Addis Ababa University

College of Health Sciences

Department of Anesthesia

Comparison of the analgesic efficacy of caudal and ilioinguinal\iliohypogastric nerve blockade using bupivacaine for children under going inguinal surgeries at Menelik II hospital .

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A thesis submitted to Addis Ababa University department of Anesthesia as partial fulfillment of requirements for the masters of sciences degree in Anesthesia.

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Thesis

For

Master of Science degree in Anaesthesia

TITLE

Comparing the analgesic efficacy of caudal and ilioinguinal/iliohypogastric nerve blockade using bupivacaine for children under going inguinal surgeries at Menelik II hospital.

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Abstract

Background

Inguinal surgeries are a type of operations performed at the inguinal region. Caudal block involves the introduction of local anesthetic into thecaudal epidural space.Ilioinguinal/iliohypogastric nerve blocks is also the most common abdominal wall blocks provide effective analgesia for surgical procedures of inguinal area.

Objectives

To compare the analgesic efficacy of caudal and ilioinguinal/iliohypogastric nerve blockade using bupivacaine for children under going inguinal surgeries at Menelik II hospital.

Methodology

An institutional based prospective cohort study was conducted on 70 patients who under gone inguinal surgeries under general anesthesia. Patients in CB group (n=35) received caudal block and IL/IH group (n=35) received ilioinguinal/iliohypogastric nerve block after induction of anesthesiabased on the independent decision of anesthetist.Study participants were selected by Systematic random sampling technique. P-value less than 0.05 was considered as statistically significant.

Result: - This study found that caudal block has prolonged postoperative analgesia with a mean duration of 301.5±73.5 minute compared to 242.4±66.4 minutes in Ilioinguinal/iliohypogastric group (p=0.001). Total analgesic consumption and pain severity was comparable between the groups (p>0.05) which is not statistically significant.

Conclusion and Recommendation:we found that caudal epidural had prolonged duration of analgesia as compared to Ilioinguinal/iliohypogastric nerve block. Based on our finding we recommend the use of caudal block as effective post-operative analgesia for inguinal surgeries in pediatrics.

Declaration

I, the undersigned, MSc in clinical anesthesia student agree to accept responsibility for the Scientific, ethical conduct of the research project and provision of required progress reports as preterm and conditions of the research and publications office of Addis Ababa University. I, declare that this thesis is my original work in partial fulfillment of the requirement for the degree Of master in clinical anesthesia. I understand that plagiarismwill not be tolerated and all directly quoted material has been appropriately referenced.

Name of the student: Yusuf Yimer

Date_____ signature _____

Approval of the primary advisor

Name of the primary advisors: AdugnaAregawiand Suleiman Jemal

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Date._____ Signature _____

Acknowledgment

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Acronyms

ASA: American Society of Anesthesiologist

ASIS: Anterior superior iliac spine

CA: caudal analgesia

CI-confidence interval

FMOH- federal ministry of health

FLACC-Face Legs activity Cray Consolable

GA: general anesthesia

IL/IH: inguinal and iliohypogastric nerve block

L: Lumbar, LI: local infiltration

LA: local anesthetics

NRS-Numeric Rating Scale

IASP- International Association Study of Pain

IQR-inter quartile range

IRB- Institutional Review Board

MOPS- Modified Objective Pain Score

MSC-Master of science

NGO-non-governmental organization

PONV- Postoperative Nausea and Vomiting

POP- Postoperative Pain

RCT-Randomized Control Trial

SD –standard deviation

WHO- World Health Organization

Chapter one Introduction

1.1 Background

Inguinal surgeries are a type of operations performed at the inguinal region which includes herniorrhaphy, orchidopexy, hydrocelectomy,PPVligation. Inguinal hernia occurs in 5 of 100 full term and 30 of 100 preterm infants. It is 10 times more frequent in males than females. It has surgical and non-surgical treatment modalities. The most commonly performed inguinal surgeries in children include inguinal hernia repair with or without orchidopexy, which is performed in 3 of 100 children (1, 2).

Pain is perhaps the most feared symptom of disease. Childrenare special in this regard because, in them it is a very complex phenomenon. It is also very difficult to differentiate restlessness or crying due to pain from that of hunger or fear in the children. An effective pain therapy to block or modify the myriad physiologic responses to stress has become an essential component of modern pediatric anesthesia and surgical practice (9).

According to the post-operative pain management guideline published in February 2016 by Chou R, Gordon DB et al, the use of peripheral regional anesthetic techniques is strongly recommended as a component of multimodal analgesia for pain management following open inguinal hernia repair (29).

For postoperative pain with these surgeries, a regional analgesic modality such as caudal anesthesia (CA) Ilioinguinal/Iliohypogastric nerve block (IL/IH) or local infiltration (LI) is combined with a general anesthesia (GA) are good alternatives. When compared to IV opioids, regional techniques reduce the risk of side effects such as somnolence, respiratory depression, nausea and vomiting (4).

Caudal block (CB) is a common regional technique in pediatric patients. It involves the introduction of local anesthetics into the caudal space. The caudal space is the sacral portion of the epidural space. It also involves needle penetration of the sacrococcygeal ligament covering the sacral hiatus that is created by the unfused S4 and S5 lamina. In pediatrics, CB is typically combined with general anesthesia for intraoperative supplementation and postoperative analgesia. It is commonly used for procedures below the diaphragm, including urogenital, rectal, inguinal, and orthopedics (5).

Ilioinguinal/iliohypogastric nerve blocks is also the most common abdominal wall blocks provide effective analgesia for surgical procedures of inguinal area. It penetrates the transverse abdominal muscle just above the iliac crest, supplies the muscle, and divides into anterior branch and lateral cutaneous branches and provides cutaneous innervation to the skin of the scrotum and adjacent thigh. It has a success rate of 70–80% and can result in technical failure in up to 20% of children (6, 7).

1.2 Statement of problem

Pain is defined by the international association for study of pain as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage". Open inguinal surgery can lead to high levels of intra and post-operative pain. The reported Incidence of pain after inguinal hernia repair and orchidopexy varies from (0% to 37) % and (30-60 %) respectively (8, 3, 32).

Finely et al have recently showed that many types of the so called "minor" surgery can cause significant pain in children. Inadequate treatment of post-operative pain in the children and newborns cause impairments in pulmonary, cardiovascular, neuroendocrinal, gastrointestinal, immunological, and metabolic functions (22, 24).

There was a controversy on the effectiveness of the two blocks between different studies. Markham SJ et al showed II/IH nerve blockade was equally effective compared with caudal blockade for inguinal surgeries and other study done by Bhattarrai in 2005 demonstrate that IL/IH nerve blockadge has longer duration of analgesia as compared to caudal block (10,31).

Therefore, CB and IL/IH block are technically simple and routinely practiced in our setup. This can be the solution for increasing the quality of postoperative pain management. So that the aim of this study was to compare analgesic effectiveness of CB and IL/IH in patient undergoing open inguinal surgeries under general anesthesia.

