Comparison between Distal Paravertebral and Line Block Anaesthesia for Laparotomy in Goats

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December, 2018

Authorization

The work presented in this thesis is entirely my own and I hereby declare that I am the sole author of the thesis entitled “Comparison between Distal Paravertebral and Line Block Anaesthesia for Laparotomy in Goats”. I also declare that it has not been previously submitted to any university for the award of a degree.

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This is to certify that we have examined the above Master's thesis and have found that is complete and satisfactory in all respects, and that all revisions required by the thesis examination committee will be addressed

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DEDICATED TO MY RESPECTED AND BELOVED PARENTS

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Contents

List of tables

List of figures

List of abbreviations and symbols

DPVA	Distal Para Vertebral Anesthesia
LB	Line block
PAN	Primary Afferent Nociceptors
CCCA	Chittagong City Corporation Area
CVASU	Chittagong Veterinary and Animal Sciences University
CNS	Central Nervous System
DREZ	Dorsal Root Entry Zone
PGA	Periaqueductal Grey
Ne	noradrenergic pontomedullary cell groups
Rm	nucleus rahe magnus
Mc	raticularis magnocellularis
Pgl	Paragigantocellularis
DLF	Dorso Lateral Funiculus
GABA	Gama Amino Butyric Acid
CNS	Central Nervous System
SAQTVH	Shahidul Alam Quadery Teaching Veterinary Hospital
OR	Odds Ratio
WBC	White Blood Cells
PCV	Packed Cell Volume
RBC	Red Blood Cel
Mg	Miligram
BCS	Body Condition Score
CGRP	calcitonin gene-related peptide
et al.	And his associates

Abstract

Animal husbandry practices are available in Bangladesh as there are a lot of feed staffs found here. A farmer raises goats for financial benefit. Where is a huge demand of chevon in Bangladeshi market especially in urban area. Sometimes goat takes polythene with their normal feed or such other unfed feed staffs, ruminal inertia happens. In that cases, laparotomy needs to correct the problem out. The study was conducted for experimental purposes toward relating the probability and efficiency of two methods of local anaesthesia with lidocaine 2% for laparotomy in goat. A total of 10 goats experiencing laparotomy were divided into two groups where five animals undertook a technique consisting of an incisional line block and the other five undertook distal paravertebral anaesthesia. Laparotomy in goat is commonly performed due to the rumenotomy or sometimes for exploratory. In our study, two commonly used local anaesthesia methods were compared with the degree of difficulty and the amount of time and anaesthetic agent required. The reactions of the goats to incision of the various layers of the abdominal wall, abdominal exploration and surgical closure of the abdomen and the time for wound healing were evaluated. Both techniques required a mean of five minutes to complete but the line block method was considered more difficult than the distal paravertebral anaesthesia. After distal paravertebral anaesthesia, pain reactions to incision of the external oblique abdominal muscle were more severe, however, reactions to abdominal exploration and to suture, the two oblique abdominal muscles were significantly milder than after line block. Wound healing was significantly better than in line-block. Neither technique resulted in consistent and complete elimination of pain reactions in every patient, but overall distal paravertebral anaesthesia had better results than the line block. The analgesic effect of both techniques was improved by mild tranquillization/sedate before laparotomy.

Key words: Distal paravertebral anaesthesia, line block, goats.

Chapter-I

Introduction

Laparotomy is universally designated for exploratory drives when clinical diagnosis is inexact or for therapeutic surgical involvement has been made (Hendrickson, 2007). It is solitary of the furthermost conjoint surgical procedures in livestock practice which is customarily accomplished on standing cattle (Nuss *et al*., 2012). However, no documents recorded in standing goats. The anatomical conditions can be effortlessly detected and positional corrections in the abdomen are calmer to do. In contrast to general anesthesia, there is less to cardiovascular depression and none inhibition of the visceral organs in local and regional anaesthesia. During local anaesthesia exertion and charge for the surgery is lower than in general anesthesia (Skarda *et al*., 2007). For the laparotomy, it is an absolute absence of pain in the incision and occlusion of the abdominal cavity. The mode of action of local anesthetics comprises blockade of sodium channels, which checks nerve depolarization. Lidocaine may use by perineural infiltration, intra-articular or epidural injection provides excellent analgesia. Lidocaine is the commonly used local anesthetics in veterinary medicine but it has a historical reputation of being toxic to goat kids (Taylor, 1991; Smith and Sherman, 2009). For the sufficient desensitization of the flank, 13th thoracic spinal nerve and the first two lumbar spinal nerves need to be anesthetized. Elimination of the sensitivity of peritoneum is caused by the switching of the second lumbar spinal nerve reached. This one gives a branch that runs on the surface of the peritoneum (Arnold and Kitchell, 1957). In the literature, there are different methods of local anesthesia for the laparotomy in the area of hunger pit (Skarda *et al.,* 2007). The flank area is easily desensitized by performing a line block, which is the most commonly used method in food animals (Skarda *et al*., 1986). Disadvantages of this technique are the large volume of local anesthetic and the lack of relaxation of the back and abdominal muscles (Ivany and Muir, 2004). Furthermore, incomplete anesthesia of the deeper layers in heavy animals as well as hematomas and seromas due to injections (Endmondson, 2008). The infiltration of cutting line with a local anesthetic may cause tissue damage and wound healing disorders

(Steiner *et al.,* 2003), especially at addition of vasoconstrictors. Another disadvantage of line infiltration is an intraoperative necessary magnification at post-anesthesia that renewed access waiting until the onset of action is required (Ivany and Muir, 2004). Distal paravertebral anesthesia (DPVA) is intended to be safely in being pain-free and easy, fast and with little local anesthetic can be performed (Farquharson, 1940). The performance area is complete and uniform in all layers anesthetized (Ivany and Muir, 2004). In inflammatory reactions around the incision line in the flank or in a relaparotomy with distal paravertebral anesthesia is better than incision infiltration (Skarda *et al.*, 2007). Disadvantage of this technique has the difficulty in fatty animals. On the other hand, the orientation leads to anatomical distinctive points not always safe anesthesia, because the spinal nerves follow a variable path (Arnold and Kitchell, 1957). One of the dangers of DPVA is the possible of penetration of large blood vessels. Besides, it is the uncertainty of the pelvic limbs upon diffusion of the local anesthetic in the route of motor nerves (Ivany and Muir, 2004; Skarda *et al.,* 2007).

The objective of this research was to compare between two commonly used local anesthetic techniques for laparotomy in goats. From this research, a local anaesthetic technique will be standardized for laparotomy in goat on the basis of pain sensation and healing result.

Chapter-II

Literature Review

2.1 Anatomy of the flank

2.1.1 Layers of the flank

The abdominal cavity is lined by peritoneum and is surrounded by muscle layers, tendon plates, fascia and skin, which are grouped together as the abdominal wall. The lateral abdominal wall is also called flank area (abdominis lateralis). The hungry pit (Fossa paralumbaris) is the lumbar portion of the lateral abdominal region. In goat, it is a triangular, marked surface, which is marked dorsally by the lumbar transverse processes, cranially by the contour of the last rib, and caudodorsally by the muscle tendon border of the inner oblique abdominal muscle (Budras and Wünsche , 2002). The layers of the flank consist of the skin, the outer trunk fascia, the Marcus cutaneus trunci, the Marcus external oblique and internal abdominal, transversus abdominis, inner trunk fascia, and peritoneum (Figure 1).

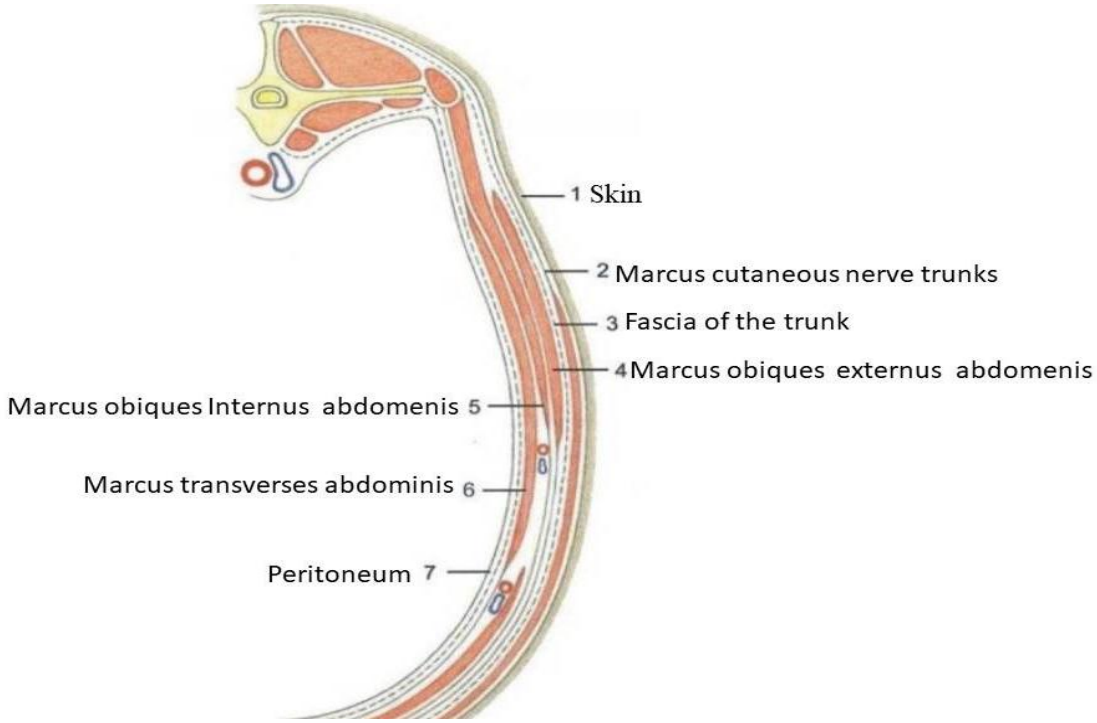


Figure 1: Stratigraphy of the abdominal wall

The outer trunk fascia (Fascia trunci externa) splits into two leaves, the outer leaf (Fascia trunci superficialis) enclosing the trunk skin muscle (Marcus cutaneus trunci). The deep leaf of the outer trunk fascia (Fascia trunci profunda) is in the ruminant strongly interspersed with elastic yellow fibers. Because of these fibers it is also called "yellow abdominal skin" (Tunica flava abdominis) (Nickel *et al.*, 1992). The fascia trunci profunda completely surrounds the two oblique abdominal muscles, while covering the Marcus rectus abdominis and Marcus transversus abdominis only externally. The inner trunk fascia (Fascia trunci interna) lies on the lateral and ventral abdominal wall as a transversal fascia from the inside of the marcus transversus and the rectus abdominis (Budras and Wünsche, 2002). The inner trunk fascia is followed by the peritoneum Parietale. Depending on the nutritional status, fat is stored between the layers of the abdominal wall. The cavity lined by the peritoneum is called the peritoneal cavity. It represents a capillary gap whose outcrops extend between the various intestines. The peritoneal cavity contains the gastrointestinal tract covered by peritoneum visceral, with the exception of the kidneys, rectum and anus.

