"PROSPECTIVE STUDY OF LOCAL INFILTRATION ANALGESIA FOR POST OPERATIVE PAIN CONTROL FOLLOWING TOTAL HIP REPLACEMENT"

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ABBREVIATIONS

LIA	:	Local infiltration analgesia
NSAIDS	:	Nonsteriodal anti-inflammatory drugs
THA	:	Total hip arthroplasty
THR	:	Total hip replacement
HRA	:	Hip resurfacing arthroplasty
IT	:	Intertrochantric line
GT	:	Greater trochantric line
i.e.	:	That is
AVN	:	Avascular necrosis
ESR	:	Erythrocyte sedimentation rate
CRP	:	C-reactive protein
AP	:	Aterioposterior
IASP	:	International association for the study of pain
NRS	:	Numeric rating scale
VAS	:	Visual analog scale
OAS	:	Oral analog scale
s.c	:	Subcutaneous
i.m	:	Intramuscular
I.V	:	Intravenous
PCA	:	Patient controlled analgesia
RCT	:	Randomized control study
COX	:	Cyclooxygenase
PG	:	Prostaglandin
SD	:	Standard deviation

ADLS	:	Activities of daily living
OA	:	Osteoarthritis
B/L	:	Bilateral
DAA	:	Direct anterior approach
ITM	:	Intrathecal morphine
Viz,	:	Namely

ABSTRACT

TITLE: -"PROSPECTIVE STUDY OF LOCAL INFILTRATION ANALGESIA FOR POST OPERATIVE PAIN CONTROL FOLLOWING TOTAL HIP REPLACEMENT"

Introduction:

Local infiltration analgesia has gained popularity in recent past using mixture of drugs for various surgeries. This study was planned to assess the efficacy of local infiltration for total hip replacement based on postoperative outcomes like Visual Analogue Score (VAS), mobilization time and hospital stay.

Methods:

This prospective study included adult patients undergoing total hip replacement under spinal anesthesia from January 2018 to December 2018. Local infiltration using ropivacaine, clonidine, ketorolac and adrenaline was given at three stages during surgery and postoperatively pain control was assessed using VAS score during rest and movement, mean duration of first walk, mean duration of hospital stay was recorded. The data collected therein was analyzed using SPSS v.22.

Results:

Pain control was satisfactory in majority of patients with VAS score of 0-3 both during rest and movement. The first assisted walk was between 11.4 to 17.5hrs (mean: 14.14hrs) after surgery. 56% of patients had less than 3 days hospital stay after surgery.

Conclusion:

Local infiltration analgesia is safe, practical and efficient in pain control after hip surgeries.

Key words:

Local infiltration analgesia, total hip replacement, VAS score, Post operative pain.

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INTRODUCTION

Local infiltration analgesia (LIA) in total hip replacement is used to reduce severe postoperative pain which may delay recovery and rehabilitation. The aim is to achieve adequate pain relief in combination with good muscle function and help in early mobilization. In recent decades, in spite of studies showing a better understanding of pain mechanism, increased awareness regarding postsurgical pain and advances in pain-management approaches, still controlling postoperative pain has been an unresolved problem. In a remarkable number of patients, post-operative pain is not efficiently managed, due to which it can have negative effects on patients including, impaired function, recovery from surgery, and quality of life; extended opioid use, increased morbidity, and increased medical costs. Postoperative pain may hamper physical functioning, recovery, and quality of life.[1, 2, 3, 4]

Postoperative pain after THA can hamper mobility, recovery and increased hospitalization[5]. To lessen the pain, an appropriate method is required to be in place. This has been dealt with spinal or parenteral opioids, peripheral nerve blocks, and epidural analgesia conventionally. Although epidural is efficacious, its side effects and complications in the elderly have been questioned. The peripheral nerve block is good analgesia, but it is technically demanding and time-consuming as it requires essential blocking of femoral, lateral cutaneous and obturator nerves and may also result in residual motor block.[6]

In 2008, Kerr and Kohan described local infiltration anesthesia (LIA) to reduce pain, opioid consumption and improve mobilization after THR. The study results showed that there was a reduction in opioid consumption and postoperative

pain score with the addition of Ketorolac to the Ropivacaine and Epinephrine through LIA method; the epinephrine addition helps to decrease the local anesthetic toxicity by localizing it to the injection site.[7]

The analgesic effect from LIA is directly proportional to the direct actions of each constituent drug. In many studies, it has been proved that the effect of LIA is well beyond its own expected time of action.[8,9,10] Local anesthetics decrease the edema by decreasing the release of inflammatory mediators from neutrophils, decreasing the formation of oxygen free radicals and decreasing neutrophilic adhesion to the endothelium.[11,12]

Epinephrine reduces systemic absorption of local anesthetic and reduces intraoperative blood loss with its vasoconstrictor property. With the help of alpha-and beta-agonist effects, epinephrine administration by this technique will end in systemic absorption. In the literature of LIA, no adverse effects are reported. But we should always consider older patients and patients with ischemic heart disease as they have poor tolerance to the systemic effects.[7]

Nonsteroidal anti-inflammatory drugs (NSAIDS) decreases prostaglandin formation. Prostaglandins sensitize nociceptive fibers and lead to sustaining the pain. Opioids produce effective analgesia by acting on opioid receptors on peripheral sensory neurons. Inflammation increases the density of opioid receptors at peripheral neurons, which in turn increases the efficacy of opioids in inflamed tissues.[7]

OBJECTIVE

The primary objective of this study is to know the effect of local infiltration analgesia following total hip replacement based on postoperative outcomes like analgesia score using visual analgesic score at rest and on mobilization, first assisted walk and hospital stay.

REVIEW OF LITERATURE

Anatomy and physiology of the hip joint.

The hip joint is a ball and socket joint. It has following features.[13]