1.3 Justification of the study

The society of Pediatric Anesthesia, 13 at its 15th annual meeting at New Orleans, Louisiana (2001) clearly defined the alleviation of pain as a "basic human right".*Langlade et al* suggestedthat the post-operative pain treatment must be included in the anesthetic planning even before induction of anesthesia, adopting the idea of 'managing pain before it occurs'(25,26).

There is also interindividual variability for pain perception, assessment, recognition that are affected by social, cultural, cognitive, genetic factors (11).

There are different modalities of pain management such as administration of opioids, non-opioid analgesics, and regional nerve block techniques. Opioid analgesics, especially morphine, are choice for treating postoperative pain in children but it has serious side effects in children such as somnolence, respiratory depression, emesis, and ileus. As far as my knowledgethere is no published study with the same topic in Ethiopia. In a resource-limitedarea like ours investigating the best choice between the two techniques for pain relief has a paramount importance

Chapter two: Literature reviews

According to assessment by American pain society, more than 80% of patients who undergo surgery experience acute postoperative pain and approximately 75% of those with postoperative pain report the severity as moderate, severe, or extreme. Less than half of patients who undergo surgery report adequate postoperative pain relief. Opioid-sparing techniques are becoming more popular as they decrease the undesired side-effects from narcotic analgesics (11).

2.1 Analgesic efficacy of caudal bupivacaine for inguinal surgeries

All types of pain complained from below the umbilical surgeries can be managed by caudal block. It is the most frequently used regional technique in children for the prevention of pain in the infraumbilical operations (inguinal, anorectal and orthopedic surgeries), whether in the intraoperative or postoperative period, but the main disadvantage of a single dose caudal block is its short duration, and this may lead to inadequate postoperative pain control, and further administration of postoperative analgesics (12).

A study done in Ethiopia by *GetuAtaro and Mary Bernard*comparing caudal bupivacaine (B) and caudal bupivacaine with neostigmine (BN) showed that the median analgesic duration in caudal bupivacaine was 5.8 ± 2.3 hr.There was no difference among the groups regarding pain and sedation scores. The PONV incidence was observed in Group-B (4.6%) and Group-BN (13.9%) which is not statistically significant ($p>0.05$) across the groups (28).

ShobhaMalviya et al showed the adequacy of caudal analgesia with 0.5 ml. kg $^{-}$1and 1 ml. kg^{-}1 0.125% bupivacaine solution for penscrotal or inguinal surgery. The duration of analgesia, pain score and narcotic recruitment did not differ between the two groups at any time during the 12 hr after the block ($P > 0.05$) (13).

Silvani et al also showed the adequacy ofcaudal blockade either with ropivacaine 0.375% at 0.5 mL/kg (Low Volume High Concentration Group, L VHC), or ropivacaine 0.1% at 1.8 mL/kg (High Volume Low Concentration Group, HVLC). Analgesics were needed after 520 +/- 480 min in the L VHC and 952 +/- 506 min in the HVLC group ($P < 0.05$). Motor block was less in the HVLC group(34).

Another study done *by Khaled R. Al-Zaben in 2012,*demonstrate that the analgesic effect of Caudal Bupivacaine and Intravenous Morphine for hypospadias repair. Pain score were higher in

the morphine group as compared to caudal group on admission to the post-anesthesia care unit and during the following 3 postoperative hours. The time to the first analgesia was significantly lower in the morphine Group (176 minute ± 111.3) compared to caudal Group (366 minute ±123.4) (P =0.000).Less patients in caudal group (6.7%) (P =0.000) encountered vomiting as compared to the morphine group (33.3%)(14).

A study done on Egypt by Ahmed Z. Mohamed showed the analgesic effect of caudal bupivacaine and adding dexamethasone to caudal bupivacaine for hypospadias repair .The duration of analgesia was 4.8±1.1h in the caudal bupivacaine group (12).

*SerblentGökhanBeyaz*demonstrate comparison of postoperative Analgesic Efficacy of Caudal Block versus Dorsal Penile Nerve Block with Levobupivacaine for Circumcision in Children. A significant decrease of pain and sedation scores was noted in both the DPNB group and the caudal block group (P< 0.001)(34).

Another study done on India also showed Analgesic efficacy of caudal bupivacaine and caudal bupivacaine/dexamethasone for infraumbilical surgeries in children. The mean duration of analgesia in caudal bupivacaine Group was 435.85 (±144.72) min (15).

A comparison study done by *Amminnikutty et al* to compare caudal bupivacaine to bupivacaine infiltration with diclofenac suppository for post-operative analgesia in pediatric herniorrhaphy. The mean analgesic duration in caudal bupivacaine group and to bupivacaine infiltration with diclofenac suppository group was 228.5 and 331.0 minutes respectively and is found to be statistically significant (P < 0.05)(16).

2.2 Analgesic efficacy of Ilio-inguinal Ilio-hypogastric nerve blockade for inguinal surgeries

Ilio-inguinal Ilio-hypogastric nerve blocks are used for procedures in the inguinal area, including hernia repair and orchidopexy. A lumbar plexus block is not optimal in these cases since these nerves exit the plexus more cranially (L1–L2) than those nerves targeted by the lumbar plexus block (L3–L5)(7).

Doggerel Boldbaatar et al demonstrate different techniques of IL/IH blocks in children at the junction of the lateral one-fourth and the medial three-fourth in the line from the anterior superior iliac spine, 2.5 mm medial to the ASIS, 10 mm medial-superior to the ASIS and 10mm

medial-inferior to the ASIS. The average pain score at 2 hours after operation was lowest at the junction of the lateral one-fourth and the medial three-fourth in the line from the anterior superior iliac spine (1.04±1.23 [Cl 95%, 0-5.3]) and highest at 10mm medial-inferior to the ASIS IV (2.88±2.47 [Cl 95%, 0-9]), a statistically significant difference(p=0.0027)(17).

MahinSeyedhejazietal also demonstrate success rate and outcomes of the two techniques of landmark-based ILIH at a point placed between outer 1/4 and inner 3/4 of a line connecting anterior-superior iliac spine and 1 cm medial and 1 cm superior to anterior-superior iliac spine. The success rate of ILIH block was 94.8% in the first group and 94.5% in the second group with no significant difference between the two groups (P= 0.64) (35)

A study done on Chinese children showed ultrasound guided IL/IH block is an effective way to alleviate the postoperative pain and incidence of common adverse events for inguinal surgery (18).

Similar study done by *H. Willschke et al* showed Ultrasound-guided ilioinguinal/iliohypogastric nerve blocks can be achieved with significantly smaller volumes of local anesthetics. The intra- and postoperative requirements for additional analgesia are significantly lower than with the conventional (land mark)method (6).

