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Paravertebral Nerve Block for Pain Management of Nissen Fundoplication Surgery

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by

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Dedication and Acknowledgements

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Abstract

Providing comfort is a fundamental nursing responsibility. Unrelieved postoperative pain has adverse physiologic and psychologic effects that contribute to prolonged hospital admissions and significant discomfort to patients. Opioids are standard methods of postoperative analgesia for many surgical procedures. Unfortunately, the use of opioids is associated with side effects such as nausea and vomiting, urinary retention, ileus and respiratory depression. These side effects, with the added problem of inadequate pain control, result in patient dissatisfaction with surgical procedures.

Paravertebral nerve block (PVB) is a regional anesthetic technique that has been shown to result in opioid sparing in many procedures including breast and hernia surgery. This study investigated the possibility of improved postoperative pain and nausea management when combining paravertebral nerve blocks with general anesthesia (GA), compared to general anesthesia alone, for laparoscopic Nissen fundoplication surgery. The convenience sample consisted of 29 patients receiving surgery at the Mayo Clinic, Jacksonville, Florida. There was significant correlation between the type of anesthesia and pain at 12 hours postoperatively, indicating that those who received PVB had less pain than those receiving GA alone, at that time. Although there was no significant correlation between type of anesthesia and nausea, only one patient vomited and

others had minimum to moderate nausea, postoperatively. The information attained from this research will be beneficial to nurses providing pain management for patient comfort in the outpatient surgery center.

Chapter I

Introduction

Pain management is an essential goal in the outpatient surgery center. In the first 24 hours, 40% - 50% of postoperative patients report moderate to severe discomfort (Moline, 2001). Unrelieved pain has adverse physiologic and psychologic effects that contribute to delayed discharge, increased emergency room visits and re-admission to hospital. The use of opioids for pain relief after surgery is frequently associated with complications such as nausea and vomiting, ileus, urinary retention and respiratory depression.

Cost containment, improved technology and less invasive surgery have contributed to the significant increase of outpatient procedures. Although there have been advances in anesthesia, ambulatory surgery continues to be limited by the side effects of general anesthesia (GA) and opioids. Paravertebral nerve block (PVB) is an alternative anesthetic technique that has been shown to result in opioid sparing in many procedures including breast and hernia surgeries. Laparoscopic Nissen fundoplication is a surgical treatment for gastroesophageal reflux, which requires GA.

Purpose

Research has shown that PVB is an effective alternative to GA for some surgical interventions (Greengrass & Buckenmaier, 2002). The purpose of this study is to determine if PVB, utilized as preemptive analgesia with GA for laparoscopic Nissen fundoplication, will result in decreased pain and nausea.

The concept of pain management is relevant to health care and impacts nurses in their daily practice when caring for patients. The framework of this paper is based on Kolcaba's (1994) theory of comfort. "The theory of comfort provides direction for nursing practice and research because it entails an outcome that is measurable, holistic, positive and nurse-sensitive" (p.1178). In stressful health care situations nursing interventions are utilized to overcome problems in order to achieve patient comfort. Positive outcomes enable patients to engage in health-seeking behaviors with high self-efficacy that ultimately results in their satisfaction of health care. Institutional integrity is enhanced by patient satisfaction, successful discharges and cost-benefit ratios (Kolcaba, 2001).

For the purposes of this study a multidisciplinary team, including nurses and physicians, provided balanced analgesia in the outpatient surgery center. The goal was pain and nausea management resulting in patient comfort after laparoscopic Nissen fundoplication.

Hypotheses

1. Patients who receive GA combined with PVB for laparoscopic Nissen fundoplication surgery will experience less pain than those receiving GA alone.
2. Patients who receive GA combined with PVB for laparoscopic Nissen fundoplication surgery will experience less nausea than those receiving GA alone.

Independent Variable

Paravertebral nerve block. The independent variable of the study is the PVB which is a method of providing analgesia using local anesthetic (LA). The injection of local anesthetic into the paravertebral space blocks impulses (sensory, sympathetic and motor)carried by spinal nerves and relieves pain (Richardson & Lonnquist, 1998).

Dependent Variables

The dependent variables are the postoperative complications of pain, nausea and vomiting.

Pain. Pain is defined as a feeling of distress, suffering or agony caused by stimulation of specialized nerve endings (Miller & Brackman-Keane, 1987). There are two categories of pain. Somatogenic is pain with a known physiologic cause and psychogenic pain has no known physical cause (Leo & Huether, 1998). Acute pain has a sudden onset and alerts the body to a harmful condition. Chronic pain persistently continues for at least six months. The pain threshold is the point at which a stimulus

is perceived and tolerance is the duration and intensity of pain that a person will endure before overtly responding. The experience of pain is unique to each individual. This study will examine acute somatogenic pain caused by a surgical procedure.

Nausea and vomiting. Vomiting is defined as "forcible ejection of contents of the stomach through the mouth and nausea is an unpleasant sensation vaguely referred to the epigastrum and abdomen with a tendency to vomit" (Miller & Brackman-Keane, 1987, p.823).