1. Joint cavity
2. Joint surface lined with cartilage
3. Synovial membrane
4. Ligamentous capsule.[14]

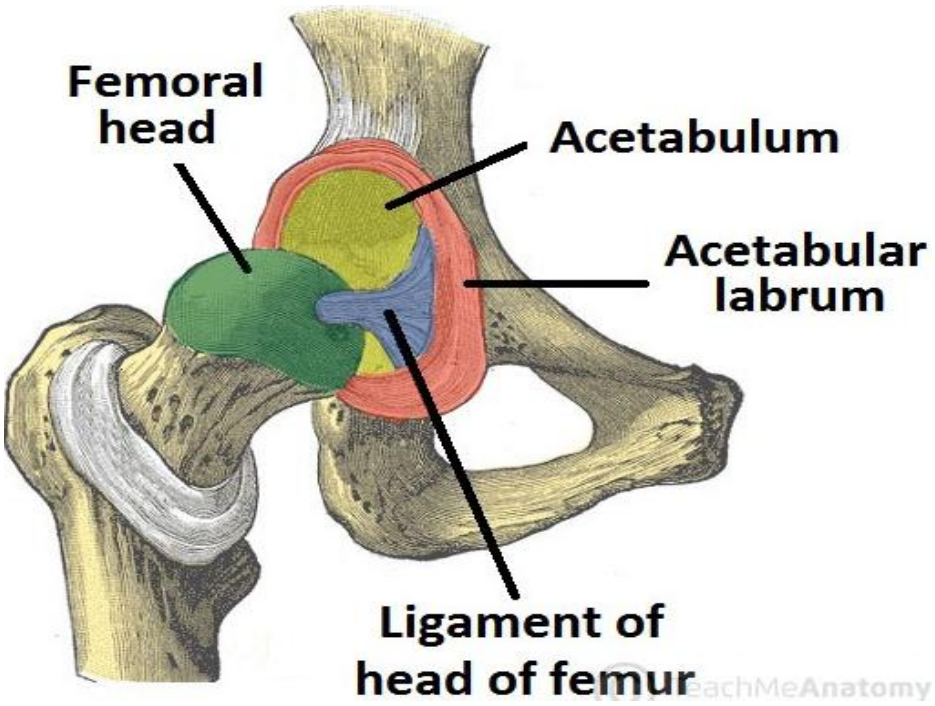


Figure 1. The joint capsule of hip

The femoral head and acetabulum are covered by hyaline cartilage, which helps the bones to move smoothly against one another, due to its smooth surface. Basically acts as a shock absorber. The synovial membrane is present between the layers of hyaline cartilage, which secretes synovial fluid to lubricate the joint. Strong muscles and ligaments around the hip prevent dislocation and hold the joint in cavity.[13]

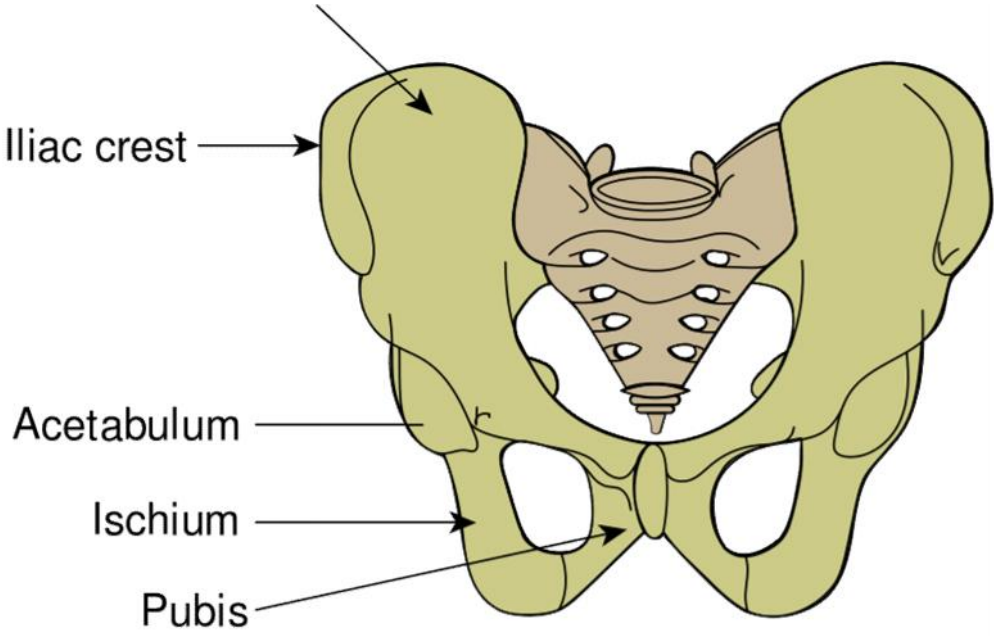
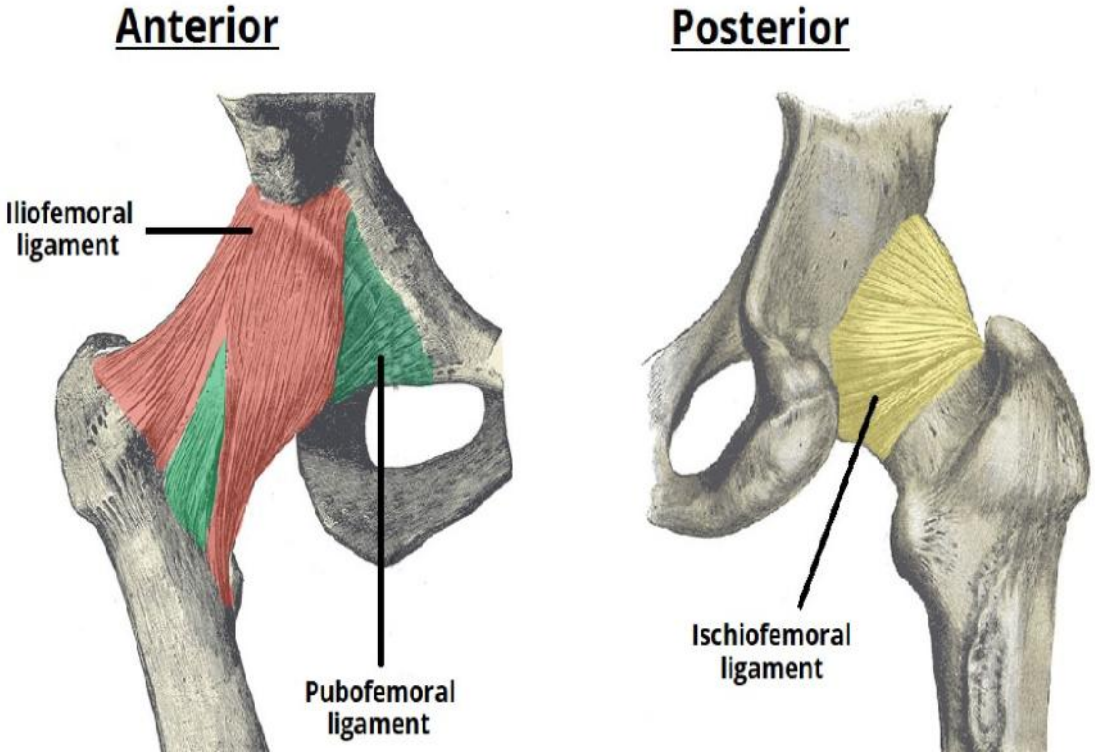


Figure 2. Structure showing acetabulum

FIBROUS CAPSULE OF HIP JOINT

The capsule takes its origin from acetabular margin, 6 to 8mm away from the labrum.[15] The front aspect of capsule attaches to the IT line and GT, the behind aspect of capsule is attached to the posterior IT line.[16] Fibers of capsule are vertically side by side to the neck of femur, whereas zona orbicularis, encircles neck of femur.[13]