Khaled R. Al-zaben et al compare ilioinguinal /iliohypogastric nerve blocks and intravenous morphine for control of post-orchidopexy pain in pediatric ambulatory surgery. Time to first analgesia was 332 ± 255 min in IL/IH group (p= 0.11). There was no significant difference in the duration of analgesia, number of total Paracetamol doses, need for extra analgesics in both groups over the 24 postoperative hours (3).

A comparison study done by *M. Seyedhejazi et al* to compare analgesic efficacy of caudal block and ilioinguinal -iliohypogastric nerve block using bupivacaine +clonidine for pain relief of inguinal surgeries in children. In caudal group 7 from 34 and in IL/IH group 12 from 33 children required postoperative analgesia which is not statistically significant. Five children (15.5%) in IL/IH group and one (2.94%) in caudal group had severe pain after operation.It seems in children caudal and ilioinguinal -iliohypogastric block have the same effect on analgesia (p=0.174) (19).

Bhattarai BK et al demonstrate analgesic efficacy of Combination of simplified (Single Puncture) ilioinguinal and iliohypogastric nerve blocks and wound infiltration vs caudal block

with 0.25% bupivacaine after inguinal herniotomy in children. The mean duration of analgesia was longer in simplified ilioinguinal and iliohypogastric nerve blocks and wound infiltration group (253±102.6 min) as compared to caudal block group (219.6±48.4 min)(10).

Abualhassan A. Abdellatif also demonstrate Ultrasound-guided ilioinguinal/iliohypogastric nerve blocks (B) versus caudal block(C) for postoperative analgesia in children undergoing unilateral groin surgery. The average pain scores during hospital stay were 1.82±1.71and 1.52±1.41 for group C and group B respectively (P>0.05). The average time to first rescue analgesia was longer in group B 253±102.6 min as compared to 219.6±48.4 min in group C(30).

In clinical trial done by *MelikeKorkmazToker* et al to compare the effects of caudal anesthesia, ilioinguinal/iliohypogastric (II/IH) nerve block, and instillation to the wound-site using bupivacaine on postoperative analgesia. Caudal block or an II/IH block have a similar quality and duration of postoperative pain relief in pediatric patients undergoing unilateral inguinal hernia repair (1).

Research hypothesis

HO: There is no significance difference in pain severity, duration of analgesia and total analgesic consumption between non exposed and exposed groups.

HA: There is significance difference in pain severity, duration of analgesia and total analgesic consumption between non exposed and exposed groups.

Chapter Three Objectives

3.1 General objectives

To Compare the analgesic efficacy of caudal and ilioinguinal\iliohypogastric nerve blockade using bupivacaine for children under going inguinal surgeries at Menelik II hospital from October 1,2018 to march 30,2019 G.C.

3.2 specific objectives

- To compare the severity of postoperative pain in caudal block and IL/IH block using 0.25% bupivacaine.

- To compare the duration of post-operative analgesia between caudal and IL/IH block.

- To compare the total analgesic consumption during the frist12 hours post-operative period in caudal and IL/IH group.

Chapter four: methodology

4.1 Study Area

This study was conducted in menelik II hospital which is the public hospital in Addis Ababa, capital city of Ethiopia. Menelik II referral hospital was established in 1910 in Addis Ababa. Since its renovation as referral hospital, it has been serving as referral hospital and giving service in both outpatient and inpatient basis for different departments. It has six electiveand two emergency operation tables. Different major surgical operations like cardiothoracic, general surgery, urology,and ENT, GYN/OBS and Pediatric surgery are the most common operations performed in this hospital.

4.2 Study design and period

Institutional based Prospective cohort study design was employed from october1, 2018 up to March30, 2019 G.C.

4.3 population

4.3.1 Source population

All pediatric inguinal surgical patients scheduled to underwent elective surgery at Menelik II hospital.

4.3.2 Study Population

All pediatric surgical patient scheduled for inguinal procedures in the study period who underwent operation under general anesthesia with caudal bupivacaine or ilioinguinal/iliohypogastric nerve blockade and those who fulfill inclusion criteria was included in the study.

4.4 Eligibility criteria

4.4.1 Inclusion criteria

- Elective inguinal surgeries managed by caudal and IL/IH block
- Age group 2-14 years
- ASA I and II patients

4.4.2 Exclusion criteria

- Day case surgery

- Patients who take caudal and IL/IH block other than 1ml/kg and 0.4 ml/kg respectively.
- Simultaneous Operation on other site (supra umbilical)
- Morphine given at time of induction
- Any additive added to bupivacaine

4.5 Sampling Technique and Sample Size Determination

4.5.1. Sample size determination

The primary endpoint of our study were to compare pain severity by FLACC/NRSscore between groups for 12 hours, duration of analgesia and total analgesic consumption after the surgery. Sample size estimation was determined based on the results of pilot study done on 10 patients at menelik II hospital which were done before data collection conducted. by taking the largest sample size which was calculated from the dependent variables by using a priori power analysis (G Power version 3.01). Sample size were calculated from the analgesic duration of caudal block (283± 35.8 min) and(257.5±45.1) min at theIL/IH group. And the results of this pilot study didn't included in the major research work.

Controlling for the probability of a Type I error at alpha = 0.05 and 80% power a sample of 32 patients involved in each group.Using 1:1 ratio between groups and when 10 % of contingency is included for dropouts, the total sample of 70 patients or 35 patients per group was required, a total of 70 pediatric patients were involved in the study.

4.5.2. Sampling technique

Systematic random sampling technique was used to select study participants on daily operation schedule list. Depending upon average values of the previous surgery per 6 months on the log book, more than 150 patients were operated on pediatric elective inguinal surgery. The sampling interval K was determined using the formula: K=N/n; where, n = total sample size, N = population per 6 months. Patients were sorted by listing inguinal surgery consecutives. Therefore, the sampling interval was 2 and the first study participant (random start) was selected using lottery method after which data collector recruit 1 patient for every 2 consecutive patients undergoes Inguinal surgery after grouping based on patients who fulfill the inclusion criteria divided into two groups based on exposure status.

Exposed (IL/IH): Patients received 0.4 ml/kg of0.25% bupivacainefor Ilioinguinal

'Iliohypogastric nerve block

None posed (CB): Patients received 1 ml/kg of0.25% bupivacainetill the required

Sample size was reached.