Chapter II

Literature Review

All patients who undergo surgery need appropriate pain control for physical comfort and emotional well-being. Unfortunately, the use of opioids is associated with side effects such as nausea and vomiting, urinary retention, ileus and respiratory depression. Paravertebral nerve block is an alternative anesthetic technique that has been shown to result in opioid sparing in many procedures (Greengrass & Buckenmaier, 2002). This review of the literature will present an overview of the laparoscopic Nissen fundoplication procedure and its attendant postoperative problems: pain and nausea. This will be followed by a discussion of pain and its management and nausea and its management. The review will conclude with a discussion of general and local anesthesia and their use with the laparoscopic Nissen fundoplication.

Laparoscopic Nissen Fundoplication

Nissen fundoplication is a surgical intervention that restores the mechanical defective esophageal sphincter to treat gastroesophageal reflux disease (GERD)(Hinder, Smith, Klinger, Branton, & Seelig, 1999). The surgery involves wrapping the gastric fundus around the distal esophagus to augment the lower esophageal sphincter. It was developed by

Dr. V. Nissen in the 1950's, followed by the "floppy Nissen" in 1977 and the laparoscopic techniques in 1991.

A prospective study of the effects of laparoscopic Nissen fundoplication on reflux mechanisms demonstrated a significant reduction in esophageal acid exposure (Straatlof, Ringers, & Masclee, 2001). The laparoscopic procedure is less invasive than the open fundoplication and usually requires a shorter recovery time. The patient is able to resume daily activities sooner and the medical costs are significantly decreased (Alpers, 1995). A study of 557 laparoscopic surgeries found it to be a safe and effective procedure for ambulatory centers (Finley & McKernan, 2001). A survey of 171 patients at a mean of 6.4 years after surgery found that 96.5% were satisfied with the result of the procedure (Bammer, Hinder, Klaus, & Klingler, 2001).

Candidates for the laparoscopic Nissen fundoplication surgery are those who are experiencing regurgitation of gastric fluids because of an incompetent lower esophageal sphincter with failure of medical therapy (Hinder et al, 1999). Complications which may occur are: perforation of the esophagus or stomach, vagus nerve injury, esophageal stenosis, bleeding, infection, herniation at trocar sites, heartburn, dysphagia, continued esophagitis, fistulas and inability to vomit or belch (Stendel & Dirado, 1995). A common postoperative complaint is gas distention and

epigastric pain radiating to shoulders. Management of both pain and nausea is important at this stage of recovery.

Pain

Pain is the most frequent complaint of the patient in the postoperative period. Pain creates emotional problems and physiologic responses such as increased heart rate and blood pressure and depresses the immune system. Unrelieved pain impacts the respiratory, genitourinary and gastrointestinal systems (Odom, 2002). As many as 50% of postoperative patients are under-medicated and suffer unrelieved pain (American Society of Perianesthesia Nurses [ASPAN], 2002).

The experience of pain is a complex interaction of three systems (Leo & Huether, 1998; Moline, 2001). The sensory/discriminative system processes information about the sensations of pain, which are mediated through afferent nerve fibers, the spinal cord, the brain stem and higher brain centers. The motivational/affective system influences the conditioned or learned behavior through the interaction of the reticular formation, limbic system and brain stem. The cognitive/evaluative system may obstruct, alter or enhance the perception of pain (Leo & Huether, 1998).

Classification of pain. Pain can be classified as nociceptive or neuropathic. The latter is caused by an injury to peripheral nerves or the central nervous system (CNS) and is often associated with paresthesias and dysesthesias (Galassi & Edmunds, 2000). Nociceptive pain

results from the stimulation of afferent nerves in cutaneous or deep musculoskeletal tissues and is categorized as somatic or visceral. Somatic pain is localized, superficial and may be a sharp or a dull ache. Deep, crampy pain in the internal organs, abdomen or skeleton is visceral, which may become referred to dermatomal sites if it radiates from the point of origin (Leo & Huether, 1998, Galassi & Edmunds, 2000).

Postoperative pain is classified as nociceptive pain that is stimulated by tissue damage (Moline, 2001). The nociceptors (pain receptors) of the afferent pathway carry signals to the spinal cord, which transmits messages to the brain. The CNS interprets the pain signal and the efferent pathway modulates the pain sensation. According to the gate control theory, specialized cells act as a gate, opening and closing the afferent pathways to painful impulses (Leo & Huether, 1998).

Pain Management

Effective pain management is important for post-operative care. Nurses must be knowledgeable regarding pain assessment and management to facilitate recovery after surgery. This post-surgical recovery takes place in three phases: (a) Phase I during the immediate post-operative time in the Post Anesthesia Care Unit (PACU); Phase II, the step-down phase, in the 23-hour stay unit; and preparation for Phase III, the home environment, in the way of discharge instructions for home management.

Balanced analgesia utilizing nonopioids, opioids and adjuvant therapy provides a multimodal approach to pain relief. As different analgesics act on various pathways, when combined, it is possible to use a variety of analgesic agents in order to gain more effective relief with smaller dosages and fewer side effects (Moline, 2001). A recent review of studies comparing morphine and the nonsteroidal anti-inflammatory drug (NSAID) ketorolac discussed improved pain control with combination therapy (Anthony & Jasinski, 2002).