LIGAMENTS OF HIP JOINT



A **B**

Figure 3 A: anterior view. B posterior view

ILIOFEMORAL LIGAMENT: it is the toughest ligament of the three and has inverted 'y' in shape. It extends from anterior inferior iliac spine and attaches to intertrochanteric line. Its function is to resist hip hyperextension.[13]

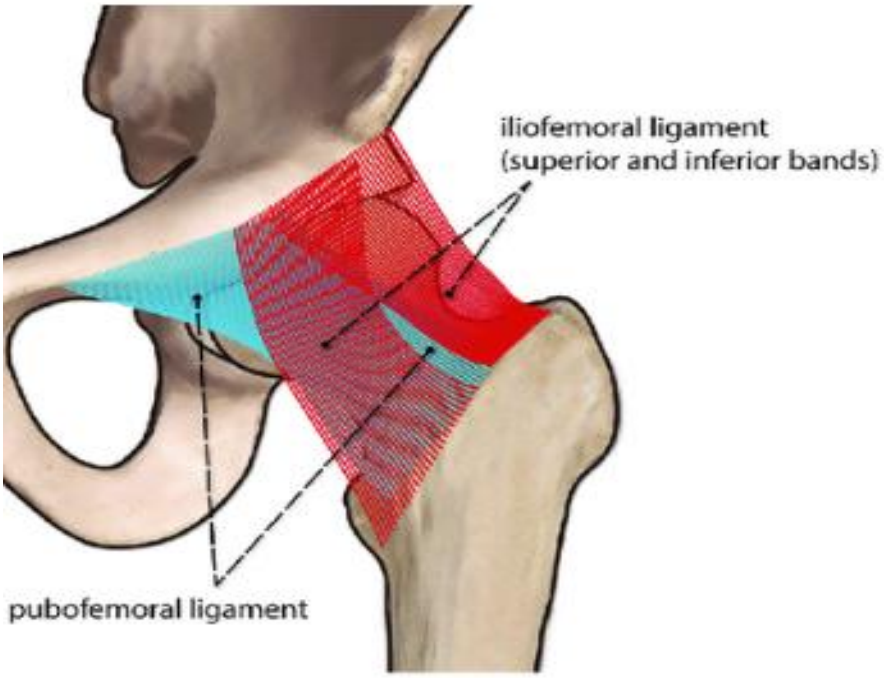


Figure 4. The iliofemoral ligament of the hip

PUBOFEMORAL LIGAMENT: It attaches superiorly to superior part of the superior pubic ramus and inferiorly to the neck of the femur. When the hip is hyper abducted, it helps by providing resistance .[13]

ISCHIOFEMORAL LIGAMENT: it is the toughest of the three ligaments mentioned – which takes its origin from the ischial rim of the acetabulum and cross posteroinferior part of hip joint and attaches on to the neck of femur. It provides stabilization when the hip joint is extended.[13, 17]

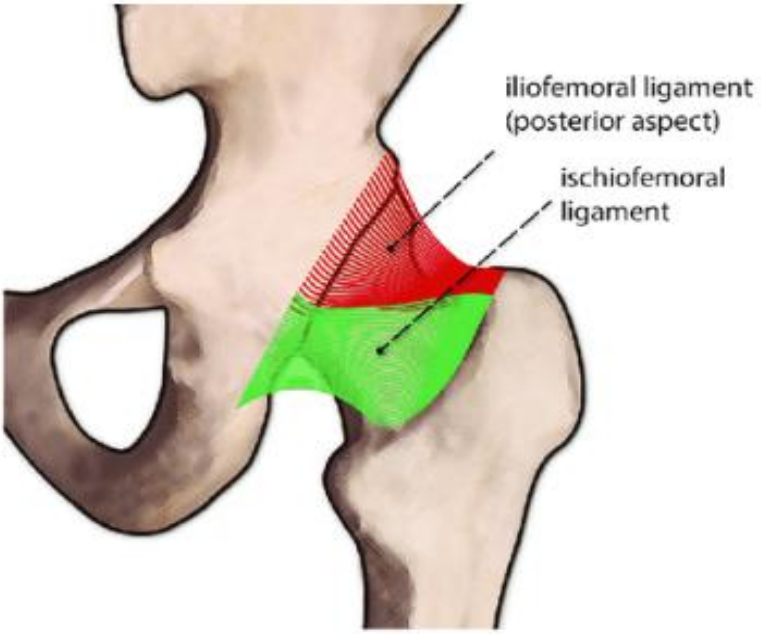


Figure 5. The ischiofemoral ligament of the hip

NERVE SUPPLY TO HIP JOINT

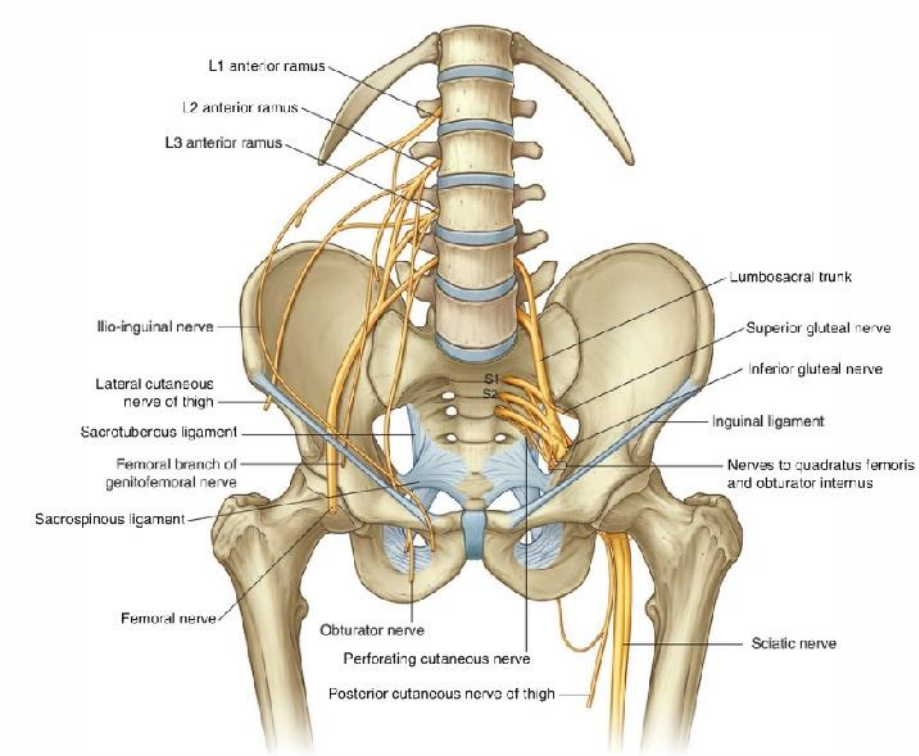


Figure 6: Nerve supply to hip joint

FEMORAL NERVE[18]: The root value of the femoral nerve is l2 to l4 of anterior rami. Femoral nerve innervates

1. Anterior compartment of the thigh
2. Iliacus and pectineus muscles
3. Skin on the front of the thigh

OBTURATOR NERVE: root value L2 to L4. It innervates

1. All the muscles of medial side of thigh leaving adductor magnus and pectineus muscles
2. Obturator externus
3. Skin over the inner aspect of the upper part of thigh.