2.1.2 Nerve supply

The spinal cord nerves provide the sensory and motor supply to the flank and arise from the dorsal and ventral roots (Radix dorsalis and Radix ventralis) on the spinal cord. The first lumbar spinal nerve (L1) originates from the spinal column from below the lumbar vertebra 1 (L1). The three terminal branches of this nerve are the iliohypogastric, ilioinguinal, and the genitofemoral nerves.

First lumbar nerve: L1 supplies many muscles, either directly or through nerves originating from L1. They may be innervated with L1 as single origin, or be innervated partly by L1 and partly by other spinal nerves. The muscles are:

- Quadratus lumborum (partly)
- Iliopsoas muscle (partly)

Second lumbar nerve: The second lumbar spinal nerve (L2) originates from the spinal column from below the lumbar vertebra 2 (L2). L2 supplies many muscles, either directly or through nerves originating from L2. They may be innervated

with L2 as single origin, or be innervated partly by L2 and partly by other spinal nerves. The muscles are:

- Quadratus lumborum (partly)
- Iliopsoas (partly)

Third lumbar nerve: The third lumbar spinal nerve (L3) originates from the spinal column from below the lumbar vertebra 3 (L3). L3 supplies many muscles, either directly or through nerves originating from L3. They may be innervated with L3 as single origin, or be innervated partly by L3 and partly by other spinal nerves. The muscles are:

- Quadratus Lumborum (Partly)
- Iliopsoas (Partly)
- Obturator Externus (Partly)
- Vasti (Key Myotome) Adductors

Fourth lumbar nerve: The fourth lumbar spinal nerve (L4) originates from the spinal column from below the lumbar vertebra 4 (L4). L4 supplies many muscles, either directly or through nerves originating from L4. They are not innervated with L4 as single origin, but partly by L4 and partly by other spinal nerves. The muscles are:

- Quadratus Lumborum
- Gluteus Medius Muscle
- Gluteus Minimus Muscle
- Tensor Fasciae Latae
- Obturator Externus

In the dorsal roots of the spinal cord nerves open afferent, somato and viscerosensible fibers whose cells are located in the spinal ganglion. Through the ventral roots run efferent, somatomotor and visceromotor fibers. In the truncus

nervi spinalis these fibers combine so that maximally mixed nerves with somatomotor, somatosensiblen, viszeromotorischen and viszerosensiblen fibers as well as vegetative fibers develop (Nickel *et al.*, 1992).

The truncus nervi spinalis leaves the spinal canal through the intervertebral foramen. Immediately after exiting the foramen intervertebral it is divided into a dorsal and a ventral branch (dorsal and ventral ramus). These two branches divide again in their course in a Ramus medialis and Ramus lateralis. The dorsal branches supply the dorsal back muscles as well as the dorsal and lateral skin of the abdominal wall. The much stronger Ventral branches behave differently depending on the region. They supply the entire ventral musculature of the trunk and the corresponding skin areas of the chest and abdominal wall. In places, they also connect to larger nerve plexuses before their division and provide the muscles and skin of the limbs.

According to the number of lumbar vertebrae there are six lumbar vertebrae nerves. The lumbar nerves supply the dorsal lumbar muscles (Marcus Longissimus and iliocostalis lumborum) as well as the anterior croup (glutaeus caudalis) and thigh musculature (femoral nerve from the plexus lumbalis). Sensitive they innervate the skin of the lumbar, crisscross and waist region. The ventral branch of the first lumbar nerve is called iliohypogasticus. Its medial branch, which is less important in anesthesia of the flank, moves to the inguinal region. Its lateral branch innervates the abdominal muscles and enters between them. It releases two skin branches, the lateral cutaneous ramus and the medial cutaneous ramus. The lateral cutaneous nerve innervates a narrow area of skin in the flank area, the medial ramus innervates the right abdominal muscle. Other fibers supply skin areas ventrally on the abdomen, on the udder and medially on the thigh.

2.1.3 Line Block

Infusion of local anesthetic into the incision site or a line block may also be used to desensitize a selected area of the paralumbar fossa. An 23-gauge 3.5 cm needle is used to infuse multiple, small injections of 6 mL of local anesthetic solution subcutaneously and into the deep muscle layers and Peritoneum (Edmonson, 2008). Pain of successive injections may be alleviated by placing the edge of the

needle into the edge of the previously desensitized area at an approximately 20-degree angle (Skarda, 1986). In heavily muscled or overweight goat, it may be necessary to use a 23 gauge 3.5-cm needle to penetrate through the large amount subcutaneous fat to reach the deep muscle layers. The amount of local anesthetic needed to acquire adequate anesthesia depends on the size of the area to be desensitized. Adult goat weighing 15 kg can safely tolerate 6 mL of a 2% lidocaine hydrochloride solution (Skarda, 1986). Delayed healing of the incision site is a possible complication of infiltration of local anesthetic at the surgical site

2.2 Distal paravertebral anesthesia

Distal paravertebral anesthesia is a technique for the conduction anesthesia of the dorsal and ventral branches of the first three lumbar nerves. It can be performed in different ways. It is referred to on the one hand as "Magda", "Cakala" or "Cornell technique", on the other hand also as a method according to Götze, modified by Kalchschmidt (Dietz *et al*., 1988). The branches of the first two spinal nerves run in the caudoventral direction, so that they can be anesthetized in the area of the corresponding lumbar transverse processes. The branches of the second lumbar nerve are largely caudal (Nickel *et al.*, 1992). This means that they cross the base of the transverse process of the L3 and can only be reached in the region of the distal end of the 4th lumbar transverse process. During the procedure, you then enter the distal end of the transverse processes with a 3.5 cm long needle deep in the direction of the median and there distribute a fan-shaped 2 ml local anesthetic. This is done in each case dorsally and ventrally of the lumbar transverse processes.

In a simplified form of distal paravertebral anesthesia, to block the thirteenth thoracic nerve, the cannula between the last rib and the transverse process of the first lumbar vertebra, at its craniolateral end, is pierced vertically through the skin. The needle is advanced to the depth of about 2-4 cm and placed over the peritoneum the first depth. With retraction, continuous injection is continued under the skin and the second depth is placed subcutaneously. The same procedure then takes place for anesthetizing the first two lumbar nerves. For each injection site 2 ml of local anesthetic are used.

2.2.1 Local anesthesia

ocal anesthetics should possess the properties of sterile ability, rapid onset of action and sufficient duration of action. The effect must be completely reversible, the drugs should not be systemic or brain-toxic and should be well tolerated by the tissue (Frey and Löscher, 2002). All synthetic local anesthetics are classified into the procaine or ester type and into the lidocaine or amide type. The basic structure always consists of a polar and an a polar component as well as an intermediate chain. These properties ensure the adhesion at the site of action. Since many enzymes are present in the body in the form of non-specific esterase, the duration of action of the ester type is only very short due to the rapid degradation. The resulting metabolites are no longer effective (Frey and Löscher, 2002). In contrast, the amide type leads to oxidative de alkylation or to hydroxylation. The resulting products are in turn still weak locally anesthetic effect. These degradation processes are slower than the cleavage of the esters.

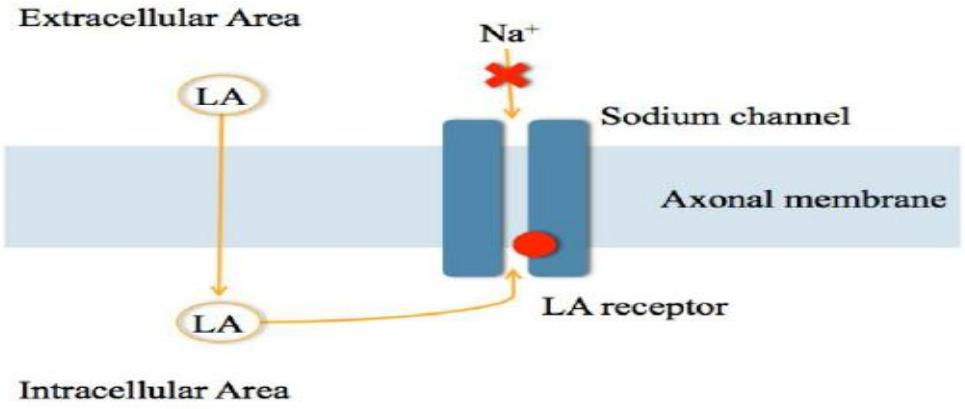


Figure 2: Mechanism of local anaesthetics**.**

Local anesthetics are lipophilic due to their chemical structure, which allows penetration into the cells. There they dissociate and a action forms. This action is attached to the sodium channels from the inside and thus seals the membrane of the cell from the inside. For this reason, the nerve cell is no longer depolarizer bar, with the result that no transmission of the stimulus is possible (Frey and Löscher, 2002). In an inflamed tissue, this effect cannot be done, because there is an acidic pH value. The local anesthetic therefore for the most part already dissociates from penetration into the cell and remains ineffective (Frey and Löscher, 2002). The

onset of action is very rapid in an infiltration anesthesia because the protonated part of the anesthetic immediately blocks the nerve end. This is different with the line anesthesia. There, the local anesthetic is applied in the area of a modulated nerve. The time it takes for the local anesthetic to enter the nerve may take up to ten minutes for Procaine (Link and Smith, 1956; Frey and Löscher, 2002). Lidocaine begins to work after six minutes (Link and Smith, 1956). To prolong the duration of action, reduce the tendency to bleed and prevent restoratives side effects can be used in local anesthetics additions of vasoconstrictors. By using this "blocking body", the removal of the local anesthetic from the site of action can be delayed and thus the duration of action can be extended by up to twice. Adrenaline is preferably added in a dilution of 1: 80,000 to 1: 200,000 (Frey and Löscher, 2002). This also reduces the systemic toxicity, which is already very low in the procaine (Frey and Löscher, 2002). Side-effects associated with blocking agents may be necrosis in the infiltration or capillary area of end stream areas.