Opioid analgesics. Opioid analgesics inhibit painful stimuli when opiate receptors in the substantia gelatinosa of the spinal cord, brainstem, reticular formation, thalamus, and the limbic system interact with neurotransmitters of the autonomic nervous system (Galassi & Edmunds, 2000). The action of the drug is manifested by analgesia, sedation, euphoria, respiratory and cough reflex depression, decreased peristaltic motility and hypotension.

Three commonly used intravenous (IV) opioids in postoperative Phase I are morphine, hydromorphone and fentanyl. Morphine is the standard opioid to which others are compared in terms of efficacy and it is the primary analgesic used for relief of moderate to severe postoperative pain (Galassi & Edmunds, 2000). The onset of action is five minutes, time to peak concentration is 20 minutes and duration of action is 4-5 hours (Schull, 2000).

Oral medication such as hydrocodone and oxycodone are semisynthetic opioids that may be given alone but are usually combined with other analgesics (Galassi & Edmunds, 2000). They are used to treat moderate to severe acute postoperative pain in Phase II and are often prescribed for Phase III. Hydrocodone (Lortab) is combined with acetaminophen 500mg. The onset of action is 10-30 minutes, time to peak concentration is .5 to 1 hour and duration of action is 4 to 8 hours (Schull, 2000).

Nonopioid analgesics. The nonopioid analgesics are first-line interventions for mild to moderate pain, especially effective for postoperative and musculoskeletal discomfort (Moline, 2001). Acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDS) are included in this group. Acetaminophen is an antipyretic without any antiplatelet effects or damage to the gastric mucosa. Overdosage of acetaminophen can cause hepatoxicity. The maximum daily adult dose is four grams.

When tissue damage occurs, prostaglandins are released at the site and inflammation develops. NSAIDS inhibit inflammation by blocking cyclo-oxygenase (COX) which is required to convert arachidonic acid to prostaglandins (Pasero & McCaffery, 2001). There are two forms of COX: COX-1 and COX-2. COX-1 isoenzymes produce prostaglandins that preserve platelet function and protect gastric mucosa. COX-2 isoenzymes produce inflammatory prostaglandins that cause erythema, edema and pain. It is important to inhibit

the synthesis of COX-2 prostaglandins while preserving the beneficial functions of COX-1. NSAIDS such as ibuprofen and ketoralac are nonselective Cox inhibitors that can cause gastric mucosa irritation and antiplatelet action. Rofecoxib (Vioxx) is a selective COX-2 inhibitor. In a study comparing, COX-1 and COX-2 NSAIDS, the authors demonstrated that analgesic effect of rofecoxib 50 mg was comparable to ibuprofen 400 mg. Duration of pain relief was greater with rofecoxib than ibuprofen, 24 hours versus 9 hours, respectively (Pasero & McCaffery, 2001). As rofecoxib is a COX-2 inhibitor and does not cause gastrointestinal disturbances or antiplatelet activity, it is a viable choice for balanced analgesia.

Anesthesia

Surgical procedures such as the laparoscopic Nissen fundoplication require the use of anesthetics. Anesthetics may be classified as general, regional, or local. The two classifications useful for laparoscopic Nissen fundoplication are general and local, specifically the paravertebral block (PVB).

General anesthesia. The discovery of GA over 150 years ago facilitated the development of modern surgery (Evers, 1997). Crawford W. Long and William E. Clark were the first Americans to utilize inhalation vapors for surgical anesthesia in 1842 (Calverley, 1997). Prior to their use as anesthetics, nitrous oxide and diethyl ether were used for

social entertainment to "induce hilarity and uninhibited behavior"(p.4).

GA can broadly be defined as, "a drug-induced reversible depression of the CNS resulting in the loss of response to and perception of all external stimuli. The components include unconsciousness, amnesia, analgesia, immobility, and attenuation of autonomic responses to noxious stimulation" (Evers, 1997, p.119). Inhalation agents are most frequently used and are commonly combined with intravenous medication to provide balanced anesthesia (Stevens & Kingston, 1997). Desflurane, enflurane, isoflurane, sevoflurane and nitrous oxide are the most prominent inhalation anesthetics. Propofol, a rapidly acting sedative-hypnotic agent, is often used for induction and anesthesia maintenance (Lichtor & Wetchler, 1997). Incidence of nausea after GA is higher than regional anesthesia alone, but does not appear to differ among the potent inhalation anesthetics (Mecca, 1997).

Paravertebral nerve block. Hugo Sellheim of Leipzig (1871-1936) is credited with performing the first PVB in 1905 (Richardson et al., 1994). It was a popular procedure for surgical and obstetrical pain in the early part of the century but fell out of favor until 1979 when interest was reawakened by Eason and Wyatt (1979). The 1990s saw a revival of the technique. PVB has been used to provide analgesia for a variety of surgeries including: breast reconstruction and augmentation, herniorrhaphy,

cholecystectomy, nephrectomy, appendectomy, and thoracotomy (Greengrass & Buckenmaier, 2002).