SCIATIC NERVE: originates from l4 to S3 of anterior rami. It innervates

1. All the posterior thigh muscles
2. Ischium origin of adductor magnus
3. Foot and leg muscles
4. Cutaneous supply to the lateral side of leg and foot.[7]

GLUTEAL NERVES

THE SUPERIOR GLUTEAL nerve root value is L4 to S1. Innervates

1. Gluteus medius and minimus muscle
2. Tensor fascia latae

THE INFERIOR GLUTEAL NERVE originates from L5 to S2. Innervates gluteus maximus

ILLIO-INGUINAL NERVE: root value L1

Supplies skin on inner area of the upper part of thigh along with neighbouring parts of the perineum.

THE GENITOFEMORAL NERVE originates from L1 to L2 and innervates skin on the upper middle aspect of front of thigh.

LATERAL CUTANEOUS NERVE OF THE THIGH originates from L2 and L3 and innervates the lateral side of the thigh.

THE NERVE TO QUADRATOUS FEMORIS originates from L4 to S1. It supplies gemellus inferior and quadrates femoris muscle.

NERVE TO OBTURATOR INTERNUS root value is L5 to S2 and supplies gemellus superior muscle.

POSTERIOR CUTANEOUS NERVE OF THE THIGH originates from S1 to S3 and innervates

1. Skin on the dorsal part of the thigh
2. The skin on the gluteal folds, on the upper central aspect of the thigh and around perineum.

PERFORATING CUTANEOUS NERVE small sensory nerves originate from S2 and S3 and innervate medial aspect of the gluteal fold.[7]

SENSORY NERVE SUPPLY TO HIP JOINT

Basically, the hip joint capsule has two sensory innervations i.e. anterior innervation and posterior innervation. Anterior innervation is mainly by articular branches of the femoral nerve and obtutrator nerve for the anterior part of the capsule. Femoral nerve innervates anterior aspect and anterolateral capsule attached in the hip joint. Anteromedial capsule receives nerve supply from obturator nerve.[19]

The posterior innervations are mainly by the sciatic nerve, nerve to quadrates femoris muscle and superior gluteal nerve. The nerve to quadrates femoris muscle supplies the posteroinferior part of the capsule. Posterolateral aspect of capsule attached to the hip joint is supplied by superior gluteal nerve. The posterosuperior aspect of capsule receives directly from sciatic nerve.[19]

VASCULAR SUPPLY

There are many sources supplying blood to the hip joint. Three arteries mainly supply acetabulum: obturator, superior gluteal and inferior gluteal. The superior and posterior part of the acetabulum is supplied by the superior gluteal artery. The inferior and posterior part of the acetabulum is supplied by inferior gluteal artery. The obturator artery supplies the inner aspect part of acetabulum from its acetabular branch.[16] The foveal artery which is a small branch of the posterior division of the obturator artery, supplies a part of the femoral head around the fovea artery, tranversing through ligamentum teres.[17] Highly vascularized loose connective tissue occupies the recess between capsule and labrum. Labeal substance and long labrum bone junction is supplied by small arteries in circular pattern.[13]

The lateral femoral circumflex artery and medial femoral circumflex artery forms the extracapsular arterial ring anteriorly and posteriorly. Gluteal arteries have a small contribution to this ring. Ascending cervical branches arise from the extracapsular arterial ring. At the intertrochanteric line, anteriorly they pass through the hip joint capsule, and posteriorly they pass under orbicularis fibers of capsule. Retinacular vessels are the branches of ascending cervical artery, which passes in to femoral head from the neck of femur, described initially by weitbrecht.[13, 20]

Fracture of neck of femur causes damage to the retinacular vessels. Metaphysis of neck of femur receives blood supply from ascending cervical arteries. In addition, metaphysis may also receive blood supply from extra capsular arterial ring, bracnches of superior nutrient artery, branches of retinacular arteries and subsynovial intra capsular artery. Communication exist between metaphysical and epiphyseal small vessels only in case of adults.[13, 21]

The ascending cervical artery has four groups based on the relation to the neck of femur i.e. anterior, posterior, medial and lateral. Lateral group provides the highest percentage of blood to neck and head of femur. Chung named subsynovial intra capsular arterial ring, which is formed at the border of articular cartilage. Epiphysial arteries originate from subsynovial vessels and supply the femoral head. Break in continuity of lateral epiphysial vessels, which usually occurs in neck of femur fracture can result in high chances of developing AVN femoral head, confirmed by Claffey.[22]