Complications with the use of local anesthetics may be systemic side effects. An example is the blockade of neurons, leading first to attenuation, then to excitement and colonic convulsions. Other side effects of the local anesthetics include the cardiovascular system in the form of lower blood pressure due to severe vasodilation and cardiac arrhythmias (Frey and Löscher, 2002).

The importance of procaine in veterinary medicine is again very high due to the authorization restrictions for lidocaine. The effect of procaine can be up to two hours depending on the concentration (Frey and Löscher, 2002). In a comparative study, it could be established that procaine induces a "satisfactory" effect in a paravertebral application over a period of two hours (Link and Smith, 1956). When used for infiltration, the duration of action is on average 1.6 hours (Link and Smith, 1956). The diffusion properties of procaine are lowest compared with other topical anesthetics Cyclain, Lidocaine, procaine, and Pyribenzamine (Link and Smith, 1956).

2.2.2. Pain

The Animal welfare Act of the federal republic of Germany states in (1): No one shall inflict pain, suffering or harm on any animal without a reasonable cause." In the fourth section on "Animal Intervention" below, it is stated that all possibilities

must be exhausted in order to prevent the pain or suffering of the animals (Animal Protection Act, 2009). All individuals responsible for animals must consider it a humane and ethical duty to combat pain (Robertson, 2002; Hudson *et al.*, 2008).

2.2.3. Physiology of pain

In animals, pain is mainly due to behavioral changes (Robertson, 2002). Pain is perceived differently by different animal species and also individuals within this species (Robertson, 2002). Intensive, repeated and persistent pain causes sensitization. These sensitizations are no longer a meaningful mechanism (Robertson 2002; Hudson *et al.,* 2008; Henke *et al.*, 2008). Therefore, preventive analgesia is indicated in such cases. Untreated pain often results in weight loss, muscle atrophy and respiratory disease (Robertson, 2002).

2.2.4 Pathology of Pain

Responses of the nervous system to noxious stimuli are not static "hard wired" events. Repeated noxious stimuli can: Change the ability of the peripheral receptor to respond to a stimulus. Change the perception of that response at the level of the brain

2.2.5 Peripheral Sensitization

Results from agents released from damaged tissues Cytokines, kinins, arachidonic acid derivatives, K+, H+, peptides & other agents (e.g. histamine) Cause an increase in the sensitivity of the nerve endings. The thresholds that are perceived as painful become lower. The system becomes "sensitized" (windup).

2.2.6 Types of pain (Acute, Chronic, Nociceptive, Neuropathic)

Early conceptualizations of pain focused on three basic causes of pain such as acute trauma or injury, chronic painful conditions for which cures were unknown and malignant processes (cancer, arthritis). With advances in understanding the neural mechanisms of pain, many mechanisms were common to the three types of pain but there were important differences.

2.2.7 Nociceptive pain

Pain resulting from activation of primary afferent nociceptors by mechanical, thermal or chemical stimuli. Acute and malignant types of pain result from activation of the primary afferent nociceptors, meaning that the underlying mechanism of these types of pain is nociceptive.

2.2.8 Neuropathic pain

Pain resulting from damage to peripheral nervous or central nervous system tissue or from altered processing of pain in the central nervous system. Chronic and malignant types of pain involve damage or alteration to nervous tissue, meaning that the etiology of the pain is a neuropathic process. Also, acute pain can become neuropathic pain if the pain persists without sufficient relief. Unrelieved pain has many pathophysiologic consequences that involve the nervous system and many other physical and psychological systems.

2.2.9 Pain Mechanisms

The"Pain Process" and blocking it with analgesics and nonpharmacological Strategies**.** The nurse uses knowledge of the pain mechanisms to interpret assessment data and to select therapies that promote maximum pain relief with minimum side effects. The neural mechanisms by which pain is perceived involve a process that involves four major steps:

1. Transduction
2. Transmission
3. Perception
4. Modulation

The transduction and transmission steps relate to the neurochemical signals of actual or impending tissue damage (nociceptive stimuli). Not all nociceptive stimuli are perceived as pain. If there is sufficient modulation of signals and perception of nociceptive events is prevented, there is no pain. Perception is critical to sensing pain. Modulation, either enhancing or inhibiting nociception, therefore is crucial to pain perception. Most pain management techniques

probably mimic endogenous pain inhibition processes. Conversely, pain that is difficult to relieve probably results from enhanced nociceptive signals. Additional details about these four steps provide a foundation for nursing practice.

2.3 Transduction

The first step of the pain process is transduction, which is the conversion of a mechanical, thermal, or chemical stimulus into a neuronal action potential. Understanding the clinical significance of this important and complex step in the pain process requires knowledge of the anatomy, physiology and pathophysiology of the peripheral nervous system and its response to tissue injury.

2.3.1 Anatomy and Physiology of Transduction

Peripheral nerve cells are stimulated by tissue damaging (noxious), pressure, heat, or chemical forces. A sufficient stimulus generates an action potential at nociceptors (receptors) on A-delta fibers and C fibers. These cells are known as primary afferent nociceptors (PANs), the first-order neurons in the processing of nociceptive stimuli. PAN fibers traverse through the dorsal root ganglia along with the A-alpha (sensory muscle), A-beta (sensory skin), and sympathetic afferent fibers, into the dorsal horn of the spinal cord where various connections are made.

The A-alpha and A-beta fibers carry the sensation of light pressure to deep muscles, soft touch to skin, and vibration. The A-alpha and A-beta fibers primarily ascend to rostral centers in the dorsal column pathway, but they also make synapses in the spinal dorsal horn close to synapses of the A-delta and C fibers. This dorsal horn connection means that input from touch fibers can enter the spinal cord and synapse or communicate with cells carrying nociceptive input

The three types of fibers differ in size and speed at which action potentials are conducted. A-alpha or A-beta fibers are large (6 to 22 microns) with myelin sheaths around them. Because of the myelin sheath and axon size, A-alpha and A-beta fibers conduct at a rapid rate (35 to 120 meters per sec). In contrast, A-delta fibers are smaller fibers also with myelin sheaths. Because of their size (1 to 5 microns), A–delta fibers conduct at a slower rate (5 to 30 meters per sec) than the

larger A-alpha and A–beta fibers. C fibers, in comparison, are small (0.2 to 1.5 microns) and un myelinated. C fibers occur singly or in clusters, and they conduct at a rate of 0.5 to 2 meters per sec. The conduction rates are important because information carried to the spinal cord by the A-alpha and A-beta fibers will communicate with dorsal horn cells sooner than information carried by A-delta or C fibers. These conduction rates have important implications for modulation of noxious information from A-delta and C fibers. Because of anatomical proximity, the peripheral environment (physiologic milieu) of the axons and dendrites of one neuron can influence other nearby neurons.

Once the PAN has been transduced, the action potential must be transmitted to the CNS and through the CNS before pain is perceived. Three steps are involved in nociceptive signal transmission: 1) projection to the CNS; 2) processing within the dorsal horn of the spinal cord; and 3) transmission to the brain. Each step in the transmission process is important to pain perception.

2.3.2 Projection to the CNS

Transduction at the PAN terminal causes the PAN membrane to depolarize. In a depolarized cell, sodium ions enter the cell through sodium channels and potassium ions exit the cell through potassium channels to generate a neuronal action potential. The action potential rapidly spreads along the neuron, more rapidly for myelinated than unmyelinated axons because ion exchange occurs only at nodes of ranvier and jumps between nodes. In contrast, ion exchange travels the entire length of the unmyelinated, C fiber axon. The transmission of the action potential to the central terminal of the neuron is necessary for the cell to deliver the nociceptive signal to cells in the spinal cord. This transmission requires more time for A-delta fibers than A-alpha or A-beta fibers, both of which have fewer nodes to jump between. Even longer time is required for C fibers, which don't have nodes of Ranvier. This conduction process explains some of the differences in fiber conduction rates described previously.

The action potential can be inhibited, however, if the ion channels are inactivated. Drugs known as membrane stabilizers inactivate the sodium channels and disrupt the transmission of the action potential along the PAN axon. Some adjuvant drugs, such as local anesthetics (e.g., lidocaine, bupivicane, mexilitine, Emla^{TM}) and

anticonvulsant drugs (e.g., phenytoin, carbamazepine, clonazepam), prevent transmission via this type of mechanism. In dilute concentrations, local anesthetics effectively block small fiber transmission. Larger concentrations of local anesthetics block larger fibers, including the motor fibers.

An important concept to recognize is that one nerve cell extends the entire distance from the periphery to the dorsal horn of the spinal cord. The cell usually makes synapses only at the terminals at the peripheral and central nervous system sites. For example, an afferent fiber from the great toe travels from the toe through the 5th lumbar nerve root into the spinal cord; it is one cell. It does not synapse at the knee or hip. Once an action potential is generated, it travels all the way to the spinal cord. The message will be transmitted to the dorsal horn of the spinal cord, unless it is blocked (e.g. by a sodium channel inhibitor) or disrupted (e.g. by a lesion at the central terminal of the fiber such as a dorsal root entry zone lesion (DREZ). Altering the peripheral soup ingredients at the distal end of the PAN is an important way to prevent pain. Once the first nerve cell in the pain process has fired an action potential, however, the uninhibited message will be transmitted to the spinal cord.