PVB is an anesthetic technique that eliminates cortical responses to thoracic dermatomal stimulation (Klein, Bergh, Steele, Georgiade, & Greengrass, 2000). When performing a PVB, local anesthesia is injected into the triangle formed by the intervertebral body, the pleura, and the plane of the transverse process (Mulroy, 1997). This blocks the spinal nerves emerging from the spinal column into the paravertebral space. The block can be given as a single dose bolus pre/postoperatively or as a continuous infusion. Contraindications to this procedure are: infection at the site, allergy to local anesthetics, paravertebral tumor or major coagulopathy. Complications include hypotension, vascular puncture and pneumothorax (Dovey, 2000).

Initial and continuing experience with thoracic PVB has demonstrated successful surgical management of a variety of breast cancer procedures with benefits of reduced pain and nausea and vomiting postoperatively (Weltz, Greengrass, & Lyerty, 1995). In a randomized study of 60 women who had cosmetic breast surgery, PVB demonstrated improved postoperative analgesia and less nausea when compared to GA alone (Klein et al., 2000). A review of surgical management of breast cancer in 156 women found PVB to be an effective alternative to GA with less postoperative opioids required, decreased nausea and significantly earlier discharge to home (Coveney et al., 1998).

In a prospective, randomized study comparing PVB, opiate and NSAID medication for postero-lateral thoracotomies, patients who received balanced analgesia maintained their preoperative pulmonary function and had excellent pain control (Richardson et al., 1994). A trial study of PVB for inguinal herniorrhaphy demonstrated long-lasting pain relief in most patients with few side effects (Klein, Greengrass, Weltz, & Warner, 1998). Eighty-five percent of patients had excellent intraoperative analgesia while 65% remained pain-free for 10 hours after surgery

Richardson and Sabanathan (1995) performed a review of thoracic PVB analgesia and found it has the "potential to produce a high degree of efficacy" (p.1008). Compared to epidural analgesia, PVB has fewer incidences of hypotension, nausea and vomiting, pruritis and urinary retention. PVB has advantages over intercostal nerve blocks regarding reliability and complications of pleural or pulmonary damage. Richardson and Sabnathan (1995) conclude "thoracic paravertebral analgesia should be considered as the afferent block of choice for unilateral surgery of the chest or trunk and is the 'gold standard' by which all other forms of afferent blockade should be compared" (p.1013).

Nausea and Vomiting

Nausea and vomiting are common postoperative side effects that can be serious if uncontrolled. Severe vomiting can lead to prolonged hospital stays and re-

admission due to dehydration, electrolyte imbalance, wound dehiscence or hemorrhage (Nelson, 2002).

The vomiting center receives messages from many areas of the body via the central nervous system. The stimuli are triggered by pain, movement, hypoxemia, hypotension, analgesics and anesthetics. Inhaled anesthetics, such as nitrous oxide, cause gut distention and increased middle ear pressure (Jolley, 2001). Opioids also stimulate the vomiting center. Prolonged fasting, obesity and anxiety also contribute to nausea. Patients often consider postoperative nausea and vomiting to be worse than pain (Orkin, 1992). The complication of nausea and vomiting is a major factor in patient dissatisfaction with surgery and fear of subsequent surgical procedures (Kapur, 1991). Research indicates women, especially those having gynecological and abdominal surgery, are three times more likely to experience postoperative nausea and vomiting (Rowbotham, 1995).

As there are a variety of factors that cause nausea, it can be difficult to treat. There are four main neurotransmitters involved in sending stimuli to the chemoreceptor emetic trigger zone (CTZ) and vomiting center in the brain (Jolley, 2001). Neurotransmitters are affected by different types of antiemetics, so appropriate choices are important. There are four classes of antiemetics each with different mechanisms of action. Drug-induced nausea and vomiting are most effectively controlled

by serotonin 5-HT3 receptor agonists and antidopaminergics (Loud, 2000). The adrenocortical steroid, dexamethasone, is also used as an antiemetic.

Prevention measures, including use of a combination of prophylactic antiemetics both pre and perioperatively can significantly reduce the incidence of nausea and vomiting in the surgical patient (Jolley, 2001). A quantitative study of ondansetron (Zofran) trials with 1043 surgical patients demonstrated all doses were more efficacious than placebo in preventing further episodes of nausea and vomiting (Tramer, Moore, Andrew, Reynolds & McQuay, 1997). Antidopaminergics, such as promethazine, act on the chemoreceptor emetic trigger zone to relieve nausea associated with chemotherapy and surgery (Jolley, 2001). A meta-analysis regarding dexamethasone, for emetic prophylaxis, illustrated its superiority to placebo for complete protection from acute and delayed emesis with chemotherapy treatment (Ioannidis, Hesketh, & Lau, 2000).