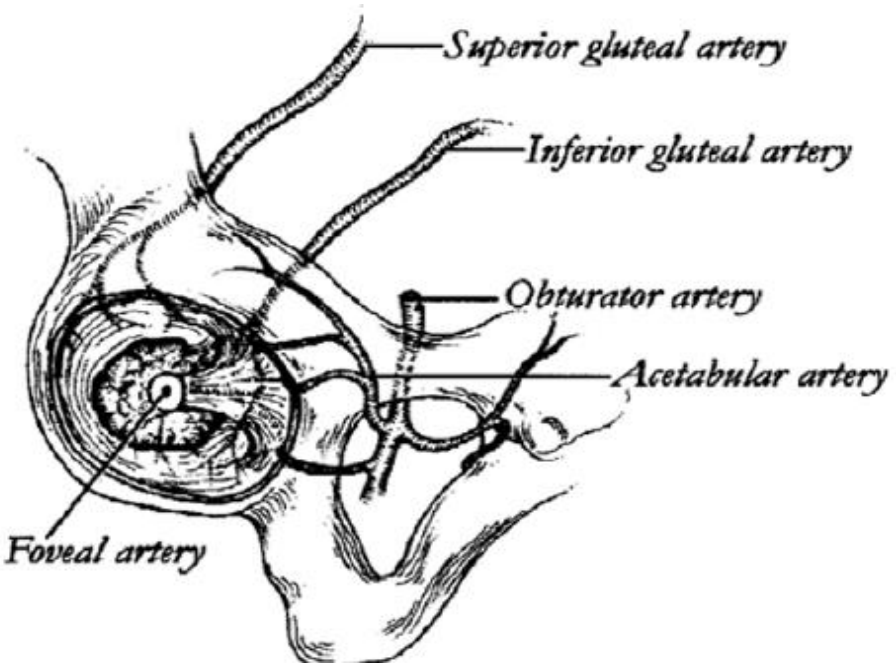


Figure 7. The blood supply to the acetabulum

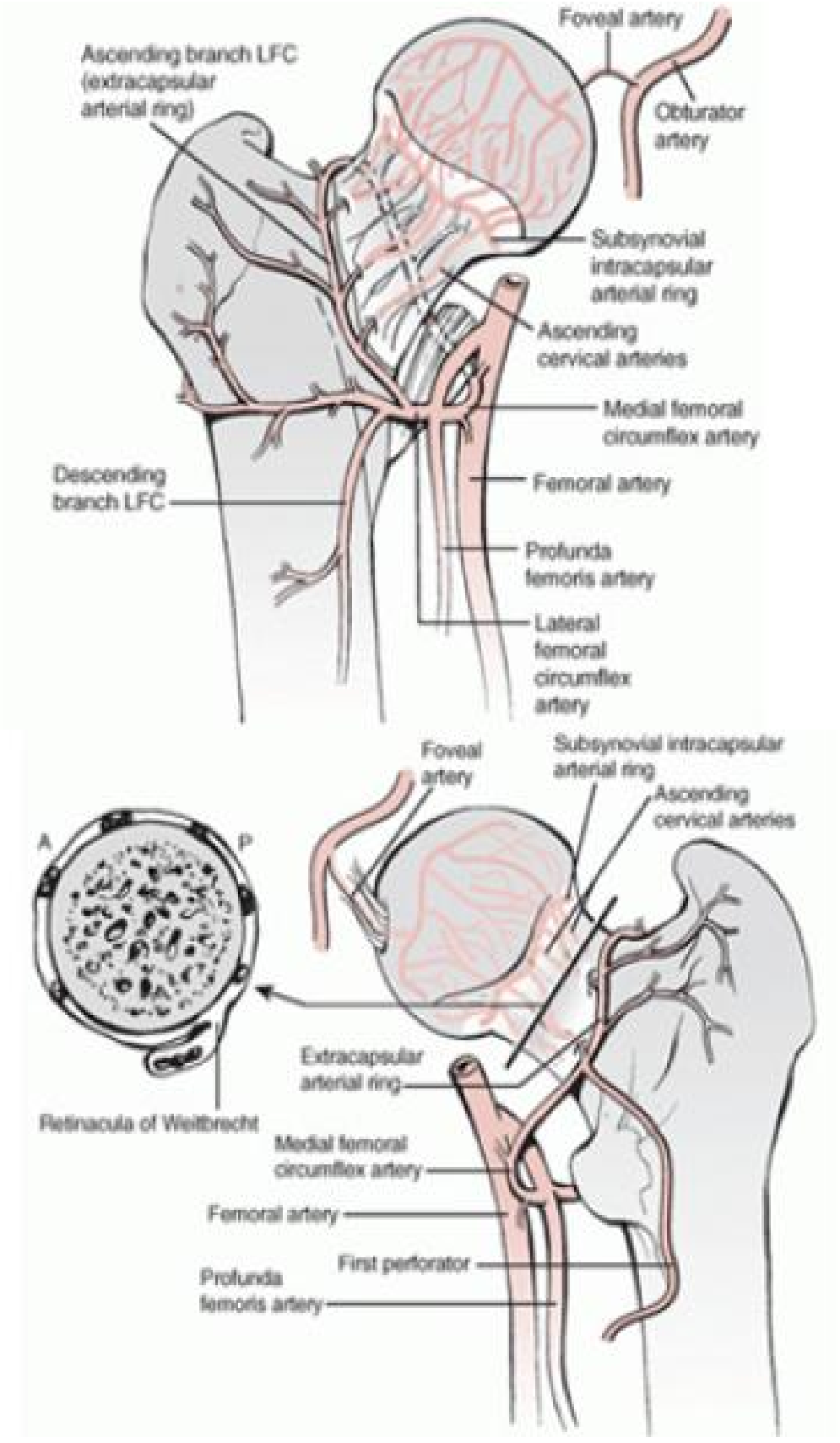


Figure 8. Proximal femur blood supply

MUSCULAR ANATOMY

The anatomy of hip allows a wide range of movement in every direction, requiring an enormous number of controlling muscles that provide stability. The 22 muscles following up on the hip joint add to soundness and give the powers required to hip development.

The solid life structures of the hip joint can be clarified from various perspectives. Classified in to 3 groups.

- Inner hip muscles
- Outer hip muscles
- Adductor group muscles[23]

They can also be separated into their fundamental activities over the hip joint.[13, 24]

MOVEMENTS OF HIP JOINT

- Flexion-extension
- Adduction-abduction
- Medial and lateral rotation
- Circumduction [25]

MUSCLES PRODUCING MOVEMENTS

FLEXION

Primary muscles:	Psoas major
	Iliacus
Assisting muscles:	Pectineus
	Rectus femoris
	Sartorius

EXTENSION

Gluteus maximus

Hamstring muscles

ABDUCTION

Primary muscles:	Gluteus medius
	Gluteus minimus
Assisting muscles:	Tensor fascia latae
	Sartorius.

ADDUCTION

Primary muscles:	Adductor longus
	Adductor brevis
	Adductor magnus.
Assisting muscles:	Pectineus
	Gracilis muscles.

MEDIAL ROTATION

Primary muscles:	Tensor fascia latae
	Anterior fibers of gluteus minimus and medius.

LATERAL ROTATION:

Primary muscles:	Obturator muscles
	Superior and inferior gemelli
	Quadratus femoris.
Assisting muscles:	Piriformis
	Gluteus maximus
	Sartorius[25]

DIAGNOSIS PROCEDURE

A total physical assessment ought to be done. Examination of gait reveals leg-length disparity, hip weakness, neurological status, coordination issues. Assessment of the skin condition and distal neuro-vascular deficit is a must. Specific consideration ought to be paid to the evaluation of the hip abductors during gait to asess strength. A careful assessment of the spine for deformity or ankylosing spondylitis may reveal pelvic obliquity, which should be taken into consideration for implant positioning.[26]

Neurological examination should incorporate the examination of strength and sensation of specific nerve roots, which help in correlating with preoperative changes.[26]

Evaluation of bilateral hip joint and same sided knee may reveal joint pathology bringing about unusual mechanics and increased forces related to the hip symptoms, Leg length should be measured for true and apparent shorting.[26]

Routine blood investigation along with Erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels are must, to exclude infection.[27]

First investigation to be considered is plan radiographs . If indicated spine and knee radiographs have to be ordered. Minimal views required are the AP projection of pelvis with bilateral hips.[27]

Computed tomography scans help in assessing the acetabulum in complex cases.[27]

Nuclear medicine scan is helpful in the diagnosis of infection, these are

- Technetium 99
- Gallium, Indium-111 labeled (WBC)
- Sulphur colloid bone marrow
- Scintigraphic athrography
- Indium-labelled WBC scan

