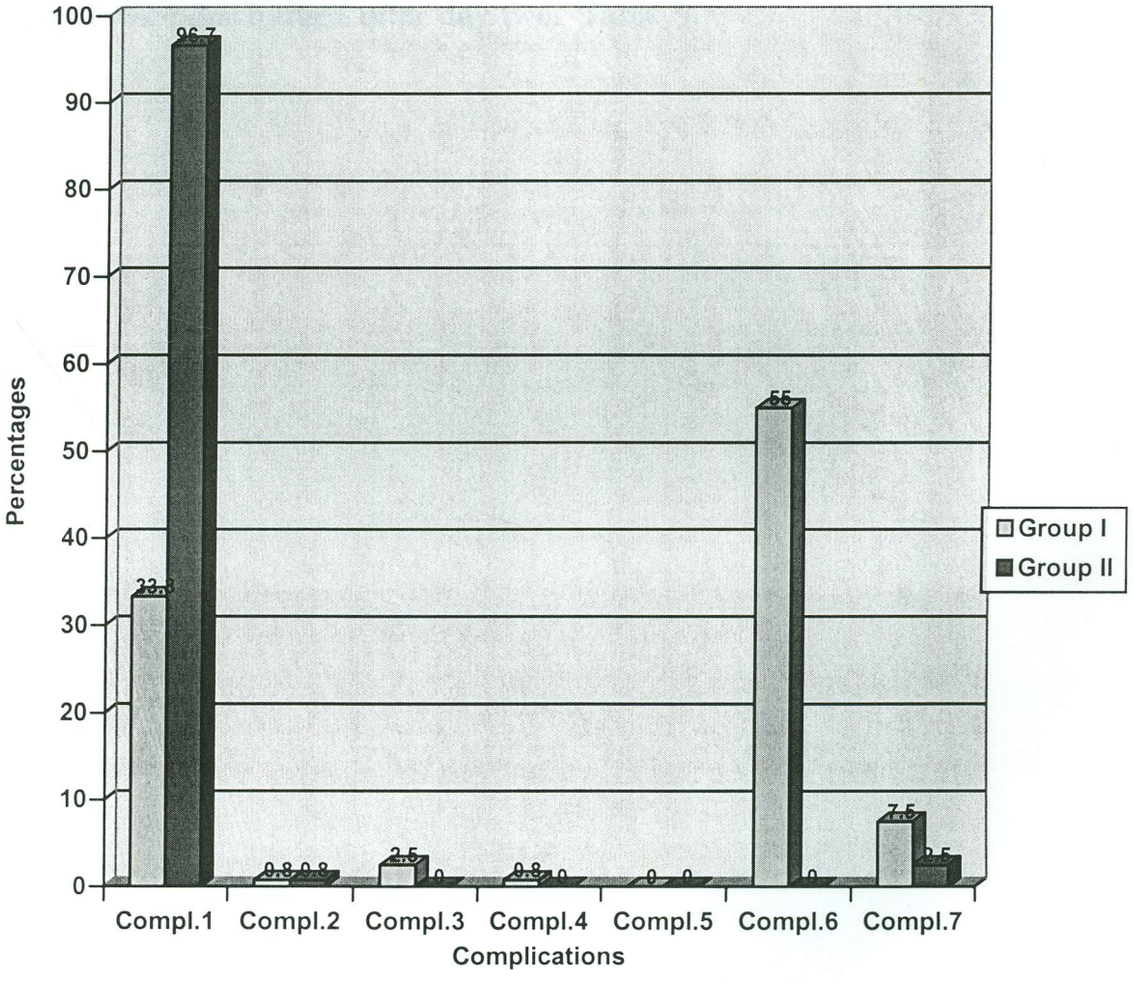
Complications:

Out of 240 patients, 84(35%) had complications from both groups (I and II). Of these 84 patients, 33.3% were from group I and only 1.7% from group II. The majority of patients in group I, a total of 55% presented with discomfort and wound dehiscence occurred in 2.5% while 0.8% each had anastomotic leakage and wound infection respectively.(Table 4.). None of the patients in group I or II had pneumonia or atelectasis. No wound dehiscence or wound infection occurred in group II patients. However, anastomotic leakage occurred in one patient (0.8%) in each group I and II patients. The total number of deaths in both groups was 12 patients (5%). Out of these, nine deaths (7.5%) occurred in group I and three deaths (2.5%) in group II. The causes of death in both groups were not related to the presence or absence of the nasogastric tube. Septicaemia, cardiac arrest, haemorrhagic anaemia and metastatic malignancy were recorded as causes of deaths in the two groups. The frequency of occurrence of complications in the two groups is presented in figure 4.