Summary

Since laparoscopic Nissen fundoplication is an abdominal surgery with gas insufflation, GA is necessary, but opioids may not give the most effective pain relief. A preoperative PVB combined with GA may offer superior pain control with less postoperative opioid administration that may decrease nausea. PVB has been performed with this procedure and initial results demonstrated excellent

analgesia with minimal nausea and vomiting (Nielson, Steele, Klein, & Greengrass, 2002).

Chapter III

Methodology

This level II comparative study examined postoperative pain in individuals who received PVB with GA, compared to GA alone, for laparoscopic Nissen fundoplication surgery. This Chapter will provide an overview of the methods and procedures in the study.

Setting and Sample

The setting for this study was the outpatient surgery center at the Mayo Clinic/St. Luke's Hospital, Jacksonville, Florida. More than 310 physicians and 3800 allied health professionals are employed at these two facilities. There are 40 specialty and subspecialty areas. The clinic outpatient surgery center has six operating rooms and performs approximately 5000 surgeries annually. Dr. Hinder performs approximately 110 Nissen fundoplications per year.

The target population for this study was a convenience sample of all patients over 18 years of age who had Nissen fundoplication, per Dr. R. Hinder. Patients medicated for chronic pain and those who were allergic to morphine and local anesthetics were excluded from the study. Dr. R. Greengrass performed all of the paravertebral nerve blocks.

Procedure

Prior to the study, an in-service was held to provide information to the surgical staff regarding the study protocol (See Appendix A). Patients who were to undergo laparoscopic Nissen fundoplication between August 15, 2001 and October 15, 2003 were approached by the admitting nurse, informed of the purpose of the study and invited to participate. Once consent was obtained, the research protocol (See Appendix B) was placed in the patient's chart. Patients then received the usual pre-, peri- and postoperative care from physicians and nurses. All patients received standard GA and fentanyl intraoperatively, with ondansetron 4 mg IV administered 30 minutes prior to the end of the case. When Dr. Greengrass was in attendance, preoperative paravertebral nerve blocks were administered. Postoperatively, the patients were assessed for pain and nausea by the nurses in Phase I (PACU) and Phase II (step-down). Morphine was administered intravenously for pain management until hydrocodone (Lortab) elixir could be taken orally. Ondansetron and promethazine were given for nausea. Hydrocodone was prescribed for self-medication of pain at home. Patient education regarding the procedure, medications and postoperative care instructions were given preoperatively and prior to discharge.

Pain and nausea were documented at emergence of anesthesia in Phase I (PACU), Phase II (step-down) at 1, 4 and 12 hours postoperatively, and at discharge (See

Appendices C & D). Telephone interviews were used to assess pain and nausea at 48 hours after surgery (See Appendices E & F).

Instruments/Tools

Patient self-report is the single most reliable indicator of the existence and intensity of acute pain and any resultant affective discomfort or distress (U.S Department of Health and Human Services, 1992). The numerical rating scale (NRS) was utilized to assess the level of pain and nausea experienced by the patient. This tool incorporates the 0 (no pain/nausea) to 10 (worst possible pain/vomiting) indicators (Jacox et al., 1994). Patients were assessed for pain preoperatively and given instruction regarding the NRS. The location and intensity level of their baseline pain was documented. There is ample evidence for reliability, convergent validity, construct validity, and discriminant validity of this instrument (Good et al. 2001). Administration of medications for either pain or nausea was documented.

Demographic information including race, age, gender, height, weight and current medications was obtained. Procedural data pertaining to the amount of time utilized to perform PVB and GA, as well as surgical time in operating room was documented.

Informed Consent

Approval for the study was attained from the Mayo Institutional Review Board (IRB) and University of North

Florida (UNF). Informed consent was required for all participants. Patients were given information regarding the study and, initially, a verbal consent for follow-up phone calls and permission to publish research information was obtained (n=24). Because Mayo Clinic changed their policy regarding consents during the study, written consent was obtained on the remainder of the participants (n=5).

Chapter IV

Results

This Chapter will present the findings from this level II comparative study of postoperative pain in patients undergoing laparoscopic Nissen fundoplication.

Characteristics of the Sample

Between 8/27/02 and 10/2/03 there were 29 participants who enrolled in the study. One patient refused to be in the study for personal reasons and two were not appropriate candidates because of chronic pain control with narcotics.

The sample consisted of 14 males and 15 females ages 25 to 81 years, with a mean age of 53.41 years (SD = 16.35). Subjects ranged in height from 125 to 190 centimeters (cm) (M = 167.48 cm; SD = 14.25) and weighed between 51 and 146 kilograms (kg) (M = 85.66 kg; SD = 20.43 kg).

Twenty-seven of the patients (93.1%) were pre-medicated with rofecoxib 50 mg orally and dexamethasone 4 mg intravenously. One was given dexamethasone 4 mg only and one was not given any pre-op medication.

Each of the 29 subjects received propofol for induction and general anesthesia (GA) using sevoflurane or nitrous oxide. Twelve subjects (41.38%) also received a paravertebral nerve block (PVB) using ropivacaine per the

anesthesiologist. Operating room (OR) time ranged from 107 to 213 minutes (M = 148.38 minutes; SD = 29.13 minutes).