INDICATIONS FOR A TOTAL HIP REPLACEMENT[27]

1) Inflammatory arthritis
    - Rheumatoid
    - Juvenile idiopathic
    - Ankylosing spondylitis
2) Osteoarthritis
    - Primary
    - Secondary
    - Developmental dysplasia of the hip
    - Coxa plana
    - Posttraumatic
    - Slipped capital femoral epiphysis
    - Pagets disease
    - Haemophilia
3) Osteonecrosis
    - Idiopathic
    - Post fracture
    - Dislocation
    - Alcoholism

- Hemoglobinopathies
- Lupus
- Renal disease
- Cassion disease
- Gaucher disease
- slipped capital femoral epiphysis

4) Failed reconstruction

- Osteotomy
- Hemiarthroplasty
- Resection arthroplasty
- Resurfacing arthroplasty

CONTRAINDICATION[27]

1) Absolute

- Active infection in hip joint
- Unstable medical illness that would significantly increase the risk of morbidity and mortality
- Neurological joint

2) Relative

- Morbid obesity
- Sever dementia
- Tobacco use
- Severe osteoporosis
- Untreated skin condition such as psoriasis
- Relative insufficiency of the abductor mechanism

COMPLICATIONS OF THA[27]

- Mortality
- Hematoma formation
- Heterotrophic ossification
- Thromboembolism
- Neurological injuries
- Vascular injuries
- Limb length discrepancy
- Dislocation
- Fractures
- Infections

DEFINITION OF PAIN[28, 29]

Pain is an extraordinarily complex sensation which is difficult to define and equally difficult to measure in an accurate objective manner. It has been variously defined as: "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damages. Pain is a complex constellation of unpleasant sensory, perceptual, and emotional experiences with associated autonomic physiological and behavioral responses". Pain can be represented as a venn diagram

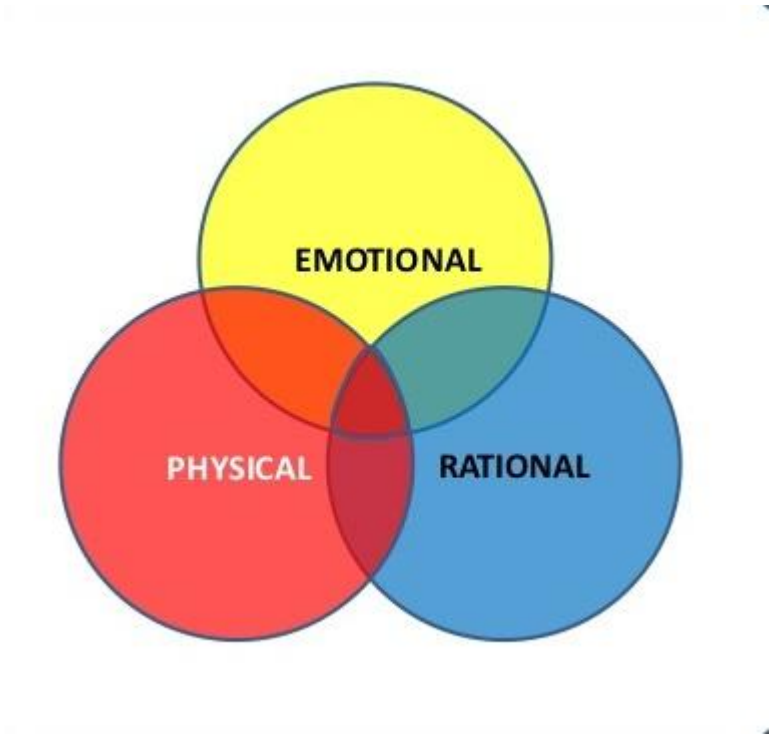


Figure 9: Pain represented as Venn diagram

This shows that sensation of pain differs among individual patients

Emotional – varies according to patient's psychological composition.

Rational – varies with patient's previous experience, insight and motivation.

Physical – varies with type and site of surgery.

Postoperative pain is for a shorter duration of time, which improves gradually over the period.

All pain perception depends upon transmission of impulses through pathways within the nervous system from the site of stimulus to the higher centers of the brain; they may impinge upon our consciousness and be interpreted.

- Receptors in the skin and other organ
- Peripheral nerves
- Neuronal aggregates in the spinal cord and associated fiber tracts
- The brainstem and thalamus
- The cerebral cortex
- Other parts of the brain indirectly involved

ACUTE POST OPERATIVE PAIN

The International Association for the Study of Pain (IASP) defines pain as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage".[30]

Factors that modify postoperative pain

a. The site, nature and duration of surgery
b. The type and extent of the incision and the surgical trauma
c. The physiologic and psychological makeup of the patient
d. Presence of complications related to surgery
e. Preoperative psychological, physiologic and pharmacologic preparation of the patient
f. The anaesthetic management before, during and after surgery
g. The quality of post operative care.[31]

MANAGENT OF PAIN

The common methods adopted for giving postoperative pain relief are

BY INCREASING THE PAIN THRESHOLD

PHARMACOLOGIC

a. Centrally acting analgesics
b. Peripherally acting analgesics

NON PHARMACOLOGIC

a. Counselling
b. Hypnosis

BY MODULATING PAIN PATHWAY

a. Transcutaneous electrical nerve stimulation
b. Acupuncture
c. Cryotherapy
d. Heat therapy

BY INTERRUPTING NOCICEPTIVE PATHWAY

a. Nerve blocks and neurolysis
b. Surgical ablation – Cryoanalgesia

METHODS OF PAIN MEASUREMENT[32, 33, 34]

One cannot determine for the individual patient how much nociception occurs in response to tissue damage for which we have to rely on the expression of the patient to accurately measure the subjective nature of pain.

University of Washington put forward a multifaceted model. The core of the model is the immediate nociception resulting from tissue damage. The next layer is the human experience of the emotional and sensory components integrated pain which is not available for direct inspection. Pain leads to suffering and suffering leads to painful behaviors which are available in the form of:

a. Withdrawal
b. Grimacing
c. Crying
d. Asking for analgesics

Thus if one relied on the patient's report of pain it is possible to measure pain intensity and the response to analgesic medications.

INTROSPECTIVE METHOD

Patient or trained attendee attempts to assess pain

BEHAVIOURISE METHOD

Some physical parameters which get altered in the presence of pain the objectively measured and correlated with the severity of pain e.g. like tachycardia, tachypnoea and increased blood pressure.