Table 4: Percentage comparison of the distribution of complications between group I and II (n=240):

COMPLICATIONS	GROUPS				TOTAL (N)
	I (n)	%	II (n)	%	
1. None	40	33.3	116	96.7	156
2. Anastomotic leak	1	0.8	1	0.8	2
3. Wound dehiscence	3	2.5	0	0	3
4. Wound infection	1	0.8	0	0	1
5. Pneumonia + atelectasis	0	0	0	0	0
6. Discomfort	66	55	0	0	66
7. Deaths	9	7.5	3	2.5	12
Total	**120**	**100**	**120**	**100**	**240**

Figure 4. Frequency occurrence of complications between group I and II.



Key: **Complications. 1. = None. 2. = Anastomotic leak. 3. = Wound dehiscence. 4. = Wound infection. 5. = Pneumonia + atelectasis. 6. = Discomfort. 7. = Deaths.**

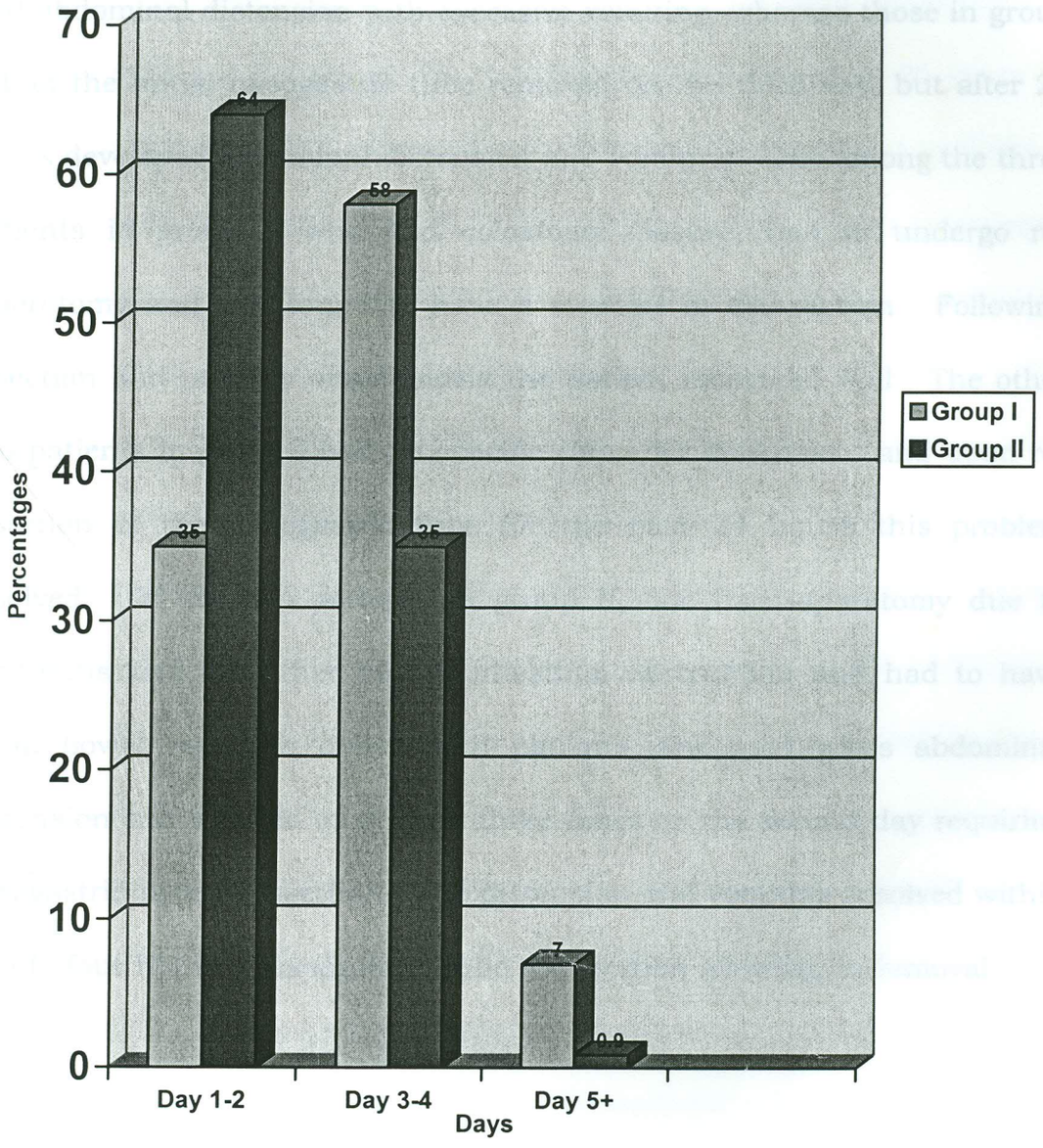
Hospital Stay:

A significantly higher proportion of patients in group II stayed for 1-2 days only as compared to patients in group I ($p < 0.01$). Most of the patients in group I were discharged after day two. Table 5.