Postoperative Pain

The pain data are presented in terms of level of pain, location of pain, and medications received for pain.

Pain level. Five patients (1 male, 4 females) complained of preoperative abdominal discomfort at pain levels of 1-8 on a 0-10 scale, where 0 indicated no pain and 10 indicated the worst pain ever experienced. Pain levels were documented postoperatively at emergence in PACU, and at 1, 4, and 12 hours, at discharge and at 48 hours. Pain ranged from 0-10 during the first hour and from 0-8 at each data collection point thereafter (See Table 4.1).

Pain location. The pain was described as being located in the abdomen, shoulders or in both abdomen and shoulders. Shoulder pain was reported less after the first 4 hours (See Table 4.2).

Medications for pain. All patients were medicated with intravenous fentanyl in the OR by the anesthetist. Morphine was administered intravenously in PACU and in phase II at 1, 4 and 12 hours, as needed (PRN). Hydrocodone was taken orally, PRN, beginning at 1 hour through to 48 hours postoperatively (See Table 4.3).

Table 4.1. *Postoperative Pain Levels at Scheduled Times (N = 29)*

Pain Level	PACU[1]		1 Hour		4 Hours		12 Hours		Discharge		48 Hours	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
0	9	31.00	3	10.30	7	24.10	6	20.70	12	41.40	7	24.10
1	0	00.00	1	3.40	3	10.30	4	13.80	5	17.20	2	6.90
2	0	00.00	4	13.80	3	10.30	7	24.10	5	17.20	4	13.80
3	2	6.90	4	13.80	3	10.30	5	17.20	3	10.30	4	13.80
4	1	3.40	4	13.80	4	13.80	3	10.30	3	10.30	0	00.00
5	4	13.80	6	20.70	4	13.80	1	3.40	0	00.00	8	27.60
6	3	10.30	1	3.40	4	13.80	1	3.40	0	00.00	2	6.90
7	5	17.20	3	10.30	0	00.00	2	6.90	1	3.40	1	3.40
8	3	10.30	2	6.90	1	3.40	0	00.00	0	00.00	1	3.40
9	1	3.40	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
10	1	3.40	1	3.40	0	00.00	0	00.00	0	00.00	0	00.00

[1]PACU = Post Anesthesia Recovery Unit

Table 4.2. *Postoperative Pain Location at Scheduled Times (N = 29)*

	PACU[1]		1 Hour		4 Hours		12 Hours		Discharge		48 Hours	
Location	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
None	9	31.00	3	10.30	7	24.10	6	20.70	12	41.40	7	24.10
Abdomen	9	31.00	9	31.00	7	24.10	15	51.70	12	41.40	12	41.40
Shoulders	6	20.70	10	34.50	7	24.10	4	13.80	1	3.40	3	10.30
Both	5	17.20	7	24.10	8	27.60	4	13.80	4	13.80	7	24.10

[1]PACU = Post Anesthesia Recovery Unit

Table 4.3. *Average Amount of Analgesia Given (N = 29)*

Analgesic Agent	Minimum Dose	Maximum Dose	Average Dose	Standard Deviation
Fentanyl	150 mcg	450 mcg	272.41 mcg	89.23
Morphine	0 mg	30 mg	11.48 mg	7.56 mg
Hydrocodone in Hospital	0 mg	90 mg	24.74 mg	
Hydrocodone at Home	0 mg	90 mg	24.74 mg	

Postoperative Nausea

Levels of nausea were measured on a 0-10 scale (where 0 indicated no nausea and 10 indicated vomiting) and were documented on the same schedule as the pain assessment. All subjects received ondansetron 4 mg intraoperatively and all who complained of nausea were given medication postoperatively. Seven subjects received a second dose of ondansetron and one subject received a third dose, postoperatively. Additionally, 12 subjects received promethazine either 12.5 mg (n = 4) or 25 mg (n = 8). The nausea level was at 0 for all subjects at discharge and at 48 hours. No one required antiemetics after 12 hours (See Table 4.4).

Table 4.4. *Postoperative Nausea at Scheduled Times (N = 29)*

Nausea Level	PACU[1]		1 Hour		4 Hours		12 Hours		Discharge		48 Hours	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
0	24	82.80	25	86.2	21	72.4	28	96.6	29	100.00	29	100.00
1	0	00.00	0	00.00	1	3.40	0	00.00	0	00.00	0	00.00
2	0	00.00	0	00.00	1	3.40	0	00.00	0	00.00	0	00.00
3	0	00.00	0	00.00	2	6.90	1	3.40	0	00.00	0	00.00
4	1	3.40	1	3.40	0	00.00	0	00.00	0	00.00	0	00.00
5	2	6.90	2	6.90	2	6.90	0	00.00	0	00.00	0	00.00
6	0	00.00	0	00.00	1	3.40	0	00.00	0	00.00	0	00.00
7	1	3.40	0	00.00	1	3.40	0	00.00	0	00.00	0	00.00
8	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
9	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
10	1	3.40	1	3.40	0	00.00	0	00.00	0	00.00	0	00.00

[1]PACU = Post Anesthesia Recovery Unit

Tests of the Hypotheses

The first hypothesis tested in this study was that patients who receive GA combined with PVB for laparoscopic Nissen fundoplication surgery will experience less pain than those receiving GA alone. There was a low but significant positive correlation (r = .385, p = .039) between the type of anesthesia and pain at 12 hours postoperatively, indicating that those who received PVB had less pain than those receiving GA alone, at that time (see Table 4.5). A t-test for differences between groups also demonstrated significance (t = -2.131, df = 26.964, p = .042) demonstrating that those who received PVB had less pain at the 12-hour assessment than those receiving GA alone. There were no positive correlations at other times postoperatively.