4.6 Study variables

4.6.1. Dependent Variables

- Severity of post-operative pain

- Total postoperative analgesic consumption

- Duration of analgesia in minute

4.6.2 Independent variable

-Socio-demographic variables (Age, Height, and weight)

- Type of inguinal surgery

- Duration of surgery and anesthesia in minutes

- Hemodynamic variables (Heart rate, blood pressure

- Induction agents (ketamine, thiopentone, propofol)

-non exposure and exposure variable: Caudal and Ilioinguinal/iliohypogastric nerve block

4.7 Data collection technique and patients

Structured check lists and questionnaires were prepared in English which includes socio demographic data, preoperative vital signs, ASA classification, duration of anesthesia, duration of surgery, and dose of analgesia if given , total volume of drug, Dose of local anesthesia and post operatively severity of pain, rescue analgesic consumption and adverse effects were monitored for 12 hours. Data collection was done using a designed check lists and observational structured questionnaires, Intraoperative data was collected from anesthesia sheet by one Anesthetists while postoperative data was collected by three nurses. In the postoperative time patients were transferred to PACU and to ward when they recover from anesthesia and observed by trained nurses. Either by FLACC/ NRS score were assessed & documented on the arrival, 1st, 2nd, 4th, 6th and 12thhour after end of surgery. According to the hospital's trend of anesthesia

practice on arrival of thepatients to the operative theater, and after application of the routine hospital monitoring protocol, HR, noninvasive blood pressure, and SPO2 has been recorded before induction of general anesthesia. Anesthesia is induced with induction agent and intubation of the trachea with an adequate sized endotracheal tube or laryngeal mask airway has been facilitated by muscle-relaxation and maintenance is by oxygen and inhalational agent. During intraoperative period vital sign like HR, NIBP (SBP and DBP), SPO2, RR and intraoperative analgesic consumption were recorded after induction, skin incision and at the end of surgery. Before start of surgery, most of MSc anesthetists or MSC anesthesia trainee give regional anesthesia for postoperative pain management. In study hospital postoperative pain management for inguinal surgery are done by either CB, IL/IH block or systemic opioids depending on the decision of anesthetist in charge. Most of the anesthetists use 1 ml/kg of 0.25% bupivacaine for CB and 0.4 ml/kg of 0.25% bupivacaine for IL/IH block and others may use different doses. But, we only select patients who were given 1 ml/kg of 0.25% bupivacaine for CB and 0.4 ml/kg of 0.25% bupivacaine for IL/IH block. Five (5) patients were excluded during the study, failed IL/IH block(three patient) , <1ml/kg for caudal (1patient) and one patient dexamethasone additive(1patient).

Caudal block technique: After induction of anesthesia and once that airway is secured, the child is turned onto the lateral decubitus and posterior superior iliac spines and the sacral hiatus surrounded by the two sacral cornua are marked. The skin is then prepared with antiseptic solution and allowed to dry while bupivacaine is prepared. Once the sacrococcygeal ligament has been pierced, the cannula is laid almost flat against the skin (forming a 10-degree angle of the skin) and advanced 2 to 3 mm through the ligament. Connect the syringe with 1ml/kg of 0.25% bupivacaine and inject slowly 2 to 3 mL every 2 minutes. Once the injection is complete, remove the catheter, clean the caudal skin area, and position the child for surgery.

Ilioinguinal/iliohypogastric nerve block technique: is performed after induction of anesthesia and once that airway is secured the anterior superior iliac spine (ASIS) is located and a 21- or 23-gauge needle is inserted 1 cm medial and 1 cm superior to the ASIS. After the “pop” is felt indicating that the external oblique Apo neurosis is pierced, Local anesthetic is then injected using 0.4ml/kg of 0.25% bupivacaine and continued in a fan-like manner.

4.10 Data quality control

Training and orientation about the objectives and relevance of the study, each items included in the study tools and the whole process of data collection were provided for data collectors and supervisors. During data collection, regular supervision and follow up were undertook. The supervisor checkedeach questionnaire daily with further cross check by principal investigator for completeness and consistency of data. Data clean up and crosschecking of missing data was done before analysis on SPSS.

4.11 Data analysis and interpretation

Data were entered to SPSS version 25 for analysis. The data were tested for normality using Shapiro–Wilknormality test. Normally distributed data (hemodynamic response , duration of analgesia) were analyzed by using student t-test and expressed as mean ±SD.Non-normally distributed data (severity of pain ,analgesic consumption ,duration of anesthesia and surgery ,demographic factors) were analyzed using Mann-Whitney U test and presented as median(IQR).Chi-square (x2) test was used to analyze the homogenous categorical Independent variables and post op complications between these two groups.P value less than 0.05 was considered as statistically significant.

4.12 Dissemination Plan

Copies of the research will be disseminated to college of health science, school of medicine/department of anesthesia, AAU student research office, Ethiopian association of anesthetists, Ethiopian society of pediatrician, different NGOs that work on pediatric health, Ethiopian FMOH. Finally, it will be sent to national and international journal publishers for publication.

4.13 Ethical Consideration

Prior to data collection, the proposal was reviewed by the ethical committee of college of health science and official letter was obtained from anesthesia department. Get permission from menellik II hospital clinical director office after submission of official letter. Moreover, the objective of the study was explained to both hospital administration and the children's parent included in the study. Verbal consent from the children's parent was obtained and confidentiality of the information assured by using code numbers than personal identification names and keeping questionnaires locked.

4.13 operational definition

ASA physical status: is classification system for assessing the fitness of patient before surgery The ASA physical status was assigned by the anesthetist prior to the surgical procedure, and was listed on the anesthetic record

ASA Status	Description
I	A normal healthy patient
II	A patient with mild systemic disease that results in no functional impairments
II	A patient with severe systemic disease that results in functional limitations
IV	A patient with severe systemic disease that is a constant threat to life
V	A moribund patient who is not expected to survive with or without the operation

Duration of anesthesia: a time in minutes it takes from induction to a time to extubation.

Duration of surgery: time in minutes from skin incision to closure in minute

Post-operative nausea and vomiting: when a patient's experience at least one episode of either nausea or vomiting within 12 hours.

Postoperative pain: the presence of pain in the postoperative period was defined as a patient complaining pain and any pain score other than zero within 12 hours.

Duration of analgesia: a time in minutes was defined as the time taken from the block placement of drug till the first recording of FLACC/NRS score >4.

Total analgesia consumption: total type and dose of medication given in mg within the first 12 hours after end of surgery.

Failed block: The need for analgesia during operation..

FLACC scale: is a measurement used to assess pain for children between age two month and seven years or for individual that are unable to communicate their pain going to score.

In patients who are asleep: observe for 5 minutes or longer. Observe body and legs uncovered. If possible, reposition the patient. Touch the body and assess for tenseness and tone.

In patients who are awake: observe for 1 to 5 minutes or longer. Observe legs and body uncovered. Reposition patient or observe activity. Assess body for tenseness and tone. Initiate consoling interventions if needed.

Each category is scored on the 0–2 scale, which results in a total score of 0–10. (see ANNEX III)n

- 0: Relaxed and comfortable
- 1–3: Mild discomfort
- 4 –6: Moderate pain and 7–10: Severe discomfort or pain or both. (20)

NRS: is a valid pain intensity assessment tool that involves asking a patient to rate his or her pain from 0-10(11-point scale) with the understanding that 0 is equal to no pain and 10 equal to the worst possible pain.