Table 5: Shows percentage distribution of hospital stay between two groups

HOSPITAL STAY (DAYS)	GROUPS				TOTAL (N)	P
	I (n)	%	II (n)	%		
1 - 2	39	35	75	64	25	$p < 0.01$
3 – 4	64	58	41	35	89	$p > 0.05$
5+	8	7	1	0.9	82	Can not be Compared
Total	**111**	**100**	**117**	**100**	**228**	

Figure 5: Shows percentage distribution of hospital stay between group I and II.



In both groups, the nasogastric tube had to be re-inserted in 5 patients; two patients in group II and three patients in group I. Those in group II had abdominal distension with excessive vomiting, whereas those in group I, had the initial nasogastric tube removed on the third day, but after 24 hours developed abdominal distension and vomiting. One among the three patients in group I, who had colostomy closure, had to undergo re-laporotomy and was found to have a stenosis in the rectum. Following resection and primary anastomosis the patient recovered well. The other two patients in group I had no specific cause for distension, and upon re-insertion of the nasogastric tube for the next 24 hours this problem resolved. Of the two patients in group II, one had laparotomy due to peritonitis and the other due to intestinal obstruction and had to have small bowel resection done. Both patients developed gross abdominal distension and vomited more than three times on the second day requiring nasogastric tube re-insertion. The distension and vomiting resolved within twenty four hours of nasogastric tube re-insertion allowing its removal.

DISCUSSION

The 240 patients were evenly distributed among both groups with respect to age and sex. The mean age of 36.78 years in group I and 38.96 years in group II, with age ranges of 12-76 years in group I and 12-86 years in group II in this study are comparable to those in series reported by William *et al.*[6], as well as Dinsmore *et al.*[16] There were slightly higher mean ages and age ranges in the study reported by Reissman *et al.* and Ibrahim *et al.*[26,27] There were also more males operated in both groups in this study, (86 in group I and 100 in group II) compared to females, a finding similar to that reported by Reissman *et al.* and Ibrahim *et al.*[26,27] Although the male preponderance in this and other series is difficult to explain it could be attributed to the fact that more males were operated for obstructed hernia and abdominal trauma with visceral injuries and peritonitis than females in both groups.

The different types of operation were equally distributed in both groups in this study, similar to those reported in other studies.[3,4,5,6] However in this study a higher percentage of patients (51.3% in group I and 48.7% in group II) were operated as emergency cases. Cumulatively higher numbers of patients were operated for obstructed inguinal hernia in both groups. The second group of patients were those who were admitted with small intestinal obstruction due to different causes, and emergency laparotomy

was performed with or without bowel resection, constituting 23.5% in group I and 18.3% in group II. Peritonitis ranked the third and was followed by patients who had abdominal trauma with visceral injury. These underwent splenectomy, repair of liver lacerations and /or repair of mesenteric tear. Peptic ulcer perforations treated by simple closure ranked the fifth. Twenty patients were operated as emergency for large bowel conditions and these underwent laparotomy for large bowel obstruction such as sigmoid volvulus or had trauma (perforation) of the large bowel requiring resection of the large bowel plus primary anastomosis or colostomy depending on the age, general condition of the patient, duration of the pathology, viability of the bowel and experience of the surgeon. These patients ranked sixth in this series. The number of patients operated for emergency obstructed inguinal hernia, small bowel obstruction due to different causes, peritonitis, abdominal trauma with visceral injury, peptic ulcer perforation and large bowel resection plus primary anastomosis or colostomy were comparable to other studies.[3,10] Gerber *et al*[10] in their series had 34 patients treated for simple obstructed hernia, 11 patients treated for intestinal obstruction, 8 patients treated for perforated peptic ulcer disease, 21 patients had peritonitis, and 27 patients had abdominal trauma with viscerae injuries. In his series all these patients were treated without nasogastric tube, which is almost similar to

this study. Bauer[3], reported 87 patients who underwent large bowel operation and treated without nasogastric tube. His study had only patients who underwent large bowel operations but no other abdominal conditions.

