CHAPTER II

LITERATURE REVIEW

2.1 Searching strategy

All related articles were searched by assessing Medline at National Library of Medicines: Pubmed that provided journal database from 1949 to present (2007). The web site is http:// www.pubmed.com by using pubmed searching engine search term (**Hemorrhoidectomy** OR **Haemorrhoidectomy**) was used in the field of title to get 1015 articles. Then key word (**Local anesthesia** OR **Local anaesthesia**) was used in the field of title and I have got 48 articles left. Stapled hemorrhoidectomy was excluded by adding Boolean operator **NOT** follow with term **"stapled"** , then 44 articles left.

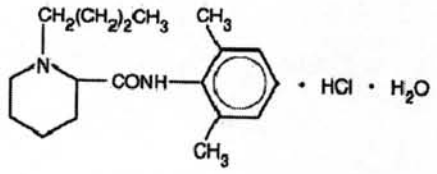
2.2 Review of related literatures

Local anesthesia

1. Pharmacology and adverse effect of Bupivacaine

The following detail is got from the website of US food and drug administration http:// fda.gov/ and Principles of Office Anesthesia: Part I. Infiltrative Anesthesia from Journal of American Family Physician 2002; 66:91-4.

Injections are sterile isotonic solutions that contain a local anesthetic agent with and without epinephrine (as bitartrate) 1:200,000 and are administered parenterally by injection. Injections contain which is chemically designated as 2-piperidinecarboxamide, 1-butyl-N-(2,6-dimethylphenyl)-, monohydrochloride, monohydrate and has the following structure:



Local anesthetics block the generation and the conduction of nerve impulses, presumably by increasing the threshold for electrical excitation in the nerve, by slowing

the propagation of the nerve impulse, and by reducing the rate of rise of the action potential. In general, the progression of anesthesia is related to the diameter, myelination and conduction velocity of affected nerve fibers. Clinically, the order of loss of nerve function is as follows: (1) pain, (2) temperature, (3) touch, (4) proprioception, and (5) skeletal muscle tone. Systemic absorption of local anesthetics produces effects on the cardiovascular and central nervous systems. At blood concentrations achieved with therapeutic doses, changes in cardiac conduction, excitability, refractoriness, contractility, and peripheral vascular resistance are minimal. However, toxic blood concentrations depress cardiac conduction and excitability, which may lead to atrioventricular block, ventricular arrhythmias and to cardiac arrest, sometimes resulting in fatalities. In addition, myocardial contractility is depressed and peripheral vasodilation occurs, leading to decreased cardiac output and arterial blood pressure.

2. Recommended concentration

Recommended concentration for local infiltration is 0.25%. Maximum dosage limit must be individualized in each case after evaluating the size and physical status of the patient, as well as the usual rate of systemic absorption from a particular injection site. Most experience to date is with single doses of up to 225 mg with epinephrine 1:200,000 and 175 mg without epinephrine; more or less drug may be used depending on individualization of each case.

3. Complications of injection anesthetics

The most common complications occur during epidural administration or accidental intravascular administration. If large amounts of local anesthetics are absorbed rapidly, central nervous system (CNS) and cardiovascular toxicity may occur. The signs and symptoms of CNS toxicity induced by local anesthetic resemble vasovagal responses. Early symptoms, such as a metallic taste, tinnitus, light headedness, and confusion, are followed by tremors and shivering. Ultimately, generalized seizures and respiratory arrest may occur. Local anesthetics can also have profound effects on the cardiovascular system. At low doses, local anesthetics cause systemic vasoconstriction and raise blood pressure. At high doses, local anesthetics

may cause negative inotropic effects on the heart as well as heart block. In addition, the high protein binding and lipid solubility of bupivacaine may explain rare reports of ventricular arrhythmias with the use of this agent. Toxic reactions to local anesthetics are best avoided by slow and careful injection to avoid intravascular administration. Halting the injection and administering oxygen will often suffice to treat CNS and cardiovascular toxicity.