2.3.2 Pain Perception

In the brain, nociceptive input is perceived as pain. New data suggest that there is no single, precise location where pain perception occurs. Instead pain perception involves several brain structures. It is known that the brain is necessary for pain perception; hence no brain, no pain. Until it is understood clearly where pain is perceived, prudent nursing practice involves treatment of any noxious stimulus as potentially painful, even in the comatose person who does not respond to noxious stimuli. Lack of a behavioral response to a noxious stimulus does not indicate that the person lacks pain perception. This notion is extremely important when providing care to the comatose person with massive injuries or the person with cancer whom is actively dying. Unless there is some reason for assuming that there has been removal of the nociceptive stimuli, which caused pain when the person was awake, it is crucial that pain therapies be continued, even though the person cannot report pain perception or show behaviors usually considered indicative of pain.

Because of the complex neural mechanisms of nociceptive processing, pain is perceived as a multidimensional sensory and emotional experience to which there are cognitive and behavioral responses. Hence the acronym, the ABCs of Pain, serves as a means by which the distinctive components can be remembered easily by patients with pain and by health professionals. In particular, the sensory component of pain is paramount in appropriate assessment of pain perception. At minimum, sensory pain elements include pattern, area, intensity, and nature, which spell the word PAIN. Persons with pain, when provided with tools, easily report these four sensory pain elements. Sensory pain reports can be indispensable to appropriate diagnosis and treatment when a nurse knowledgeable about the pain process interprets the data. Persons with pain, however, are the most appropriate experts about the effectiveness of therapies prescribed to modulate the pain process and block pain perception.

2.3.4. Modulation

Critical to transmission of nociceptive stimuli and pain perception are the modulatory mechanisms, the final step in the pain process. Evidence has been available for 25 years that nociceptive cells in the spinal dorsal horn are selectively inhibited by brain stem stimulation. The dorsolateral funiculus (DLF) also has been shown to be critical to the inhibition of nociceptive responses in animals. Today however, we know that modulation may include both inhibition as well as enhancement of nociceptive stimuli. Fields and colleagues demonstrated that the firing pattern of specific cells in the rostral ventral medulla might be associated with the inhibition of nociception but that other cells may permit transmission of the nociceptive information. The clinical significance of these findings is not clear. It is possible that people with intractable pain experience enhanced modulation of nociceptive stimuli that leads to more intense pain through mechanisms that are not understood fully.

Fields and Basbaum proposed a diagram of the structural components of the descending opioid-related pain inhibitory system. Generally, findings indicate that several centers are involved in generating analgesia, three of which have received extensive investigation, the periventricular and periaqueductal grey, the rostral ventral medulla, and the spinal cord. Afferent input to the descending pain

modulating system is less well known, but certainly hypothalamic and amygdala inputs are involved and possibly the frontal granular and insular cortex.

Descending inhibition of pain occurs through a complex circuit involving a number of receptor systems, such as mu, delta, and kappa opioid; alpha 2 adrenergic; serotonin (5HT); adenosine; GABA; neuropeptide Y; calcitonin; somatostatin; and neurotensin receptors.1, 22 Although 5HT, alpha 2 agonists, and opioids are known to inhibit nociceptive cells in the spinal dorsal horn, the role of the neurochemicals has not been fully delineated in each of the areas of the CNS that are believed to be involved in pain modulation provides a graphical summary of the descending inhibitory mechanisms at the level of the spinal cord dorsal horn. Once nociceptive information is perceived as pain, inhibition can occur at any of the synapses in the ascending pathways. A well-studied and important inhibitory synapse is in the spinal dorsal horn. For example, serotonin, norepinephrine, and enkephalin are released by descending fibers and inhibit release of neurotransmitters, such as substance P and CGRP, and thereby diminish excitation of projection cells. The inhibitory neurotransmitters successfully prevent the PAN from communicating its information about the nociceptive stimuli to the second-order neuron and pain is blocked even though the PAN has been activated and has transmitted an action potential to the spinal cord.If the PAN action potential does not result in release of sufficient neurotransmitters to communicate the signal to the projection cell, pain is blocked.

Chapter-III

Materials and Methods

3.1 Study period

The present study was conducted during the period of July 2017 to June 2018 at Shahidul Alam Quadery Teaching Veterinary Hospital (SAQTVH), Chittagong Veterinary and Animal Sciences University (CVASU) Chittagong, Bangladesh.

3.2 Study area

The study was driven at SAQTVH in Chittagong Veterinary and Animal Sciences University as case registered and out patients of Chittagong Metropolitan area of Chittagong.

Figure 3: Geographical location of study area

3.3 Study design

A total of ten (n=10) samples from two groups mixed with male and female (5 male and 5 female of local breed) of different ages were chosen for this study.

Schematic diagram of the research program

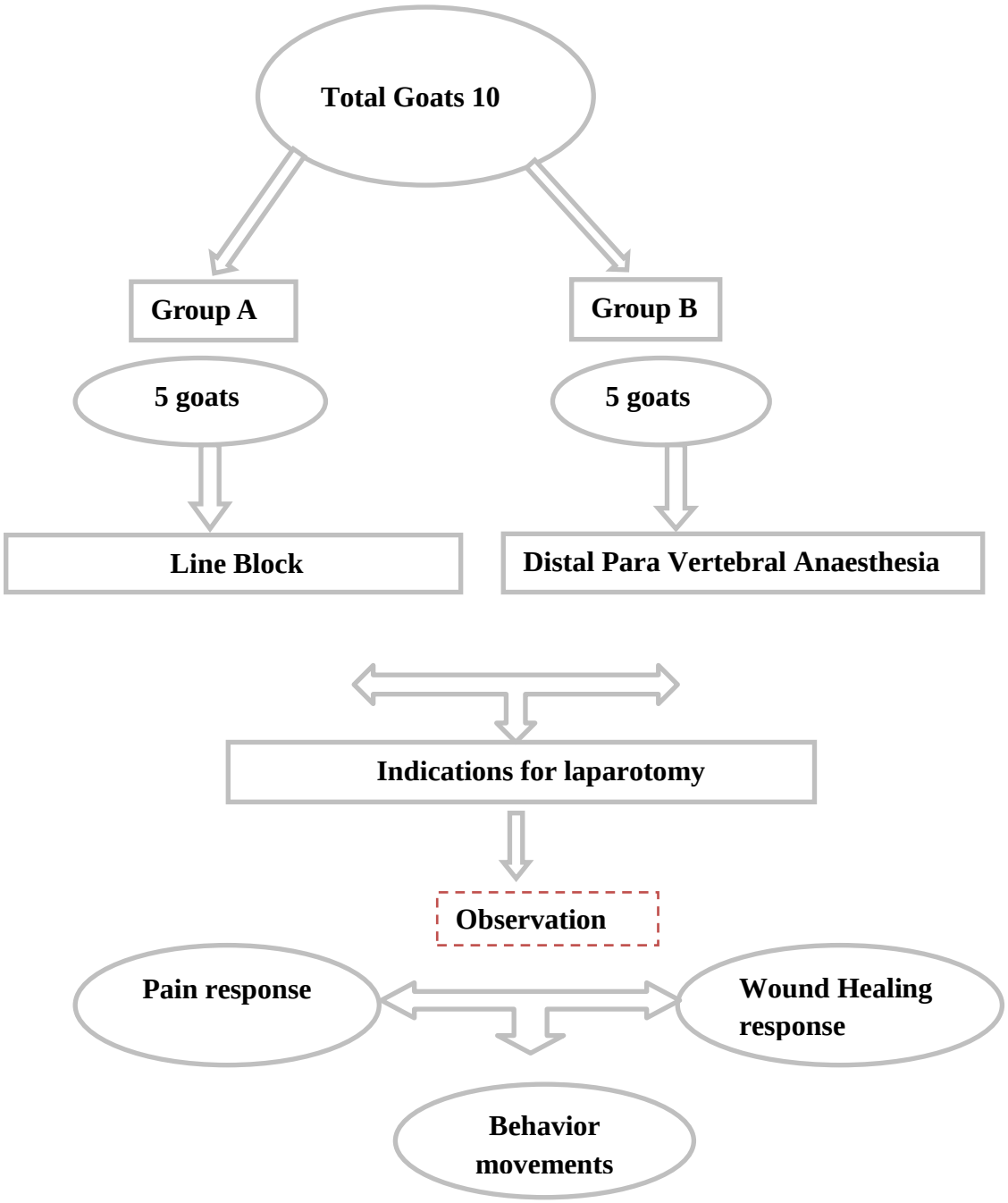


Figure 4: The overall experimental design of this study

3.4 Preoperative measures

For laparotomy, the goats were in a stationary or a fixed mobile togetherness before the start of blocking, proper shaving from T13 to L4 and sketch diagram of nerve supply for proper nerve block was drawn for proper detection and identified the nerves for proper anaesthesia and pain sensation measure.

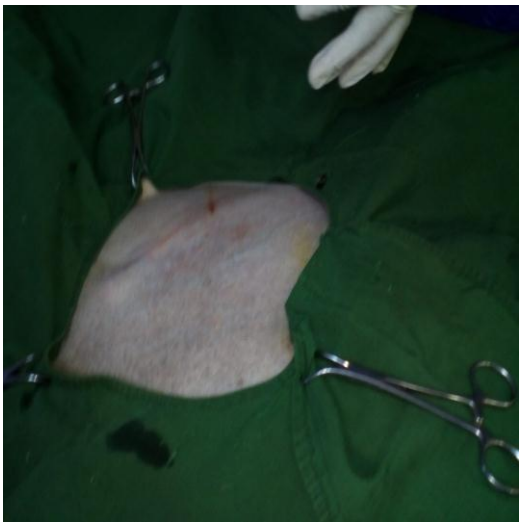
3.5 Anesthesia

As a local anesthetic, lidocaine 2% solution came without further additives for use (Jasocane 2%, jayson pharma Dhaka Bangladesh) Lidocaine does @ 6mg/kg bw (Clarke and Trim, 2013) for two types of techniques applied as distal paravertebral anesthesia and modified line infiltration. After setting the respective anesthesia was waited at least for 5 minutes, before the operation started (Sharda, 1986).