In this study the number of elective cases studied was smaller. There were 49 patients in both groups, and of these 55.1% had no nasogastric tube and 44.9% had nasogastric tube inserted. Bauer's[3] study comprised entirely of elective cases and the results of his study regarding postoperative nasogastric tube are similar to those reported by Gerber[10] and Cheadle[6]. In this study 13 patients underwent biliary and gastric bypass surgery for malignant conditions such as advanced carcinoma of the pancreas with obstructive jaundice in both groups (31.8% in group I and 22.2% in group II). Colostomy closure was done in 12 patients (22.7% group I and 25.9% group II). Elective biliary surgery, (commonly cholecystectomy) in this series ranked the third with 9 patients, and of these 7(25.9%) had no nasogastric tube while 2(9.1%) had a nasogastric tube. Other studies have reported similar results in biliary surgery, colostomy closure and colectomy. Although there were fewer patients in this study, the types of operations performed were similar to those in other studies. Moreover in this study no patient underwent gastric surgery.

A total of 228 patients were studied (48.43% in group I and 51.55% in group II) and the findings showed that there were more patients in group II (71.8%) who had active bowel movement between day 1-2 postoperatively compared to 41% in group I. More patients had active bowel movement on day 3-4 postoperatively in group I (53%) but this is a larger percentage as compared to patients in group II who had active bowel movement on day 3-4 (28%) postoperatively. No patient in group II reached the fifth day without passing flatus, whereas in group I there were still a significant number of patients (6%) who passed flatus on the fifth day postoperatively. This can be explained by the presence of gastric secretion in the stomach, which can stimulate bowel activity by distending and stretching the muscle fibres of the stomach hence initiating bowel movements. Such results are similar to those was reported by Cheadle et al[6] and Pearl.[12] Both studies found a significant number of patients in group I who took a longer time to first passage of flatus, active bowel movement and discontinuation of intravenous fluids. However there are other series, which have reported no significant difference in onset of bowel movements between the two groups [8,10].

In this study, three patients required re-insertion of the tube in group I, after initial removal and two patients had re-insertion of the nasogastric tube in group II due to gross abdominal distension and more than three

times frequency of vomiting. These findings are similar to other studies.[3,6,8,12]

This study therefore re-affirms the fact that the majority of patients without a nasogastric tube had early active bowel movement within the first two days postoperatively. Those who required nasogastric tube re-insertion had similar presentation (i.e. vomiting more than three times and gross abdominal distension) in both groups, and their symptoms were relieved within twenty four hours of tube re-insertion, except one patient in group I who had colostomy closure following sigmoidectomy due to sigmoid volvulus had to undergo re-laparotomy because of a stenosis in the rectum possibly following previous surgery. This patient was initially operated as a case of colostomy closure following sigmoidectomy due to sigmoid volvulus and on the third day showed signs of active bowel movement and the nasogastric tube was removed, but twenty four hours later he presented with gross abdominal distension and vomiting after being allowed to start oral feeding.

Eighty four patients (35%) had complications (33.3% group I and 1.7% group II). Anastomotic leak was equally distributed in both groups (one patient in each group I and II), a finding that is similar to that reported by others.[3,8,16] However, in this study the overall incidence of anastomotic leak in group I and II is low (0.8%). Patients who had leaks in this study

were as follows: the one in group I had ileotransverse end to side anastomosis and the one in group II had primary anastomosis of sigmoid colon. Wound dehiscence occurred in 3 patients (2.5%) in group I and none of the patients in group II in this study. The result corresponds to that reported by Ibrahim *et al.*[18] but is different in other studies [3,12], whereby wound dehiscence was equally distributed between both groups.[3,6,12] Of three patients in group I who had wound dehiscence, one had closure of duodenal ulcer perforation and the other two had laparotomy due to peritonitis secondary to perforated appendix.

Wound infection in this study, occurred only in one patient from group I; this patient was operated as an emergency laparotomy for a perforated duodenal ulcer. There were no patients with wound infection in group II. Several series presented no differences between two groups found in terms of wound infection.[8,12] On the other hand Cheadle[6] reported 6 patients in group I and 4 patients in group II, while Bauer et al[3] had 3 patients in group I, and 2 patients in group II.

In this study no patient in either of the two groups presented with postoperative pneumonia or atelectasis. This findings is similar to that reported by Dinsmore *at el.*[16]. One study reported equal distribution of pneumonia among the two groups [12], while other studies have reported

higher number of patients with pneumonia in group I with none in group II.[3,5,6,10]

Discomfort was the single commonest problem in the majority of patients (55%) with nasogastric tube. Discomfort was expressed by these patients differently, some felt difficulty in breathing or cough adequately and some felt throat and nasal irritation.