Table 4.5. *Significant Spearman Correlations With Postoperative Pain Level at Scheduled Times (N = 29)*

		Point at Which Pain Level was Measured				
Variable	Stat	PACU[2]	1 H	12 H	D/C	48 H
PVB/GA[1]	*r*			.39		
	p			.04		
Location	*r*	.74	.43	.40	.515	.47
	p	0	.02	.03	.004	.01
Analgesia	*r*	.85	.59	.70	.60	.66
	p	0	.001	0	.001	0

[1]Combination of Paravertebral Block and General Anesthesia
[2]Post Anesthesia Recovery Unit

The second hypothesis tested in this study was that patients who receive GA combined with PVB for laparoscopic Nissen fundoplication surgery will experience less nausea than those receiving GA alone. There were no associations between the type of anesthesia used and postoperative nausea.

Correlates With Pain and Nausea

There was no significant correlation between the gender, age height or body weight of the subject and the amount of pain or nausea experienced. There was a significant correlation between pain level, pain location and total amount of analgesia received at all data collection points. Higher levels of pain were associated with shoulder pain, either alone or combined with abdominal pain. Higher levels of pain were also associated with higher amounts of analgesia administered, indicating that whenever a patient experienced pain they were given analgesics (See Table 4.5). There was no significant correlation between the type of anesthesia used for the surgical procedure and the total amount of analgesia received.

Chapter V

Discussion

Providing comfort is a fundamental nursing responsibility. Unrelieved postoperative pain has adverse physiologic and psychologic effects that contribute to prolonged hospital admissions and significant discomfort to patients. Pain management is an essential goal in the out-patient surgery center.

The question addressed by this study was whether the paravertebral nerve block (PVB) combined with general anesthesia (GA) offers superior postoperative pain relief after laparoscopic Nissen fundoplication surgery, compared to GA alone. Our results illustrate that there was significant correlation ($r = .385$, $p = .04$) between the type of anesthesia and pain at 12 hours postoperatively, indicating that those who received PVB had less pain than those receiving GA alone, at that time. There was no other correlation between pain and the type of anesthesia at other scheduled times. The reason for this is uncertain.

One possibility for the lack of significant differences may be the type of surgery and the procedure involved. Past research indicated that patients undergoing other surgeries, such as mastectomies and thoracotomies, had significantly reduced postoperative pain when PVB was

utilized (Klein et al., 2000; Richardson et al., 1994). Neither of these procedures requires abdominal gas insufflation to perform the surgery. The gas insufflation during the fundoplication surgery is a major cause of upper abdominal and shoulder pain. The PVB does not relieve discomfort and pressure caused by gas insufflation. Often, it is difficult for patients to differentiate between pain stimulated by surgery or gas insufflation, especially at emergence when they are still under the influence of sedation. Acquiring accurate levels of pain and location from patients who are semi-conscious is also challenging.

Another reason for the lack of improved postoperative pain control with PVB could be an inadequate nerve block related to technique or insufficient preoperative time between the block and the surgery. It is important that there is adequate time for the anesthesiologist to assess the effectiveness of the block prior to entering the operating room.

There was a significant correlation between pain level, and total amount of analgesia received, indicating that whenever a patient experienced pain, regardless of the location, they were given medication. This is important, as patient comfort is a primary nursing objective. All participants were discharged home within 24 hours of surgery with adequate pain control. They maintained satisfactory levels of comfort on oral medication at home

until 48 hours after surgery. None of the participants were re-admitted to hospital.

The use of opioids for pain relief after surgery is frequently associated with complications such as nausea and vomiting. This study investigated the possibility of improved pain control with PVB and less opioid use resulting in decreased nausea. There was no significant correlation between type of anesthesia and nausea. This may be related to the fact that there was little variability in the levels of nausea among subjects. Only one patient vomited, once in PACU, and once at the one hour time schedule. Others had minimum to moderate nausea (See Table 4.4). All patients with nausea and vomiting were medicated with antiemetics. No one was nauseated at discharge and none of the participants self-medicated at home with antiemetics in the first 48 hours. This excellent control of nausea may also be indicative of preoperative and intraoperative prophylactic medications, as well as prompt antiemetic treatment of postoperative complaints.

There were several limitations to this study, which may have contributed to the lack of support for the original hypothesis. The study outcome may have been affected by the small number of subjects (29 in total, 12 with PVB). A larger sample might have given the ability to demonstrate significance.