PAIN AS A SELF REPORT ON A SINGLE DIMENSION

NUMERIC RATING SCALE (NRS) – here patients are asked o indicate how strong their pain is on a scale from 0 to 10 on which 0 represents "no pain at all" and 10 "the worst pain imaginable"[32]

VISUAL ANALOG SCALE (VAS) – Currently, the most commonly used method; first described by ATIKEN is 1966. The subject makes a mark on a 10cms line – horizontal or vertical, one end of which is marked as 'No pain" and the other as "The worst pain one can imagine". The position of the mark on the line measures how much pain the subject experiences.[33]

ORAL ANALOG SCALE (OAS) – First put forward by AUSTIN et. Al. It is a simple and clinically relevant rating system scheme. Absence of pain, presence of pain, and if the patient desired more analgesics are rated 0, 1 and 2 respectively. This rating is simple, yet addresses the essence of problem for the patient whether pain present and if it is, does the patient desire more pain relief with more analgesic medications.[34]

LOCAL INFILTRATION ANALGEASIA

ROPIVACAINE:

A newer form of bupivacine, which is long acting with cardio toxicity. It blocks A and C fibers more than AB fibers, which helps in releaving pain. Ropivivane is Lower lipid soluble, which decreases the percentage of penetration in to myelinated motor fibers than the sensory fibers. It is widely used for postoperative and labour pain.[35]

CLONIDINE

It is an imidazoline derivative with complex actions. Clonidine is a partial agonist with high affinity and high intrinsic activity at alpha 2, especially alpha 2A. Clonidine is well absorbed orally. Half life is 8 to 12 hrs. Used as an anti hypertensive, to withdraw from opiods, as analgesia to substitute morphine for

epidural surgical and postoperative analgesia, to control loose motion due to diabetic neuropathy.[36]

ADRENALINE

It is a direct sympathomimetic which directly acts as agonists on alpha and beta or both alpha and beta adrenoceptors. Adrenaline has vasoconstriction property which acts mainly on cutaneous vessels, mucous membrane and renal cells. Adrenaline acts on alpha1 and alpha 2 receptors and produces vasoconstriction action. Vasodilatation occurs in skeletal muscles, liver and coronaries. Arteries and capillaries are the two, where action of adrenaline is highest. At higher doses only larger arteries and veins may be affected. Adrenaline for systemic action, 0.2-0.5mg s.c, i.m is given .Its action lasts for half an hour to 2 hours. As local vasoconstrictor, 1 in 200000 to 1 in 80000 added to lidocane.[37]

KETOROLAC

This is a acetic acid derivate NSAID. It has strong affinity for analgesia than anti inflammatory function. When managing post surgical pain, it is equally productive as morphine, it does not act on opiod receptors, hence free of opiod side effects. Ketorolac acts by inhibiting PG synthesis and relives pain primarily by a peripheral mechanism. Ketorolac is rapidly absorbed after oral and i.m administration. Plasma life is 5-7 hours. It plays a handy role in controlling pain in post surgical condition for dental and acute pain in musculoskeletal surgeries. It can also be used in renal pain, severe headache and any pain in bony pathology.[38]

RANAWAT ORTHOPAEDIC CENTER (ROC) COCKTAIL[39]

Medication	Strength/dose	Amount
First injection		
Bupivacaine	0.5% (200–400 mg)	24 cc
Morphine sulphate	8 mg	0.8 cc
Epinephrine (1:1000)	300 ug	0.3 cc
Methylprednisolone		
Acetate	40 mg	1 cc
Cefuroxime	750 mg	10 cc
(reconstituted in normal saline)		
Sodium chloride	0.9%	22 cc
Second injection		
Bupivacaine	0.5%	20 cc
Sodium chloride	0.9%	20 cc

Drugs Used In Postoperative Analgesia

Opioid analgesia:

Opioids are still the drug of choice for postoperative pain treatment. Opioids bind to the central nervous system and peripheral tissues receptors and do modulate the effect of the nociceptors. Opioids are administered Oral, transdermal, parenteral, neuraxial and rectal routes. For postoperative pain, morphine, fentanyl, and

hydromorphone are the most commonly used Intravenous (IV) opioids. Morphine is an extensively used opioid. It has a faster onset of action with peak effect happening in 1–2 hours. Fentanyl and hydromorphone being the synthetic derivatives of morphine are more potent, have a shorter onset of action and half-lives, compared with morphine.[40]

Respiratory depression is the most important side-effect, which could cause hypoxia and respiratory arrest. In view of the side effect mentioned, it is always important to monitor respiration on O_2 saturation, when opiods are given in post surgical patients. The side effects of opiods are nausea, vomiting, decreased bowel motility which may lead to development of ileus and constipation.[41, 42]when opiods are taken for a long period , patients can become addictive and dependent on it .[40]

Intravenous patient-controlled analgesia:

Patient-Controlled Analgesia (PCA) pump was started to use in the early 1970s.[43, 44] Morphine, fentanyl, and hydromorphone can be administered through the PCA pump. PCA needs equipment and patient can control the medicine infused at a given time .Patient and staff, both require protocoled training, which is very important. In a study of 15 RCTs comparing IV PCA and IM administered opioid, patients favored IV PCA as they had low pain scores but increase in adverse effects.[45] Similarly, Cochrane Review comparing IV opioid PCA with IV "when required" opioid administration said that patients with IV PCA experienced less pain based on VAS scores. PCA is an effective alternative to systemic analgesic drug while treating post-operative pain.[46]

Nonopioid analgesia:

NSAIDs favours in decreasing the use of opioids and also side adverse effects.[47]NSAIDs acts on cycloxygenase(COX) and inhibits it, then block the formation of prostaglandins and then exhibit anti-inflammatory response.

NSAIDs are two types of COX-1 and COX-2. NSAIDS have to be selectively used based on each patient, for the reason of its side effects i.e. increased bleeding. In recent literature, COX-1 inhibitor is preferred over COX-2 inhibitors, as COX-2 it is associated with cardiac problems.[48,49,50]

Ketorolac is a new NSAID; it has strong affinity for analgesia than anti inflammatory function. It has been extensively used in postoperative analgesia both the sole agent and to supplement opioid analgesics. The usual dose is 30 mg given IV.[50, 51, 52]

Acetaminophen is a centrally acting drug, does not exhibit its anti-inflammatory effect in the periphery. Basically, used to control pain. Acetaminophen should not be used more than 4000mg per day as it may result in hepatotoxicity. One good thing is it can be used over NSAIDS as it does not alter platelet function and can also be given in peptic ulcers or asthma.17

In a mixed trial comparative study resulted in "reduced morphine use in 24 hours, when paracetamol, NSAIDs, or COX-2 inhibitors were given in addition to PCA morphine after surgery with decreased morphine related side effects"[53] A systematic review of 21 studies concluded that paracetamol, when used with NSAIDs, had better efficacy than using paracetamol alone.

METHODOLOGY

This study was conducted to know the efficacy of Local Infiltration Analgesia (LIA) following Total Hip Replacement (THR) based on postoperative outcomes like analgesia score, mobilization and hospital stay.

STUDY DESIGN: A prospective observational study.