CHAPTER FIVE:RESULT

5.1 Demographic and Perioperative Characteristics

A total of 70 patients (35 patients in each group) were finally involved for analysis of this cohort Studybased on whether they received caudal block(CB)and Ilioinguinal/iliohypogastric block (IL/IH) .The demographic characteristics of patients and baseline anesthesia characteristic were homogeneous with no statistically significant difference among the Groups such as age, sex (all are male in each group), weight, duration of surgery, duration of anesthesia and ASA status (Table I).

Table I Demographic and baseline anesthetic characteristics between CB & IL/IH groups in pediatric inguinal surgeries at Menellik II hospital. From October 1, 2018 G.C to march 30, 2019.

Variable	CD group (n=35)	IL/IH group (n=35)	P value
Age(years) M(IQR)	5(3-9)	6(4-8)	0.64
ASA ASA I n(%)	29(41.4)	28(40.0)	0.75
ASA II n (%)	6(8.6)	7(10)	
Weight M(IQR)	18(25-15)	18(25-15)	0.86
Procedure Orchidopexyn (%)	16(22.9)	14(20)	0.59
Inguinal hernia repair n (%)	10(14.3)	14(20)	
PPV ligation n (%)	9(12.9)	7(10)	
Induction Propofoln (%)	28(40)	22(31.4)	0.25
Ketamine n (%)	5(7.1)	8(11.4)	
Thiopentonen (%)	2(2.9)	5(7.1)	
Induction analgesia Fentanyln (%)	25(35.7)	28(40.0)	0.4
Duration of surgery(min) M(IQR)	60(80-50)	55(65-50)	0.49
Duration of anesthesia(min) M(IQR)	75(99-65)	75(90-65)	0.37

NBCB = Caudal block **IL**/IH = Ilioinguinal/Iliohypogastric block **M** (**IQR**) =median (interquartile range), **n(%)** =number (proportion) , Mann-Whity U test and chi-square test (x^2) was used, p-value < 0.05 considered statistically significant.

5.2 Hemodynamic response in between groups

There was no statistically significant difference in vital signs, baseline (PR,SBP and DB), before and after skin incision.

Table II Hemodynamic response between CB& IL/IH groups in pediatricinguinal surgeries at Menellik II hospital.FromOctober 1, 2018 G.C to march 30, 2019.

Variable		CB (n=35)	IL/H (n=35)	P value
Base line	PR*	119±12.8	113.8±12.18	0.9
	SBP*	101.83±11.73	107.3±10.94	0.06
	DBP*	53.89±9.51	53.09±7.79	0.7
Before skin incision	PR *	122.43±12.05	118.2±9.67	0.11
	SBP*	104.4±12.77	106.31±12.88	.06
	DBP*	52.94±7.97	53.03±7.23	0.96
After skin incision	PR*	120.46±13.45	114.91±9.87	0.05
	SBP*	102.89±16.34	107.49±10.81	0.17
	DBP*	54.49±7.68	54.71±6.94	0.89

NBCB = Caudal block **IL/IH** = Ilioinguinal/Iliohypogastric block, * =mean ± standard deviation, PR=pulse rate, SBP=systolic blood pressure, DBP=diastolic blood pressure, t-test was used, p-value >0.05 considered not statistically significant.

5.3 Comparison of postoperative pain severity

As assessed by FLACC/NRS the median pain score was comparable in between the CB and IL/IH groups at the arrival PACU, $2^{nd}4^{th}$,$6^{th}$and 12^{th} hourspostoperatively, with no statistically significant difference of p-value >0.05.

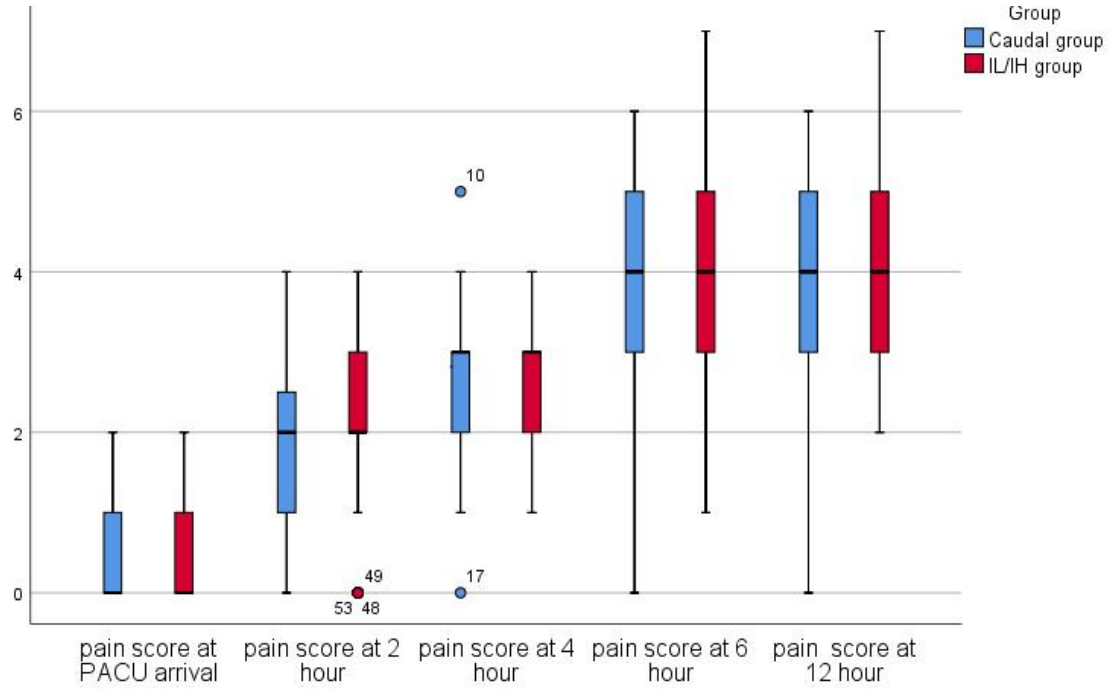

Figure 1comparison of postoperative pain severity score betweenCB & IL/IH groups in pediatricinguinal surgeries at Menellik II hospital. FromOctober 1, 2018 G.C to march 30, 2019.

5.4 Comparison of duration of analgesia between groups

The mean duration of analgesia was longer in caudal group with a mean and standard deviation (SD) of 301.5±73.5 minute as compared to IL/IH group 242.4±66.4 minute (p value=0.001).

Table III Comparison of duration of analgesia between CB & IL/IH groups in pediatricinguinal surgeries at Menellik II hospital.FromOctober 1, 2018 G.C to march 30, 2019.

	CB(n=35)	IL/IH(n=35)	P value
Duration of analgesia (mean ±SD)	301.5±73.5	242.4±66.4	0.001

B CB = Caudal block **IL/IH** = IlioinguinalIl/iohypogastricblock, SD=Standard deviation

p value <0.05 is statistically significant.