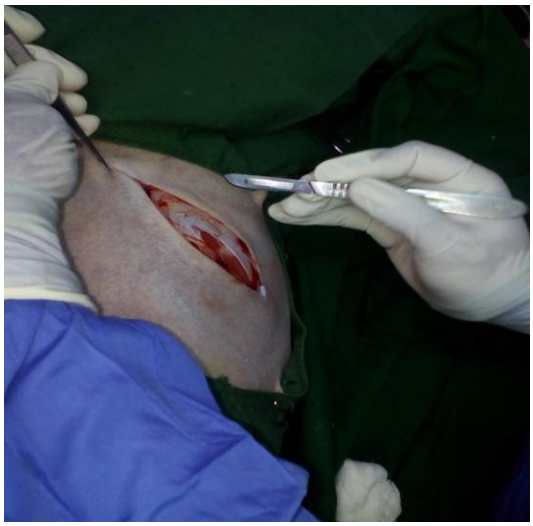
3.6 Surgical procedure

Feed and water were withdrawn from animals at least 12 hours prior to the surgery. The left flank region of each goat in the both group was prepared for routine aseptic surgery by clipping the hairs around the proposed surgical site; the site was scrubbed with Povin vet solution containing 10% povidone iodine (Opsonin pharma Limited, Dhaka) and then flushed with 70% alcohol. Regional anesthesia was achieved with plain 2% lidocaine hydrochloride and injection (Jasocaine, Jayson pharma limted, Dhaka). Goats of both groups were placed on right lateral recumbency exposing the left flank. Laparotomy was done according to standard procedure described by (Ames, 2007; Freeman, 2003; Tuagi and Singh, 1993). The laparotomy was routinely closed from within outward; muscle layers were closed using jonson chromic catgut of the size of 1/0 and atraumatic ½ circle taper point needle (Anhui Kangning Industrial Groups, China) using simple continuous to peritonium and ford interlock in muscle layer. The subcutaneous layer was closed using jonson chromic catgut of the size of 2/0 andatraumatic1/2circle taper point needle using simple continuous suture pattern. The skin was closed using virtical mattness suture pattern with nylon of the size of 0 and atraumatic 3/8

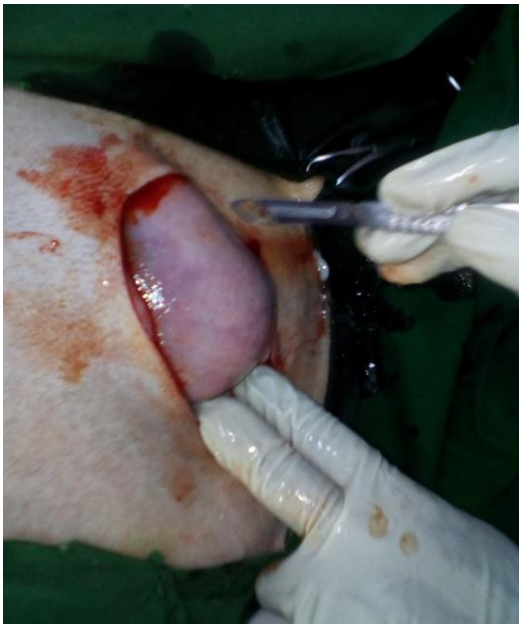
curved, cutting needle (Agary Pharmaceuticals Ltd, Xinghuai,China). Meloxicam injection at the rate of 0.5mg/kg subcuteneousinjection (ACME Pharmaceutical, Dhaka) was administered for 3 days after surgery to take care of postoperative pain. Ampicillin injection at the rare of 20 mg/ kg bw (ACI Pharmaceutical, Dhaka) was administered for 5 days after surgery to control the secondary bacteria infection.(**Figure: 5**)



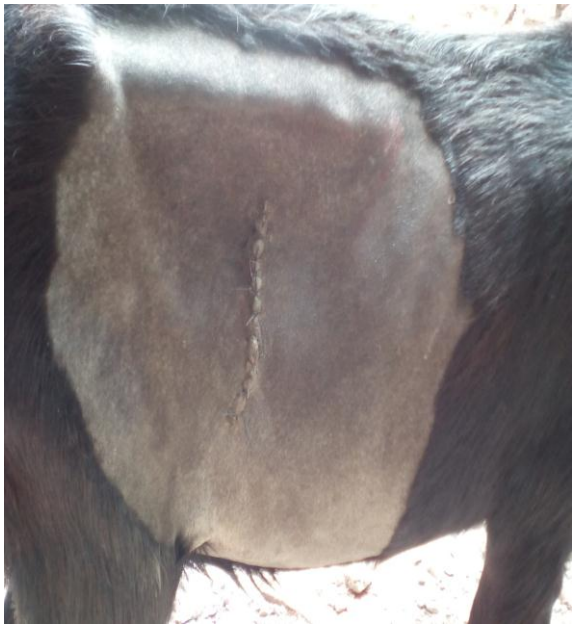
Aseptic flank region



Cutting muscle layers



Incision to peritoneum layer



After surgery

Figure 5 Surgical procedure

3.7 Distal Paravertebral Anesthesia (DPVA)

The skin of the left last ribs to fourth lumber transverse process was clipped and scrubbed with disinfectant over the surgical area where the needle were introduced. The distal paravertebral nerve block desensitizes the dorsal and ventral rami of the spinal nerves T13, L1, and L2 at the distal ends of the transverse processes of L1, L2, and L4, respectively. An 23-gauge, 3.5-cm needle was inserted ventral to the transverse process, and 6 ml of local anesthetic was infused in a fan-shaped pattern. The needle was removed completely and then reinserted or redirected dorsal to the transverse process, in a caudal direction, where 2 ml of local anesthetic was again infused in a fan-shaped pattern. This procedure was repeated for the transverse processes of the L2 and L4 lumbar vertebrae of spinal nerves.

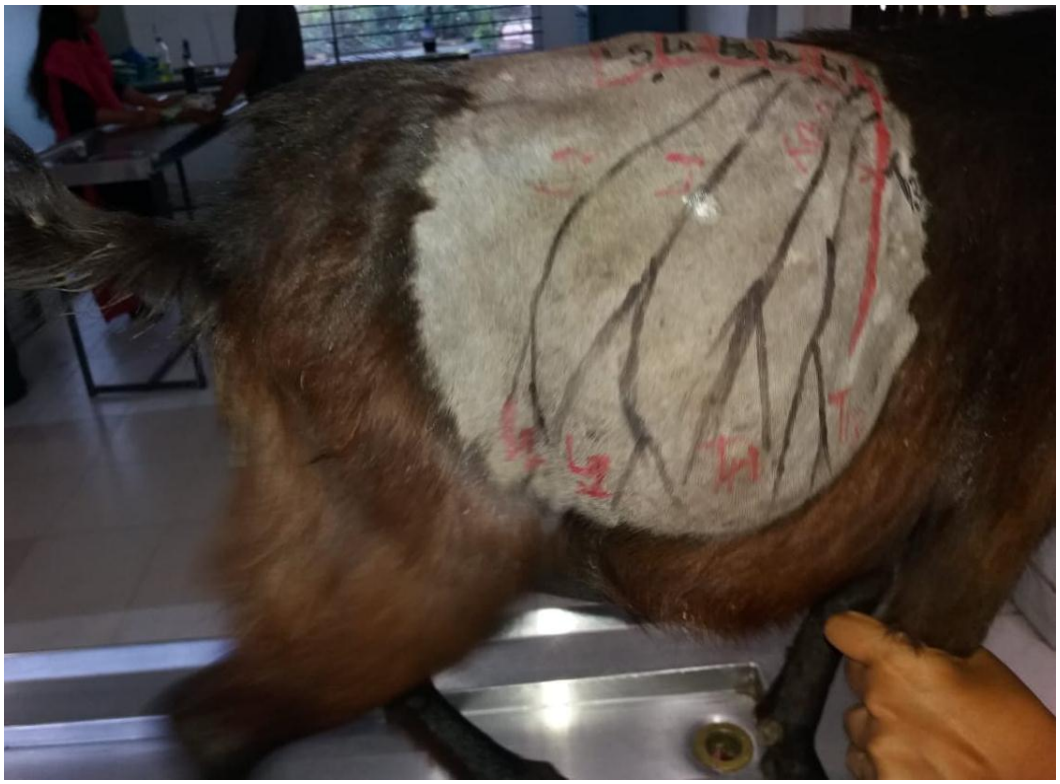


Figure 6: Distal Paravertebral anaesthesia technique. Drawing of the nerve supply T13, L1, L2, L3 and L4 palpation of the cranial edge of the transverse process of lumber vertebra (redline denotes lumbar vertebra and black denotes nerve supply) of the an imaginary line for the anaesthesia of the first lumber spinal nerve.

3.8 Line block (LB)

An 23-gauge 3.5-cm needle is used to infuse multiple small injections of 6 mL of local anesthetic solution subcutaneously and into the deep muscle layers and peritoneum. Pain of successive injections may be alleviated by placing the edge of the needle into the edge of the previously desensitized area at an approximately 20-degree angle

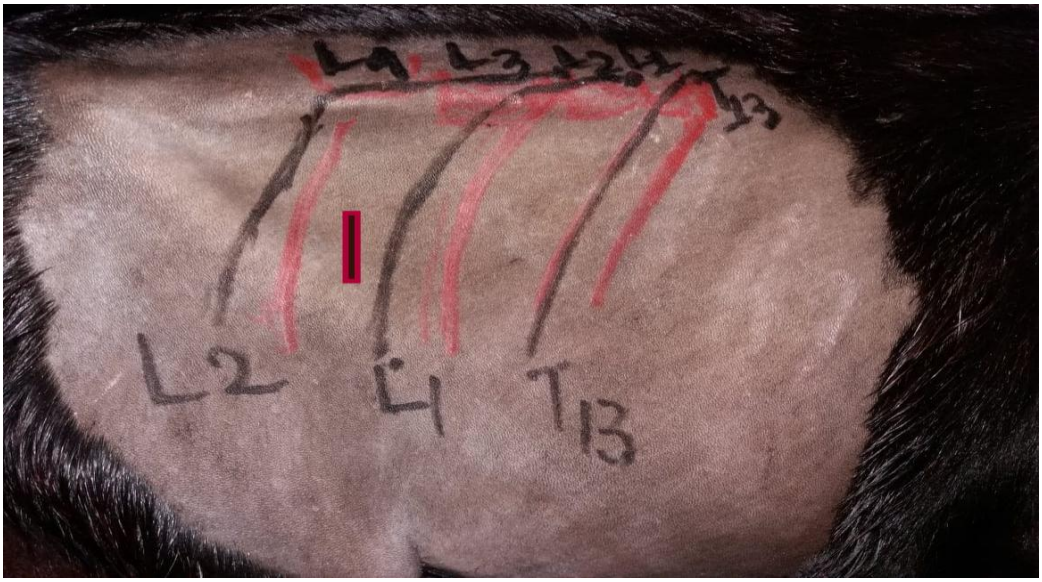


Figure 7: Technique of the line block anaesthesia (LB) where the red and black color denote nerve supply and LB block with 2% of lidocaine and deep red line denote line of incision.