Pharmacologic activity

Anesthetic	*Equivalent Concentration*	*Onset (minutes)*	*Duration (hours)*	*Maximal dose (mg per kg)*
Bupivacaine (Marcaine)	0.25%	5	2 to 4	2.5 mg per kg, not to exceed 175 mg

Spinal anesthesia

The following detail is got from Spencer S. Liu. Current issues in spinal anesthesia. Canadian Journal of Anesthesia 2002

Local anesthetic solution injected into the subarachnoid space blocks conduction of impulses along all nerves with which it comes in contact. There are three classes of nerve: motor, sensory and autonomic. Stimulation of the motor nerves causes muscles to contract and when they are blocked, muscle paralysis results. Sensory nerves transmit sensations such as touch and pain to the spinal cord and from there to the brain, whilst autonomic nerves control the caliber of blood vessels, heart rate, gut contraction and other functions not under conscious control. SA affect the activity of the urinary bladder and voiding by inhibiting the autonomic and pudendal nerve result in prolonged detrusor block cause inability to void. After injection of spinal anesthetics, dilution with the CSF occurs prior to arrival at effector sites in the CNS. Thus, individual variation in lumbosacral volumes of CSF and distribution within this volume will affect spinal anesthesia. Recent imaging with magnetic resonance demonstrates great variability between individuals in volume of lumbosacral CSF with a range of 28–81 ml.

Interestingly, obese individuals have substantially less CSF (~10 ml less) that is partly due to compression of the neural foramina. Clinical correlation between volume of lumbosacral CSF and spinal anesthesia with hyperbaric lidocaine and isobaric bupivacaine is excellent with CSF accounting for 80% of the variability for peak block height and regression of sensory and motor block. Unfortunately, volume of lumbosacral CSF does not correlate with external physical measurements other than weight. Thus, CSF volume cannot be easily estimated from physical examination and is not easily applied to the clinical setting.

Duration of action of spinal bupivacaine

Local anesthetic	*Dose (mg/ml)*	*Duration of motor block* (min)	*Duration of sensory block* (min)
Bupivacaine (hyperbaric)	5	50	123

Cardiovascular effect

Cardiovascular effects of spinal anesthesia typically include a decrease in arterial blood pressure and central venous pressure (CVP). Hypotension occurs from decreases in systemic vascular resistance (SVR) and CVP from sympathetic block with vasodilation and redistribution of central blood volume to lower extremities and splanchnic beds. Sudden bradycardia can occur from shift in cardiac autonomic balance towards the parasympathetic system as evidenced in spectral analysis of heart rate variability, from activation of left ventricular mechanorecptors from a sudden decrease in left ventricular volume, or from increases in baroreflex activity.

Spinal Headache

A characteristic headache may occur following spinal anesthesia. It begins within a few hours and may last a week or more. It is postural, being made worse by standing or even raising the head and relieved by lying down. It is often occipital and may be associated with a stiff neck. Nausea, vomiting, dizziness and photophobia

frequently accompany it. It is thought to be caused by the continuing loss of CSF through the hole made in the dura by the spinal needle. This results in traction on the meninges and pain.

Treatment of spinal headache Patients with spinal headaches prefer to remain lying flat in bed as this relieves the pain. They should be encouraged to drink freely or, if necessary, be given intravenous fluids to maintain adequate hydration.

Urinary retention

The reported incidence of urinary retention following hemorrhoidectomy, averaging around 15 percent, has range from less than one percent to as high as 52 percent of patients[1-5].As the sacral autonomic fibers are among the last to recover following a spinal anesthetic, urinary retention may occur. If fluid pre-loading has been excessive, a painful distended bladder may result and the patient may need to be catheterized. After hemorrhoidectomy, urinary retention is probably the most unexpected complication among the more common complications such as bleeding and severe pain. It is believed that the factors associated with urinary retention are anesthesia, surgery, volume of fluid administrated, and pain.