5.5 Comparison of total analgesia consumption between groups

In caudal group 6(17.1%) patients and 4(11.4%) patients in Ilioinguinal/iliohyogastric group didn't require any analgesia within 12 hours.

The median total paracetamol consumption was 300mg in both caudal and Ilioinguinal/Iliohypogastric group(p=0.15).And also there was no statistically significant difference in Tramadol consumption between caudal and IL/IH group (p =0.18).

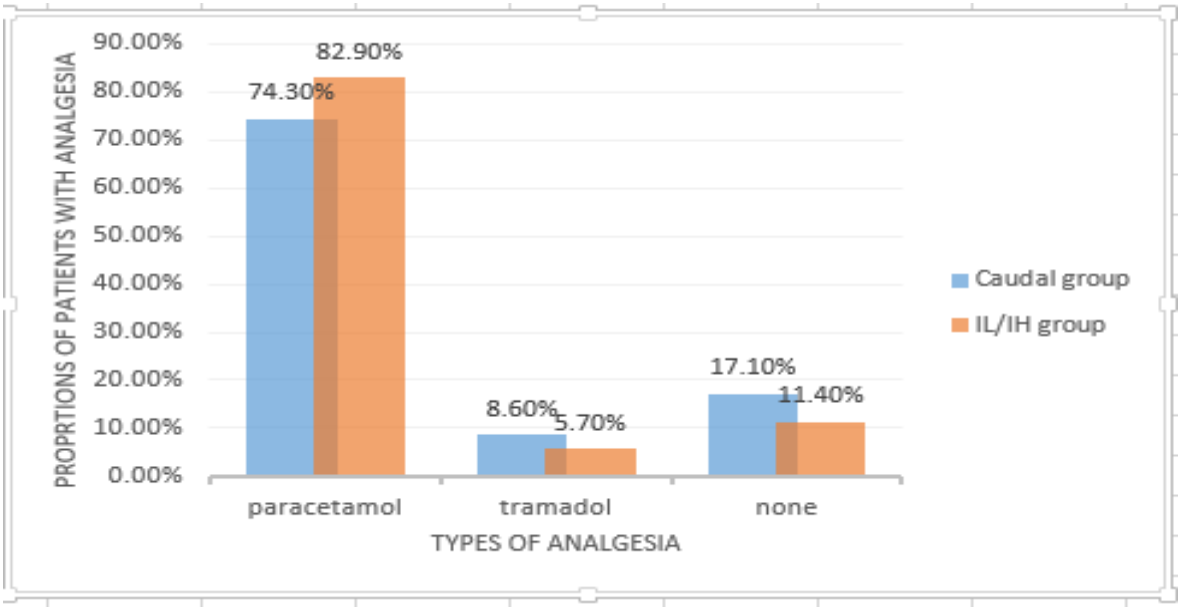

Figure 2Proportionof postoperative analgesia given betweenCB & IL/IH groups in pediatricinguinal surgeries at Menellik II hospital. FromOctober 1, 2018 G.C to march 30, 2019.

5.6 Comparison of postoperative complications between groups

Postoperative complications was comparable between groups with the proportions of patients with leg weakness 2(5.7%)in IL/IH group as compared to caudal group 4(11.4%) within 12 hours which was not statistically significant with (p = 0.39). And the proportions of patients with PONV 5(14.3%) in IL/IH group and 3(8.6%) in caudal group with no statistically significant difference between groups (p=0.45). None of them used anti-emetic drugs postoperatively and no patients developed other complications such as sedation during the first 12 hours.

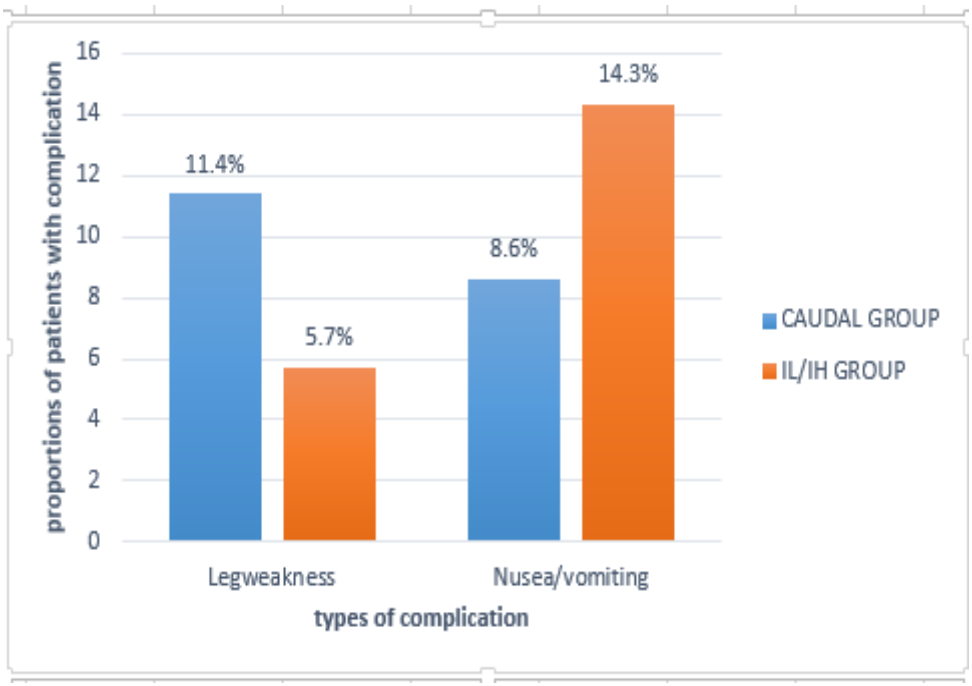

Figure 3 Proportion of postoperative complications between CB & IL/IH groups in pediatricinguinal surgeries at Menellik II hospital. From October 1, 2018 G.C to march 30, 2019.

CHAPTER SIX

6.1 DISCUSSION

Creating a pain-free postoperative period in pediatric patients is an important objective for an anesthetists. Several methods can be used for pain relief after inguinal surgeries. The systemic use of narcotics or anti-inflammatory drugs administered either alone or in combination do not often result in satisfactory pain relief. Regional analgesic modality such as caudal analgesia, inguinal and iliohypogastric nerve block are good alternatives for this type of surgical procedures (10).

In fact,thepreferredperi-operative analgesic technique should be effective, safe and have minimal side effects.Postoperative pain can be problematic, specifically in pediatric surgeries hence it can lead to pulmonary(atelectasis, pneumonia), cardiovascular complications and also prolonged hospital stay, and thus it increases cost.Various confounding factors such as Sociodemographic and perioperative variable maycontribute to postoperative pain severity and, if these factors were not correctly taken into Account, may result in variation in the severity of pain. In our study, these confounding factors such as age, gender, duration of anesthesia and surgery were all comparable between the groups and the difference in duration of analgesia between groups was likely due to CB and IL/IH block in exposure groups.