3.9 Surgical Wound Assessment

The clinical appearance of the skin was assessed and scored twice:18–24 hours and 10–25 days after surgery as described by (Sylvestre *et al.*, 2002) using 4-point scoring scale, based on the following criteria: discharge, swelling, erythema, and dehiscence. Mostly complecation was seen after surgery so monitor the wound to know the wound healing condation .

3.10 Haematology

Blood samples were collected from each animals in the groups throug the jugular vein after thorough disinfection of the area with 70% alcohol, the sample was collected using 5 mL syringe and needle into EDTA bottles. The samples were collected before surgery as baseline (T0), 24 hours after anaesthesia (T24) and one week after surgery (T7). Physiological parameters were taken manually (heart rate

taken by auscultation with a stethoscope, pulse rate taken by digital counting, respiration by counting abdominal movement, rectal temperature with a clinical thermometer) at intervals of 0, 30, 60 minutes and 24 hours after lignocaine administration. The samples were analyzed using digital hematology anlyzer (Full Automated Blood Cell Counter PCE-210, Erma Inc, Tokyo, Japan) according to procedure described (Egbe-Niyi *et al.*, 2000; Olaifa *et al.*, 2009).

3.11 Intra- and postoperative complication

Intra and post surgical complications were assessed using 3-point scoring system designed, parameters considered were intraoperative haemorrhages, postsurgical seroma, incisional hernia, and wound fistula described by a protocol from (Abubakar *et al.*, 2014)

Table 1: Criteria used to score intraoperative and postsurgical omplications.

Outcome	Scores		
	0	1	2
Haemorrhage	None	Mild	Severe
Seroma	None	Mild	Severe
Wound fistula	None	Mild	Severe
Incisional hernia	None	Mild	Severe

3.12. Subjective Healing Interval

Subjective healing interval was determined by visual observation and taking notes of days of apparent surgical site healing.

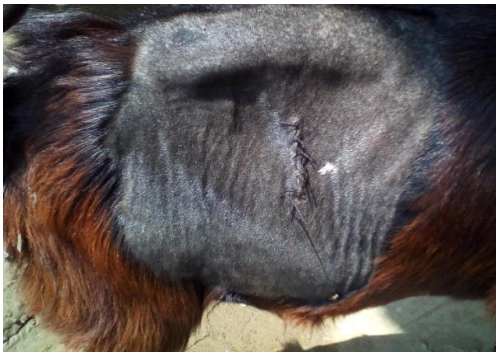


Figure 9 Wound healing condition in DPVA after 5 days

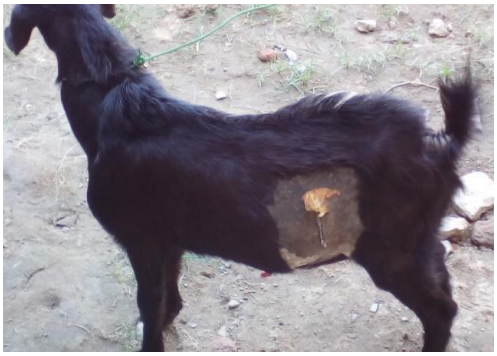


Figure 8: Wound healing condition after 5 days in line block.

3.13 Data collection and Analysis

In the anesthesia protocol, the reactions of the animal to the set the local anesthesia in six given reaction degrees noted (Table 2). The documentation also included the required amount of local anesthetic and the time required for the performance of local anesthesia. In the operation log, there were the pain reactions (Table 2) in the various stages of the procedure detained. In an evaluation of reaction with grade 0 was allowed to the animal during the carried out action showed no reaction. Resulted in a rating with grade 1 to 3, the animal showed nonspecific reactions that were not in connection with the manipulations of the anesthetist or the surgeon had to stand, so no statement regarding allow pain. The animal left clear signs of restlessness and defense resulted in a rating with the reactions of grades 4 to 6 considered to be specific. Out of 10 goat patients, 6 averaged 7 days (Maximum 25 days) daily in the clinic to be examined. The Creating the logs and recording the data were done after an introduction to the assessment of the BCS, in the anesthetic methods and in the surgical procedure. For data entry specially created data sheets were used in the "Microsoft Excel, Windows Version 10". The statistical evaluation was done with the "Data Analysis" tools. The differences in the mean values were calculated by "t-test. Two samples assuming unequal variances". For comparisons between forms of anesthesia, the odds ratio (OR) determined. A p-value of <0.05 was considered significant.

Table 2: Grading of patient reactions that occurred during application of lidocaine, during abdominal incision/closure and during exploration of the abdominal cavity

Degree of reaction		Behavior
0	Nonspecific reaction	No reaction
1		Slight skin or muscle twitching (slight Moan)
2		Distinct muscle twitching (strong moaning)
3		Trippeln / unrest
4	Specific reaction	Defensive movements like hitting with the leg
5		Dodge attempts such as going back and forth
6		Outbreak attempt / intention to go down

Chapter-IV

Results

Both the pre-piercing and the subsequent application of the local anesthetic caused pain reactions. The risk of an animal showing a pricking response was significantly greater in DPVA when applying the local anesthetic. Proved at the LB the piercing and the anesthetic application are the same painful. Regarding the surgical opening of the abdominal cavity there were some significant differences. The average pain score line block anesthesia was more painful than the average pain score in distal paravertebral anesthesia technique where pain reduction in the two techniques

4.1 Comparison of pain response between Line block (LB) VS Distal Para Vertebral Block (DPVA)

Present study reveals that distal paravertebral anaesthesia is less pain for laparotomy then the Line block anaesthesia (Figure 9).

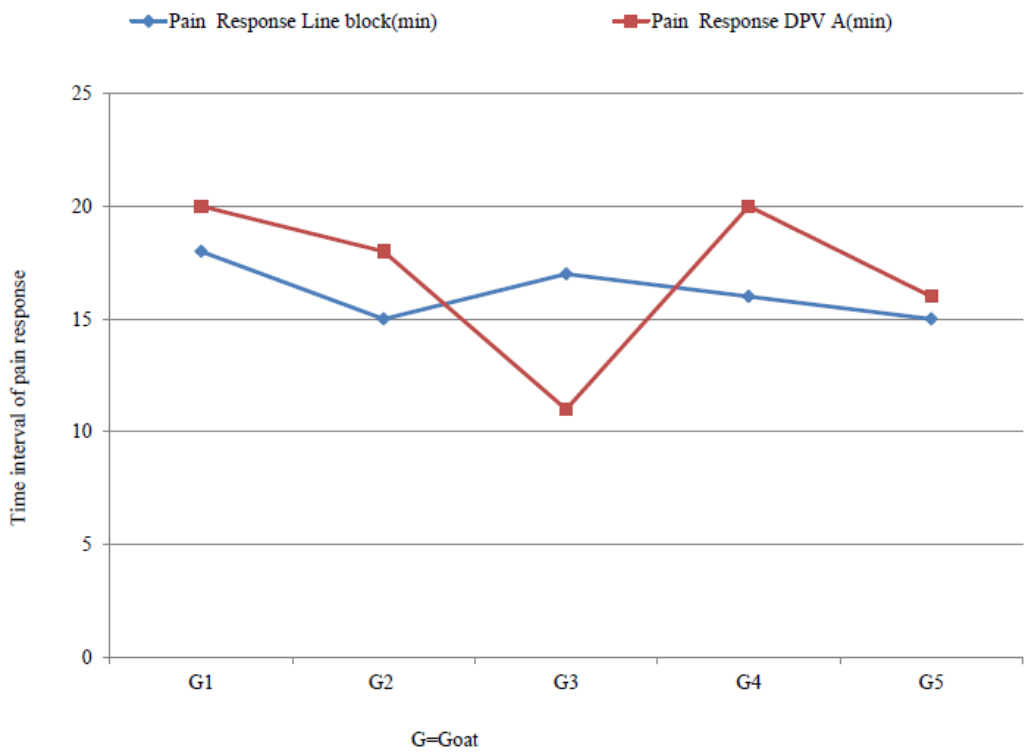


Figure 10: Comparison of pain response between Line Block (LB) VS Distal Para Vertebral Block (DPVA) t-Test: Two-Sample Assuming Unequal Variances (P – value was not significant due to >0.05)

4.2 Animals Movements Behaviors

Present study based on goat movements behaviors which are my target pain response measurement key for evaluation and grading. In this study we can see mostly non-specific reaction behaviors seen, so we can say that 2% lidocaine anaesthesia for pain management is good so we can say that pain response in both anaesthesia somewhat different.

Table 3: Grading of patient reactions that occurred during application of lidocaine during abdominal incision/closure and during exploration of the abdominal cavity.

Degree of reaction		Behavior
0	Non specific reaction	No reaction
1		Slight skin or muscle twitching (slight Moan
2		Distinct muscle twitching (strong moaning)
3		Trippeln / unrest

4. 3 Pain response during time

In my present study time application of local anaesthetic that makes pain response in time interval that is measured in grade. We can see that during application time DPVA create more pain then the LB (figure 10).