Jai Bikhchandani, M.S et al[6]. Department of Surgery, Maulana Azad Medical College and Associated Lok Nayak Hospital, India reported 42 patients symptomatic hemorrhoid that were operated on under spinal anesthesia. The most common complication seen was urinary retention (16.7%). One patient (2.4%) had severe bleeding per rectum in the first 24 hours after surgery. Marian F et al [7] conducted a prospective study comparing between local anesthesia and spinal anesthesia for anorectal surgery setting at Maimonides medical center, New York in 1994. This study revealed that local anesthesia was superior to spinal anesthesia due to less postoperative pain in local anesthesia. Spinal anesthesia had significantly greater incidence urinary of retention (32% Vs 9.6%, $p<0.05$) while other complications were higher, but not reached statistical significance.

Postoperative pain following hemorrhoidectomy is usually very intense. Severe postoperative pain usually leads to prolong convalescence associated with substantial analgesic consumption. In an effort to accomplish of early pain control with infiltration of

local anesthesia into the wounds and the ischiorectal fossae. It should provide paralysis of the external sphincter and decreased sensation in the anal canal. The addition of this block would appear to confer specific advantages following hemorrhoidectomy. Zouheir Naja MD, et al. 2004[8] reported the result from a prospective, randomized, double-blind study that bilateral nerve stimulator guided pudendal nerve blocks could provide better postoperative pain relief compared to general anesthesia alone or in combination with placebo nerve blocks. In the year 2001, Samuel Argov [9] reported his experience in 2,245 patients. He performed ambulatory hemorrhoidectomy using cocktail of local anesthesia 20 cc, composed of bupivacaine hydrochloride 0.5% with adrenalin and lidocaine hydrochloride 2% in equal amounts with the addition of some bicarbonate. Anesthetic solution was injected into intersphincteric plane. Each patient was discharged within 2 hours postoperatively. A negligible number of patients (5) were detained overnight because of their fear of being alone at home immediately after the operation. The most common complication was difficulty in voiding (9%), which ordinarily resolved in a warm Sitz bath. Only 4 patients (0.2%) required single catheterization. Only 42 patients (2.1%) bled, but successfully controlled by conservative treatment. No patient required reoperation or hospitalization.

The technique for perianal block rarely described in Textbooks. Many techniques have been developed to provide sufficient blockage of the sensory and motor nerves that supply the anus. These technique induce and relaxation of the sphincters and anesthesia to allow anal surgery without general anesthesia. L. Hunt, et al [10].1999 report their experience in 51 patients who were performed hemorrhoidectomy under local anesthesia. 86% satisfied with their postoperative pain control. There were 2 patients rebled, 2 anal stenosis, 1 urinary retention and 1 severe anal pain. Jaehwang Kim, et al [11] conducted a prospective randomized trial to study the effects of a pudendal nerve block in anal surgery were compared with those of spinal anesthesia. Postoperative pain controlled was better in pudendal group. The time from the injection of the anesthetics to the first sensation of pain was longer in the pudendal group (9.1 *vs.* 3.1 hours; $P < 0.001$). Urinary catheterization was required in only 7.5% in the pudendal group compared with 69.6% in the spinal group ($P < 0.001$). The degree of pain at 24 hours after surgery was significantly lower in the pudendal

group (2.7 *vs.* 5.2, Visual Analog Scale; $P < 0.001$). The amount of analgesics injected was significantly lower in the pudendal group (16/81 *vs.* 45/82; $P < 0.001$). Lohsiriwat V and Lohsiriwat D [12] conducted a retrospective study including 222 elective ambulatory anorectal surgeries. There were 150 closed hemorrhoidectomies under perianal anesthetics infiltration. The average pain score was 3.4 +/- 2.3 on day 1 and 1.2 +/- 1.5 on day 7 postoperatively. Urinary retention was found in one case (0.5%). None of the patients needed hospital admission, except one emergency hospitalization (0.5%) due to bleeding.