Our study showed that the mean duration of analgesia is longer with caudal block(301.5±73.5 min) as compared to Ilioinguinal/iliohypogastric nerve block (242.4±66.4 min) with 0.25% bupivacaine(p=0.001).Similar study done by Ahmed et al with the duration of analgesia after caudal block for hypospadias repair was 4.8±1.1hr (12).Our finding also supported by other studies(14, 15,28).

In contrary to our study studies done in Nepal by Bhattarai BK et al in 2005 on comparing ilioinguinal and iliohypogastric nerve blocks and wound infiltration vs. caudal block with 0.25% bupivacaine which found the mean duration of analgesia for IL/IH was longer 253±102.6 min and 219.6±48.4min in caudal group(p>0.05)(10).This difference in duration may be explained by the addition of wound infiltration in IL/IH group.

Anotherstudyalsodone in 2016 by *MelikeKorkmazToker et al in turkey*,*Markham SJ et aland M. Seyedhejazi et al* in Iran showed caudal and ilioinguinal -iliohypogastric block have the same

effect on duration of analgesia for children undergoing inguinal surgeries(1,19,31).The possible reason for short duration in IL/IH block in our study may be the imprecise description of the landmarks and the precise location of the needle tip between the ilioinguinal and iliohypogastric nerves and within the correct facialplane couldn't be detected. It is associated with multiple administration of LA in adjacent anatomical structures, particularly is muscle tissue.

*Abdellatif*assessed whether ultrasound (US)-guided II/IH nerve blocks with local anesthetic would provide comparable postoperative analgesia to blind technique caudal block following pediatric unilateral groin surgery. He found that US-guided II/IH nerve blocks are an ideal postoperative analgesic and they are as effective as caudal blocks (30).In a prospective randomized study by *Willschke and coworkers* showed the use of a US-guided II/IH block was compared with the landmark-based approach. It was clearly demonstrated that the use of the US-guided technique was associated with a significantly higher success rate (6).In our hospital, although an ultrasound device was not present; consequently the II/IH nerve block was performed by insertion of a short beveled needle 1 cm medial and 1cm superior to the ASIS.

Regared to pain severity our study also demonstrates pain score was comparable in caudal group compared to IL/IH group immediately at PACU, 1^{st} ,2^{nd},4^{th}, 6^{th} and 12^{th}postoperative hour($p > o.o5$).

The result of our study was comparable with a study done byMelikeKorkmazToker et al in turkey,Bhattarai BK et al and M. Seyedhejazi et al They found that an II/IH nerve block was as effective as a caudal block in terms of the quality and duration of postoperative pain relief(1,10,19).

The median total paracetamol consumption was 300mg in both caudal and IlioinguinalIl\iohypogastric group ($p=0.15$). And there was no statistically significant difference in Tramadol consumption between caudal and IL/IH group ($p =0.18$). The result of our study is line with the above studies.

The proportions of patients with leg weakness was 2 (5.7%) in IL/IH group as compared to caudal group 4(11.4%) which was statistically not significant with ($p = 0.39$).A study done by Bhattarai BK et al in 2005and M. Seyedhejazi et al was in line with our study which showed that

there was no any statistical difference in post-operative complication between the two groups (10,19).

In contrary to our studyin 2016 MelikeKorkmazToker et al showed None of the patients had any motor weaknessincaudal and ilioinguinal -iliohypogastric block(1). The possible reason for patients develop leg weakness in our study may be the dose that we use for the bocks was higher 1 ml/kg and 0.4 ml k/g of 0.25% bupivacaine for caudal and IL/IH group respectively, whereas the studies used 0.5 ml/kg and 0.3 ml/kg of 0.25% bupivacaine respectively.

PONV was comparable with no statistically significant difference between groups (p=0.49)

6.2 Limitation of the Study

Inability assign similar anesthetists and surgeons for the procedures

In ability to do randomized control trial study

6.3 Strength of the Study

In our study we have tried to make comparable study groups in terms of Sociodemographic factors, perioperative factors and we used similar doses. We have also used similar procedures between groups.

Chapter Seven:Conclusion and Recommendation

7.1 Conclusion

In our study Caudal anesthesia performed after induction of anesthesia for inguinal surgery had statistically significantly difference in prolonging duration of analgesia than Ilioinguinal-Iliohypogastric block.

7.2 Recommendation

According to the finding of the study, we recommend theuse of caudal blockover IL/IH block for inguinal surgery in pediatrics.

We also recommend further randomized control trial study.

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Annex one: Information sheet to get permission for the research

Introduction

This information sheet is prepared to explain the research project that you are asked to join by a group research investigators.

The research team includes MSc students, two senior advisor from AAU and three data collector From menelik II Hospital.

Name of Principal investigator: - Yusuf Yimer

Advisor's name: - Mr.:-AdugnaAregawi

Mr:- Suleiman Jemal

Name of sponsor: - AAU

Name of organization: - AAU, Health science college, anesthesia department

This information sheet is prepared by the above-mentioned investigator.

Risk

There is no any risk or harm that you will face by participating in this research. Any personal Information recorded will not be copied and transferred to other bodies. No need of writing Participants' name but by a code. Every piece of information will be kept confidentially.

Benefits

There is no incentive or payment to be gained by taking part in this project. The information collected from this research project will be kept confidential and only accessed by the researcher and research assistant only. This research project will be reviewed and approved by ethical committee of the department. If you want to know more information, you can contact the committee through the address below.

Tel: - +251972339836E-mail-yusufwassiee2019@gmail.com

Annex two: Consent form

Addis Ababa University, College of Health Sciences Department of Anesthesia

Prospective Cohort Study, On Comparing the analgesic efficacy of caudal and ilioinguinal/iliohypogastric nerve blockade using bupivacaine for children under going inguinal surgeries at Menelik II hospital from October 1,2018 to march 30,2019 G.C

Hello! My name is _____ I am of the members of the research team and I am here to ask you some questions and to collect some important information from your chart. If you are willing to participate in this research on postoperative analgesic efficacy of **caudal and ilioinguinal/iliohypogastric nerve blockade.** So you are kindly requested to your child to participate on this study. I obtained the child name from the list of operation for surgery. Participation is voluntary. We strictly keep confidentiality. This observation will for 12 hours. Therefore, we kindly request your child to participate in the observation? I understood about the objectives of the research and the roles I will have in the research. I have agreed to participate in the research.

A) Agree B) Disagree

If **agrees**, the observation will be started.

Thanks for taking part in the study!!!!

For further question ask investigator

Tel: - +251972339836

E-mail-yusufyimer2019@gmail.com

Annex Three Questionnaire

Instruction: For each of the questions, please circle the number of alternative(s) that fit the response or fill the blank space provided.