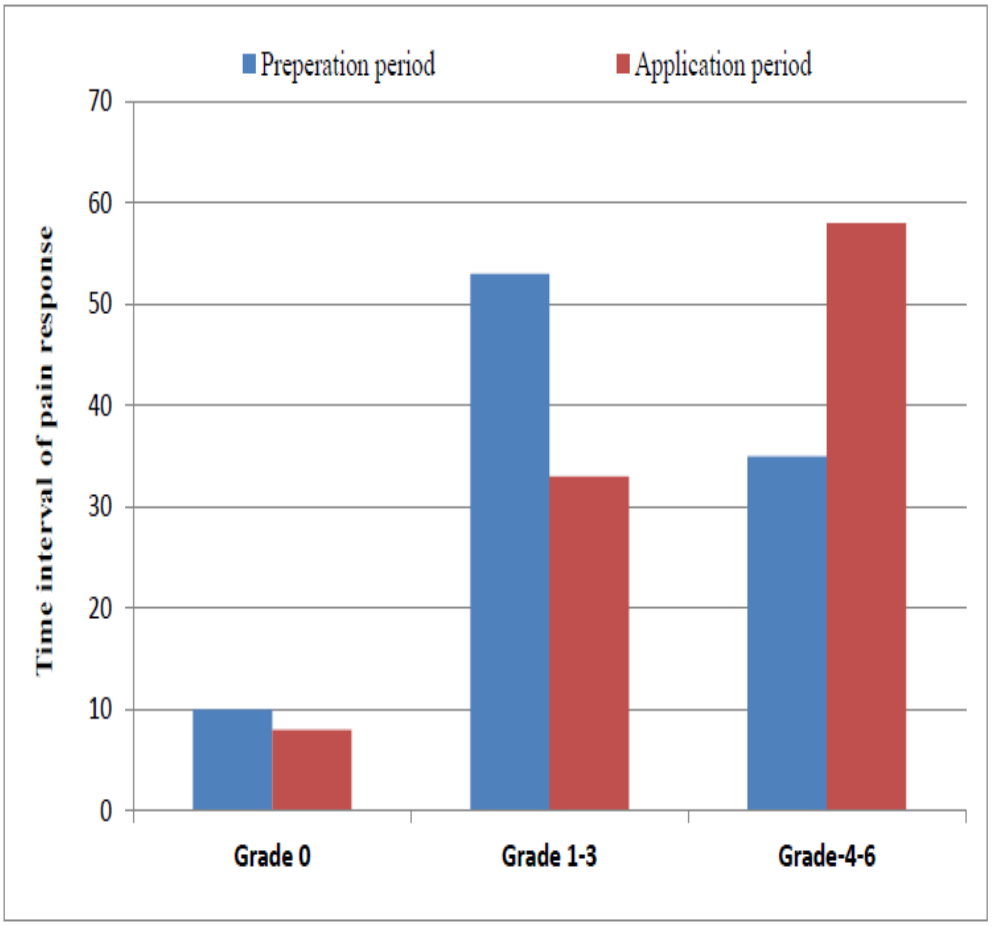


Figure 11: Percentage of pain reaction during DPVA and LB (in minutes).

4.4 Comparison of wound healing response

Comparison of two techniques of wound healing make the result that DPVA has good wound healing response then the LB and also there was no infection in DPVA but one case seen infection in LB (Figure 11).

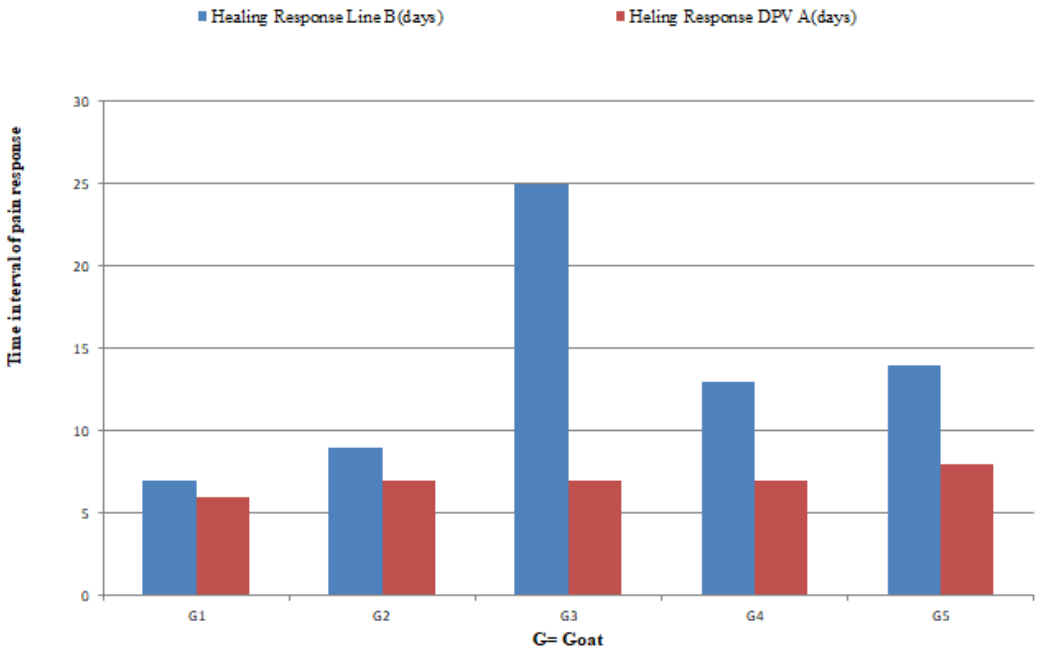


Figure 12: Comparison of wound healing response between Line Block (LB) VS distal Paravertebral Block (DPVA) t-Test: Two-Sample Assuming Unequal Variances(P – value was not significant due to >0.05)

4.5. Hematology parameter

The haematological values observed in this study were within normal range. Lignocaine has been known to control cardiac arrhythmia and suppressing automaticity, and this may have helped to keep the hematological parameters within normal range.

Table 4: Total leucocytes and differential leucocytes counts before and after surgery of the DPVA and LB approaches (mean±SD)

Parameters	**Mean scores**			
	Groups	**Before surgery**	**24 hours of surgery**	**One week after surgery**
RBC ($\times 10^6/\mu\ell$)	DPVA	12.32 ± 1.35	12.79 ± 1.23	12.23 ± 1.32
	MIA	13.13 ± 0.51	13.69 ± 0.52	13.36 ± 0.85
PCV(%)	DPVA	21.92 ± 2.56	24.66 ± 5.24	16.15 ± 2.85
	MIA	25.22 ± 1.19	25.90 ± 1.15	25.72 ± 4.37
Hemoglobin (g/d)	DPVA	8.12 ± 1.36	8.98 ± 2.25	8.63 ± 1.51
	MIA	9.16 ± 0.43	9.84 ± 0.59	9.86 ± 1.28
Total WBC **(**$\times 10^3/\mu\ell$)	DPVA	25.48 ± 4.19	37.70 ± 3.90	34.93 ± 3.12
	MIA	33.86 ± 9.96	50.52 ± 16.32	51.08 ± 5.07
Granulocytes**(**$\times 10^3/\mu\ell$)	DPVA	11.10 ± 3.69	13.24 ± 3.45	10.23 ± 5.72
	MIA	11.38 ± 4.41	20.90 ± 10.51	18.62 ± 5.07
Lymphocytes**(**$\times 10^3/\mu\ell$)	DPVA	11.74 ± 3.27	19.16 ± 2.61	21.33 ± 8.22
	MIA	33.86 ± 3.40	24.06 ± 7.37	28.32 ± 11.98
Monocytes**(**$\times 10^3/\mu\ell$)	DPVA	2.60 ± 0.89	4.08 ± 1.21	3.35 ± 0.66
	MIA	4.14 ± 1.02	5.60 ± 1.54	4.12 ± 0.44

Pair of means bearing different superscript are not significantly different due to minor change **(**$p > 0.05$).

Chapter-V

Discussion

In the present study, two local anaesthetic techniques were compared for laparotomy in goats. It was the first study of its kind in Bangladesh. Ten (10) goats experiencing laparotomy were divided into two groups where five animals undertook a technique consisting of an incisional line block and the other five undertook distal paravertebral anaesthesia. Both techniques required a mean of five minutes to complete but the line block method was considered more difficult than the distal paravertebral anaesthesia. After distal paravertebral anaesthesia, pain reactions to incision of the external oblique abdominal muscle were more severe, however, reactions to abdominal exploration and to suture the two oblique abdominal muscles were significantly milder than after line block. Wound healing was significantly better than in line block. Neither technique resulted in consistent and complete elimination of pain reactions in every patient, but overall distal paravertebral anaesthesia had better results than the line block.

The assessment of the pain behavior of an animal is selfsame life-threatening to measure in animals like cattle and goat (Steiner et al., 2003; Feist et al., 2008, and). About their specific pain expressions or the individual pain sensitivity is little known (Anderson et al., 2005 and Feist et al., 2008). The administration of 6ml (100 mg) @ of 6 mg/kg bw of 2% lignocaine hydrochloride to accomplish distal paravertebral nerve block produced appreciable analgesia of the lateral abdominal wall. It is noteworthy that 2ml (40mg) of the drug was deposited at each site rather than 3ml (60mg) as specified by some authors. This deliberate reduction in the volume of lignocaine has a significant implication on both the economy of cost and reduced toxicity to the animal, which supports my present study (Olaifa et al., 2009; Clarke et al; 2013). In the course of the investigation, it became clear that not only the comparison of the two methods but also the effectiveness of local anesthesia was put to the test. The results obtained in this study shown that the DPVA is more feasible and easy, which was also recommended by Nuss et al., 2012. The implementation of LB not only referred to the inexperienced, but also more than 50% of experienced anesthetists mention that as "not easy". Reason for that it often deep or small hunger pit, worrying to hurt abdominal organs, as well defensive movements of the animals. Probably also played one role that the injection for the LB because of the larger length also had a larger diameter than those for the DPVA which was also recommended

by Nuss et al., 2012. For infiltration anesthesia should, therefore, be possible to use thin needles to help the pain in the present examination could with regard to pain reactions. DPVA is less panic then the LB which is also recommended by Nuss et al., 2012.

The present investigation was in the prospect of a better distribution of the anesthetic and thereby achieve a better effect. However, the DPVA was not in the majority of cases as a mention for (Farquharson, 1940; Skarda and Tranquilli, 2007), reliable in the pain elimination. Furthermore, it would be desirable to have more potent local anaesthesia (Skarda and Tranquilli, 2007) for livestock available, in particular for longer operations. The BCS of the animals influenced neither feasibility in the present study still the effectiveness of anesthesia. In bleeding, the needle was withdrawn and placed differently. Diffusion of the local anesthetic toward the pelvic limb, recognizable by an unstable state or by a decline of the patients (Ivany and Muir, 2004; Muir et al., 2005) could not be observed in any of the animals. For the assessment of pain during the operation appeared the distinction in "no reaction", "unspecific reaction" and "specific response" most important because the pain cannot be completely eliminated. These findings encourage to refine the anesthesia techniques and also to use more advanced measures, such as light sedation which is also recommended previously (Nuss et al., 2012).