Although all the nurses were given an in-service on the use of the numerical rating scale (NRS), there may not have

been consistent patient teaching done with all subjects. Patient self-report is the most reliable indicator of the existence and intensity of acute pain (U.S. Department of Health and Human Services, 1992) but individual interpretations, especially with sedation may have altered their perception, indicating inaccurate results.

Another limitation could have been varying degrees of activity during Phase II (step-down) from 4 hours to discharge. Increased activity is beneficial for the resolution of gas insufflation but can stimulate incision site discomfort. No data were collected regarding when and how active the subjects were and if they had been medicated prior to movement.

Implications for Practice and Research

Kolcaba and Wilson's recent comfort theory for perianesthesia nursing "provides nurses with rationale for enhancing patient comfort. Enhanced comfort strengthens recipients (patients or family members) to engage in getting well, following a health care regime, achieving presurgical function, and feeling confident about the future"(2002, p.104). Their framework guides research, education and evidence-based practice that are important for continued health care advancements. Providing comfort is a fundamental nursing responsibility.

This study investigated the possibility of improved postoperative pain and nausea management utilizing multimodal analgesia and antiemetics with paravertebral

nerve block and general anesthesia. Advanced registered nurse practitioners (ARNP) may utilize this information when they are counseling their patients about surgical procedures. It is important for patients to understand that they have treatment options pertaining to their health care. The ARNP may inform their patients regarding current prophylactic antiemetics and analgesics as well as adjuvant therapy. The limitations and adverse effects should be discussed. Patient education regarding the possible treatments for postoperative pain and nausea will help to relieve unnecessary anxiety and prepare them for surgery.

Summary

The patients who received PVB had less pain, 12 hour postoperatively, than those with GA alone. This may not be enough to justify the time and expense of a PVB for Nissen fundoplications. Further research is necessary to determine the efficacy and economic impact of PVB for this type of surgery.

Although there was no other significant correlation, the goal of maintaining comfort in order to achieve successful discharge and home management was accomplished. A multidisciplinary approach, by the nurses and physicians, provided balanced analgesia and antiemetic therapy in the outpatient surgery center. This type of collaborative teamwork for patient care has the potential to positively influence patients' satisfaction with both their surgical procedure and their overall perioperative experience.

Appendix A

Notice of Research In-service

Research In-service

PARAVERTEBRAL NERVE BLOCK FOR POSTOPERATIVE PAIN MANAGEMENT OF NISSEN FUNDOPLICATION SURGERY

Monday, July 29, 2002

1400 - 1500

This research is in fulfillment of my thesis requirement in the Nurse Practitioner program at UNF.

The inservice will provide research protocol information to all staff in OSC. Team work is important.

Presented by Shelly Brock

Guest Presentation by

Kathleen Mullen

Thank You

Appendix B

Research Protocol for Chart

Pre-op

Informed consent (verbal and documented in nurses notes).

Pre-medication:

- Rofecoxib (Vioxx) 50 mg po
- Dexamethasone 4 mg IVP

Patients receiving PVB will have procedure performed per Dr. Greengrass per standard of care.

OR

All patients will receive GA per standard of care.

- Propofol/Sevoflurane
- Fentanyl
- Ondansetron (Zofran) 4 mg IV 30 minutes prior to end of case.

Phase I (PACU)

- Morphine IV prn pain
- Ondansetron IV prn nausea
- Promethazine 25 mg pr prn nausea

Phase II (23 hour stay)

- Hydrocodone (Lortab) elixir po prn pain
- Promethazine 25 mg pr prn nausea

Phase III (Home)

- Hydrocodone elixir po prn pain
- Promethazine 25 mg pr prn nausea

Appendix C

Pain Record Sheet

Time	Pain level 0-10	Location of Pain	Medication
Pre-op	_____	_____	_____
PACU	_____	_____	_____
1 Hour	_____	_____	_____
4 Hour	_____	_____	_____
12 Hour	_____	_____	_____
Discharge	_____	_____	_____
48 Hour	_____	_____	_____

Appendix D

Nausea Record Sheet

Time	Nausea level 0-10	Medication
Pre-op	_____	_____
PACU	_____	_____
1 Hour	_____	_____
4 Hour	_____	_____
12 Hour	_____	_____
Discharge	_____	_____
48 Hour	_____	_____

Appendix E

Patient Pain and nausea record sheet (Home)

Time	Pain/Nausea level 0-10	Location of Pain	Medication
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
48 Hours	_____	_____	_____

Appendix F

Telephone Script

This is Shelly Brock RN from the outpatient surgery center at the Mayo Clinic. I'm calling to see how you are doing after your surgery. (Patients will be given forms at discharge to record their pain and nausea at 48 hours postop)

Did you have pain 48 hours after surgery?

If so, where was the pain located, what was the pain level (0-10) and did you take any medication? Was it effective?

Did you have nausea/vomiting 48 hours after surgery?

If so, what was the level (0-10) and did you take any medication? Was it effective?

Did you have any other problems after surgery?

Do you have any questions or concerns?

Thank you

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