I) Identification

Code no……. Date……Age (year)…… Sex….. ASA……. Weight: ....kg

Type of surgery……

II) Baseline information

Baseline Vital sign BP……..PR……spo2……

1) **III) Intraoperative observations**
2) Induction; Time…….
3) 2) Induction agents a) ketamine b) propofol c) others(specify)……
4) 3) Does the patient receive analgesia during induction? a. Yes b. No
5) 4) If YES specify type, time and dose _____(____mg)
6) Vital sign after induction BP---------- PR ----------SPO2---------
7) Caudal block; -Time performed ……, bupivacaine 0.25%dose……(mg
8) IL/IH block; Time performed……..,bupivacaine 0.25%dose.....(mg)
9) Vital sign before skin incision----------
10) skinIncision time (min)……
11) Vital sign after skin incision BP…….PR…….
12) 10) Additional intraoperative analgesia given a) yes b) no
13) If yes specify the type, time and dose of the drug given----------(------mg
14) Duration of surgery: ……...……minute
15) Duration of anesthesia: ……...……minute
16) Time from caudal or IL/IH block to admission to PACU---------- (min)

IV) Postoperatively

1) Arrived at PACU _____pm/am (time per 24hr/date/month/E.C)

2) Analgesic required time _____PM/AM (time per24hr/date/month/E.C)

3) Duration till first analgesic request _____

4) Total and type of analgesic consumption within 12 hours after the patient arrived in recovery/ward_____

5) Post OP Severity of Pain by FLACC/NRS and V/S at Time in hours respectively.

At arrival PACU----------BP----------PR

At 1hr---------- BP---------- PR----------

2hr ---------- BP---------- PR ----------

4 hr ---------- BP---------- PR ----------

6 hr ---------- BP---------- PR----------

12 hr ---------- BP ---------- PR ----------

Complications observed

1. Does the patient have nausea within the first 12 hours of surgery? A. YES B. NO

2. Does the patient develop vomiting within first 12 hours of surgery? A. YES B. NO

3. Does the patient develop motor/leg weakness within first 12 hours of surgery? A. YES B. NO

4. Does the patient develop sedation within first 12 hours of surgery? A. YES B. NO

Annex Four Pain Assessment Tool

How to score in patients who are awake: observe for 1 to 5 minutes or longer. Observe legs and Body uncovered. Reposition patient or observe activity. Assess body for tenseness and tone. Initiate consoling interventions if needed.

In patients who are asleep: observe for 5 minutes or longer. Observe body and legs uncovered. If Possible, reposition the patient. Touch the body and assess for tenseness and tone

Figure 4 :FLACC SCORE

FLACC scale

Behavioral Observation Pain Rating Scale

Categories	Scoring		
	0	1	2
Face	No particular expression or smile; disinterested	Occasional grimace or frown, withdrawn	Frequent to constant frown, clenched jaw, quivering chin
Legs	No position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No crying (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or talking to. Distractable	Difficult to console or comfort
Each of the five categories (F) Face; (L) Legs; (A) Activity; (C) Cry; (C) Consolability is scored from 0-2, which results in a total score between 0 and 10.			

Each category is scored on the 0–2 scale, which results in a total score of 0–10.

0: relaxed and comfortable

1–3: mild discomfort

4 –6: moderate pain

7–10: severe discomfort or pain or both

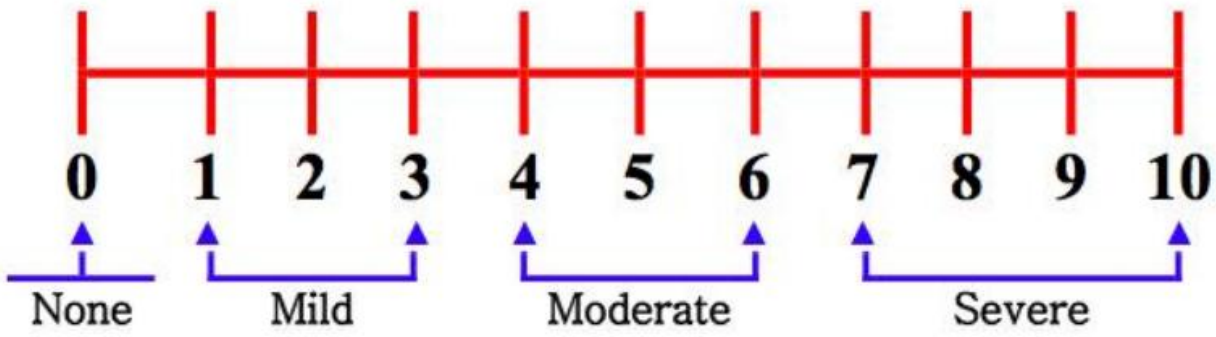

Figure 5: NRS Score

Annex five: Data accuracy check sheet

Table 4:Data accuracy check list

S.NO	Tools	YES	NO
1	Are the Inclusion criteria /exclusion criteria done appropriately		
2	Are all questions on Sociodemographic data filed appropriately?		
3	Are all questions on preoperative Period data filled appropriately?		
4	Are all questions on intraoperative Period data filled appropriately?		
5	Did the postoperative analgesic drugs filled with appropriate type of drug, time and dose		
6	Did the SOP followed strictly		

Appendix I English Version of Numeric Rating Scale (NRS)

The scale was taken 6 times within the first 12 hours. Patients was asked to rate their pain was

Assessed and recorded (immediately on acceptance of patient at recovery room) 2^{nd} , 4^{th} , 6^{th} and 12^{th}hours postoperatively.

The patient were asked one of the following questions:

-A. What number on a 0 to 10 scale would you give your pain right now?

B. When the explanation suggested above is not sufficient for the patient, further explanation

or conceptualization of the scale will be done:

0 = no pain

1-3 = mild pain (nagging, annoying, interfering little with ADLS)

4–6 = moderate pain (interferes significantly with ADLS)

7-10= severe pain (disabling; unable to perform ADLs)

Appendix II አማርኛትርጉምበቁጥርአምሳያመለኪያ (NRS)

ይህ መለኪያ በመጀመሪያዉ 24 ሰአት 6 ጊዜ የሚወሰድ ሲሆን በሽተኛዉ የሚጠየቃቸዉ ጥያቄዎችአሁን የሚሰማዎትን ህመም በየትኛዉ ቁጥር ይወክለዉታል;

ሀ) ከዜሮ እስከ አስር ካሉት ቁጥሮች አሁን የሚሰማዎትን ህመም የትኛዉ ቁጥር ይገልፀዋል.

ለ)ከላይ የተሰጠዉ ማብራሪያ በቂ ሳይሆን ሲቀር፣ ለበሽተኛዉ የበለጠ መረጃ መስጠት አስፈላጊ ሆኖ ይገኛል

0- **ምንም ህመም የለም**

1-3 - **ትንሽ ህመም አለ**

4-6 - **መካከለኛ ህመም አለ** 7-10 - **ከባድህ መምአለ**