Subcutaneous and muscular infiltration at LB provided good anesthesia. At the incision of the Marcus obliquus externus significantly underperformed the DPVA and LB obviously, the local anesthetic was at the incision initially effective under LB in the area of the cutting line and then quickly became non-specific in the well-perfused muscle, which is recommended by Loscher, 2006. When wound closure was done, the effect got subsided, so that the Marcus obliquus externus and internally abdominis significantly showed more reactions after DPVA occurred. The duration of action of lidocaine was thus too short for pain response.

The present study reveals that the use of plain lidocaine which is better than the combined with epinephrine which is also recommended by Skarda and Tranquilli (2007). Study on DPVA, the depth was in the nerve surrounding connective and fatty tissue, thus reducing the active ingredient runs slower and the effect is guaranteed longer which was also recommended by Link and Smith (1956). At the LB were because of the rapid decay of the effect also no differences in the painfulness at long continuous and short lasting operations determine. Therefore, for the laparotomy in goats a more potent local

anesthetic will be available regarding the more difficult to infiltrate deeper muscle layers. There were no differences between LB and DPVA in terms of effectiveness. That's good, contrary to expectations cutting off the LB in the deep layers are likely to be on their component, which is believed to be one the DPVA equivalent anesthesia of the inner layers contributed. Present study mention that exploration of the abdominal cavity by local anaesthetics techniques among the DPVA significantly fewer signs of pain, which is also recommended by Nuss et al. (2012). During the study period, replenishment was usually only after incision of the external oblique abdominis, it is seen that the pain reactions remained too strong. In the present Investigation when the animals feel more pain then surgery pause for a while. This was also practiced in other studies (Holton et al., 2001; Underwood, 2002). Sedation of the goat in laparotomy is discussed in the literature. In recent years, however, the opinions prevail, that the positive effects justify the use of xylazine (Anderson and Muir, 2005; Muir et al., 2007). The Sedation is the mode of administration of xylazine important. The intravenous administration leads to a faster, more intensive effect and to better analgesia than intramuscular administration. At the subcutaneous injection is the least risk that the Animal goes down (Abrahamsen, 2008) but in the present research, there is no use of xylazine for sedation. In the present study, there were slight variations of total white blood cells (WBC) count of the two approaches before surgery, at 24 hours, and at the first week after surgery, the LB group had slight variation WBC value at all the intervals with non-significant differences at first and second week after surgery. There were slight variations of total granulocytes between the two groups with the LB group having slight higher values at all the intervals, but there is no significant difference between the two groups. The lymphocytes values of the two groups also varied and the LB approach had the slight highest value which is also support by (Abubakar et al., 2014).

In present study seen that LB techniques for laparotomy among five, one goat has shown edema in incision line and wound healing delayed for 25 days but there is no any infection seen in DPVA and wound healing seen in nearly 7-8 days but in LB takes longer time then DPVA so we can say that DPVA is better than the LB supported by Skarda, 1986.

It is also notable that complete relief of pain was not achieved by both the investigated anesthesia techniques. This could be due to the technical implementation of anesthesia, but also could be due to relatively weak effect and short duration of action of lidocaine.

Chapter-VI

Conclusions

Comparison between two methods of local anaesthesia will be effective in field conditions to select suitable anaesthesia for laparotomy in goats. Both the anesthetic techniques could cause complete pain reduction, however the pain was more reliably switched off under DPVA than under LB. A replenishment of local anesthetic should therefore be scheduled for both the techniques. Furthermore, a slight sedation of animals will be helpful to reduce pain during laparotomy.

Recommendation

Though a significantly positive conclusion was found in this study, however, large sized population will provide more specified result for better conclusion. It is also suggested that laparotomy in goat with distal paravertebral technique is better than the modified infiltration techniques for pain management and better wound healing. It is applicable in field conditions considering the animal's welfare and economical values with available anaesthetic materials.

Chapter-VII

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Annex-I

Questionnaire for establishment of wound healing protocol for laparotomy goat.

Case Registration no: contact no:

1. Owner's name:

Address:

2. Patient's information:

Age: Sex: Breed:

Body weight:

Feeding history: Normal/off feed

Mucous membrane: white/pale/pink

Dehydration: mild/moderate.

3. Additional finding:

4. Diagnosis:

5. Observation of common clinical parameters before and after treatment.

Observation	Before surgery.	During surgery	After surgery
Heart rate			
Respiration rate			
Temperature			
Mucous membrane			
Degree of Reactions	Specific/nonspecific	Behaviors	
0		No reaction	
1		Slight skin or muscle twitching (slight Moan)	
2		Distinct muscle twitching (strong moaning)	
3		Trippeln / unrest	
4		Defensive movements like hitting with the leg	
5		Dodge attempts such as going back and forth	
6		Outbreak attempt / intention to go down	

Table 5: Comparison of pain response between Line Block (LB) VS Distal Parvertebral Anaesthesia (DPVA)

Goat's no.	Pain Response During Line Anaesthesia (Minutes) Group-A	Pain Response During Distal Para Vertebral Anaesthesia (Minutes) Group-B
Goat 1	18	20
Goat 2	15	18
Goat 3	17	11
Goat 4	16	20
Goat 5	15	16

Table 6: Percentage of pain reaction during DPVA and LB (In minutes).

Parameter	Process	Grad 0	Grad 1-3	Grad 4-6
Preparation Period	DPVA (In Minutes)	10	53	35
Application Period	LB (In Minutes)	08	33	58

Table 7: Comparison of healing response against Line block (LB) VS Distal Para Vertebral anaesthesia (DPVA)

Goat's no.	**Healing Response Line Block (Days) Group-A**	**Healing Response Distal Para Vertebral anaesthesia (Days) Group-B**
G1	07	06
G2	09	07
G3	25	07
G4	13	07
G5	14	08

Annex-II

Table 8: Total erythrocyte count (million/cumm):

Patients number	Groups	Before surgery	24hours of surgery	One week after surgery
1	DPVA	11.35	11.30	12.02
2	LB	11.02	11.01	11.86
3	DPVA	10.86	10.80	11.02
4	LB	11.22	11.16	11.60
5	DPVA	11.02	11.00	11.15
6	LB	10.12	10.02	10.75
7	DPVA	11.02	11.00	1.45
8	LB	10.75	10.65	11.02
9	DPVA	10.45	10.40	10.89
10	LB	11.35	10.50	11.02

Table 9: Packed Cell Volume (%)

Patients number	Groups	Before surgery	24hours of surgery	One week after surgery
1	DPVA	19.58	19.50	19.98
2	LB	21.59	21.53	23.58
3	DPVA	20.92	21.66	22.15
4	LB	24.22	24.50	24.72
5	DPVA	22.12	22.10	24.12
6	LB	21.25	21.30	25.65
7	DPVA	23.54	23.52	23.98
8	LB	22.59	22.56	24.38
9	DPVA	23.25	23.20	23.99
10	LB	24.28	24.23	24.96

Table 10: Hemoglobin (g/dl)

Patients number	Groups	Before surgery	24hours of surgery	One week after surgery
1	DPVA	8.10	8.30	8.58
2	LB	8.89	8.69	8.98
3	DPVA	9.10	9.02	10.56
4	LB	10.12	10.10	10.85
5	DPVA	8.82	8.98	8.66
6	LB	9.10	9.14	9.56
7	DPVA	9.24	9.20	10.25
8	LB	8.25	8.24	9.56
9	DPVA	9.56	9.53	9.88
10	LB	9.15	9.12	9.69

Table 11: Total Count of WBC ($\times 10^3/\mu\ell$):

Patients number	Groups	Before surgery	24hours of surgery	One week after surgery
1	DPVA	22.86	32.54	30.86
2	LB	28.23	35.24	33.80
3	DPVA	23.25	29.98	28.65
4	LB	26.64	31.69	30.92
5	DPVA	28.30	37.29	36.98
6	LB	26.68	36.50	34.69
7	DPVA	24.48	35.70	32.93
8	LB	32.06	45.42	41.08
9	DPVA	30.26	37.96	35.28
10	LB	32.52	39.24	38.68

Table 12: Granulocytes ($\times 10^3/\mu\ell$)

Patients number	Groups	Before surgery	24hours of surgery	One week after surgery
1	DPVA	11.02	15.64	14.26
2	LB	10.25	13.58	12.54
3	DPVA	12.25	16.21	16.00
4	LB	10.30	14.24	13.85
5	DPVA	11.21	16.52	15.28
6	LB	12.36	15.65	14.59
7	DPVA	10.85	**13.32**	12.69
8	LB	12.69	15.36	14.84
9	DPVA	10.10	12.24	10.01
10	LB	10.38	19.20	17.42

Table 13: Lymphocytes ($\times 10^3/\mu\ell$)

Patients number	Groups	Before surgery	24hours of surgery	One week after surgery
1	DPVA	9.80	17.16	18.23
2	LB	32.80	23.16	27.30
3	DPVA	12.23	20.66	17.15
4	LB	21.36	24.50	24.72
5	DPVA	14.65	18.98	18.66
6	LB	25.36	19.14	29.56
7	DPVA	26.20	23.70	32.93
8	LB	12.52	24.42	31.08
9	DPVA	9.68	12.24	10.01
10	LB	12.98	19.20	17.42

Table 14: Monocytes ($\times 10^3/\mu\ell$)

Patients number	Groups	Before surgery	24hours of surgery	One week after surgery
1	DPVA	1.99	2.98	2.30
2	LB	2.02	3.65	3.25
3	DPVA	2.65	4.21	3.20
4	LB	1.80	3.88	2.90
5	DPVA	3.24	4.50	3.82
6	LB	1.25	3.00	2.14
7	DPVA	1.20	2.69	2.22
8	LB	2.35	3.65	3.10
9	DPVA	1.21	2.65	2.10
10	LB	1.98	2.36	2.30

Biography

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