There were a total of twelve deaths in both groups [9 (7.5%) from group I and 3 (2.5%) from group II] as shown in table 4. Although there were more deaths in the tube group as a whole, the difference was not significant. The cause of 9 deaths in group I patients were as follows, three had severe haemorrhage, three developed septicaemia, one had severe acute haemorrhagic pancreatitis, one had cardiac arrest and one patient had severe peritonitis and history of local herb intoxication. The three deaths in group II were as follows; one had septicaemia, one had cardiac arrest and one died of metastatic malignancy, on the fifth day post palliative gastrojejunostomy due to advanced carcinoma of the stomach. This finding is similar to other studies.[6,8]

In both groups the majority of patients were due for discharge between day 1-2 and day 3-4 postoperatively (35% and 58% in group I and 64% and 35% in group II) respectively. However, there were more patients in group II who were due for discharge between day 1-2 (64%; $p < 0.01$) and only

35%; $p < 0.01$ in group I. There were 7% of patients from group I and 0.9% in group II who stayed beyond five days but the reasons for their stay were not related to the presence or absence of the nasogastric tube, as most of them had their bowel movement active between day 1-2 and 3-4. It was because of either leakage at the anastomosis and or wound sepsis, which necessitated them to stay beyond five days in hospital. Studies by Schwartz[8], Ibrahim and *associates*[27] and Ressman *et al.*[26] reported similar findings in term of hospital stay. The higher proportion of patient ready for discharge in group II found between day 1-2 can be explained by the presence of intestinal contents that could stimulate bowel movements and contribute to early discontinuation of intravenous fluids, early start of ambulation and oral feeding, hence early discharge home and short hospital stay.

SUMMARY:

Routine nasogastric tube (NGT) decompression in patients undergoing abdominal operations has been the main mode of treatment from the early 20th century world wide and continues to be so in developing countries. The procedure is considered unnecessary with significant discomfort in some patients without any added advantage.

The rate of complications (anastomotic leakage, wound dehiscence, wound infection and deaths) and hospital stay has been found to be similar and even less in some situation in the "no tube" patients. These findings have been presented by previous studies done in Western countries.

This study was conducted with the aim of determining the role of prophylactic nasogastric tube decompression in patients undergoing abdominal surgery in Dar-es-salaam. Two hundred and forty patients (120 patients with tube [group I]) and 120 patients without tube [group II] who presented for emergency or elective surgical intra-abdominal conditions at Muhimbili Medical Centre were studied.

The findings are that, the type of operations and age distribution of patients were similar in the two groups. With the exclusion of two (i.e. those who had nasogastric tube re-inserted) and three patients (i.e. those who died) out of 120 patients in group II a total of 115 patients (95.8%) were treated successfully without nasogastric tube decompression,

compared to 108 patients (90%) in group I (i.e. after excluding nine deaths and three patients who had nasogastric tube re-inserted from a total of 120 patients in group I). The rate of complications was generally higher in group I than group II patients. The commonest problem was discomfort reported in 55% of patients in group I. Nasogastric tube re-insertion was necessary in both groups (2 patients in group II and 3 patients in group I). Deaths occurred in both groups, the number being higher in group I (tube patients); 7.5% compared to 2.5% in group II (no tube patients), but the causes of death in both groups were not related to the presence or absence of the NGT. The length of hospital stay, and the onset of bowel movements were statistically significantly shorter among patients in group II ($p<0.01$ and $p<0.001$) respectively. The study recommends that routine use of NGT in patients undergoing abdominal surgery is unnecessary and unjustified. It should only be used in specific cases as a therapeutic measure, especially in those who present with gross abdominal distension and excessive vomiting.

RECOMENDANTIONS

1. To reduce patient discomfort, nasogastric tubes should only be inserted in patients with clear indications such as gross abdominal distension and excessive vomiting. In these cases nasogastric tubes should be used as a therapeutic rather than a prophylactic tool.
2. Nasogastric tubes should not be used routinely to all patients undergoing abdominal surgery, as it is associated with numerous side effects. Hence there should be clear indications for its use.
3. Routine use of nasogastric tube decompression to all patients undergoing abdominal surgery places an added demand of funds on procurement of hospital consumables unnecessarily.
4. The findings in this study that routine use of nasogastric tubes is unnecessary, expensive and related to increased complications should be discussed and the information disseminated to other up country hospitals.

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