STUDY PERIOD AND DURATION: this study was conducted over a period of one year from January 2018 to December 2018

PLACE: This study was carried out in the Department of orthopedics, KLES Dr.Prabhakar Kore Hospital and Medical Research Centre, Belgaum attached to KLE University's Jawaharlal Nehru medical college, Belgaum

SOURCE OF DATA: Patients admitted for Total Hip replacement under the Department of orthopedics, KLES Dr.Prabhakar Kore Hospital and Medical Research Centre, Belgaum attached to KLE University's Jawaharlal Nehru medical college, Belgaum

SAMPLE SIZE: Thirty patients of both genders were included in our study.

SAMPLE SIZE: Patient admitted for Total hip replacement under the department of orthopaedics, KLES Dr.Prabhakar Kore Hospital and Medical Research Centre, Belgaum was studied.

Was estimated based on the Highest pain score at rest as outcome under Local infiltration as 8 ± 5.62 (Obtained from Median Pain score at 24 to 48 hrs at 8 (0 – 22.5 IQR) from the PhD thesis by Karen Vestergård Andersen et al. Considering SD of

5.62, at 2% alpha error and at 95% Confidence level sample size of 30 was obtained and will be included in the study.

Z = at 5%

Alpha error =1.96

SD = 5.62

d= 2% error

$$\text{Sample size} = \frac{Z_{1-\alpha/2}{}^2 SD^2}{d^2}$$

$Z_{1-\alpha/2}$ = Is standard normal variate as mentioned in previous section.
SD = Standard deviation of variable. Value of standard deviation can be taken from previously done study or through pilot study.
d = Absolute error or precision as mentioned in previous section

SELECTION CRITERIA:

Inclusion criteria:

- Patients of all age groups operated for total hip replacement.

Exclusion criteria:

- Traumatic etiology
- Contraindication to spinal anesthesia
- Chronic pain
- Intolerance to study drugs
- Bleeding disorders
- Serious asthma and others

ETHICAL CLEARANCE:

The study was approved by Ethical and Research Committee, JNMC Belgaum prior to commencement

METHOD OF COLLECTION OF DATA:

Demographic data such as age, sex and history was obtained through an interview. These patients were further subjected to clinical examination and the findings such as type and extent were noted on a predesigned and pretested Performa (Annexure 2)

LOCAL INFILTRATION ANALGESIA

COCKTAIL IN TOTAL HIP REPLACEMENT	**UNILATERAL**	**BILATERAL**
INJ. ROPIVICANE 0.75	40 ml	50 ml
INJ. CLONIDINE	0.6ml	0.8 ml
INJ. ADRENALINE	0.3ml	0.3 ml
INJ. KETOROLAC	1 ml	2 ml
NORMAL SALINE	18 ml	64 ml
TOTAL	60 ml	120 ml

TOTAL HIP REPLACEMENT PROCEDURE

The patient put in lateral position on the table under spinal anesthesia. Parts scrubbed, painted and draped under aseptic precautions. A 10 cm incision taken through the Hardinge approach, i.e., longitudinal incision over the greater trochanter over the skin. Then fascia latae split along the line of incision. TFL retracted medially and gluteus maximus laterally, revealing the starting point of vastus lateralis and the gluteus medius. Oblique incision taken over gluteus medius over the GT, without disturbing the posterior half, which is attached to GT. Later the incision is extended proximally along the fibers of gluteus medius. Distally, the incison is extended along the fibers of vastus lateralis over the antero lateral surface of the femur. The tendinous insertions of the anterior portions of the gluteus minimus and vastus lateralis muscles elevated. Abducting the thigh reveals of the anterior capsule of the hip joint.[54] Capsule incised.

The femoral is head dislocated by adducting the hip and flexing the knee joint to 90 degrees. Osteotomy of the femoral head done and excised after which acetabular rimming is done and confirmed by trial implant. Acetabular cup with a liner placed in the posterior superior position.

Local infiltration analgesia 20mL injected around the rim of the acetabulum, joint capsule and in to the gluteal and adductor muscles.[55]

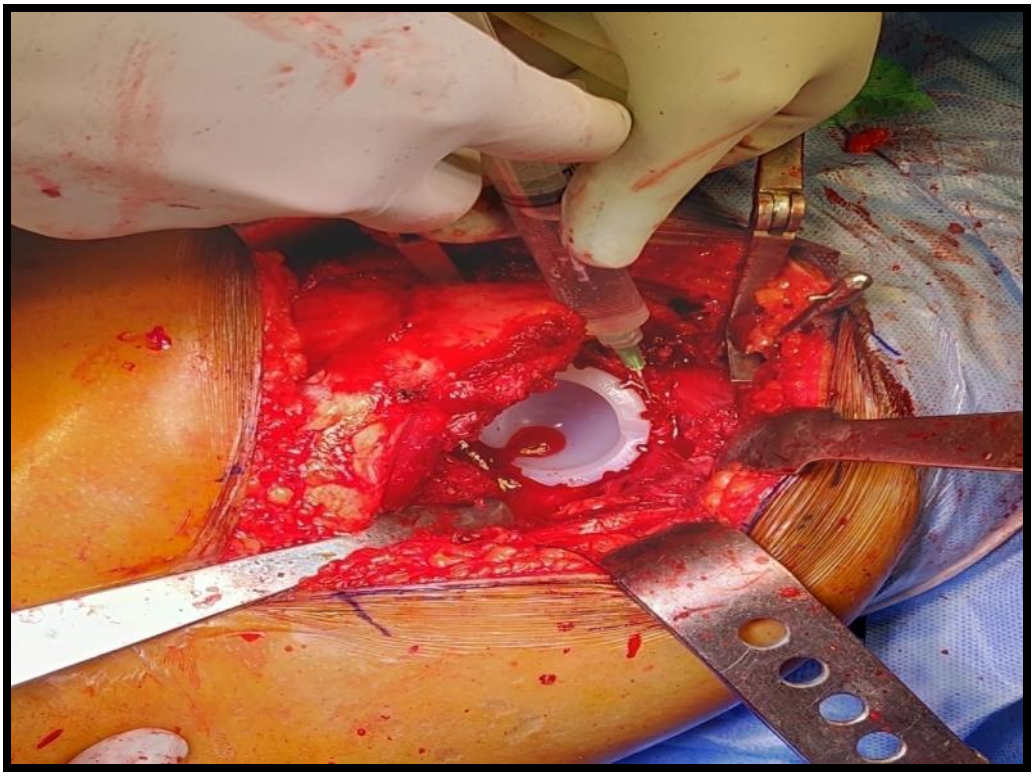


Figure 10. :Infiltration into the tissues around the rim of the acetabulum

The femoral canal reammed and an appropriate stem placed after the trail. Femoral stem reduced into acetabulum by abducting and applying traction to the operated limb.

Local infiltration analgesia 20 mL injected around the gluteal tendon, external rotators, and iliotibial band. [55]

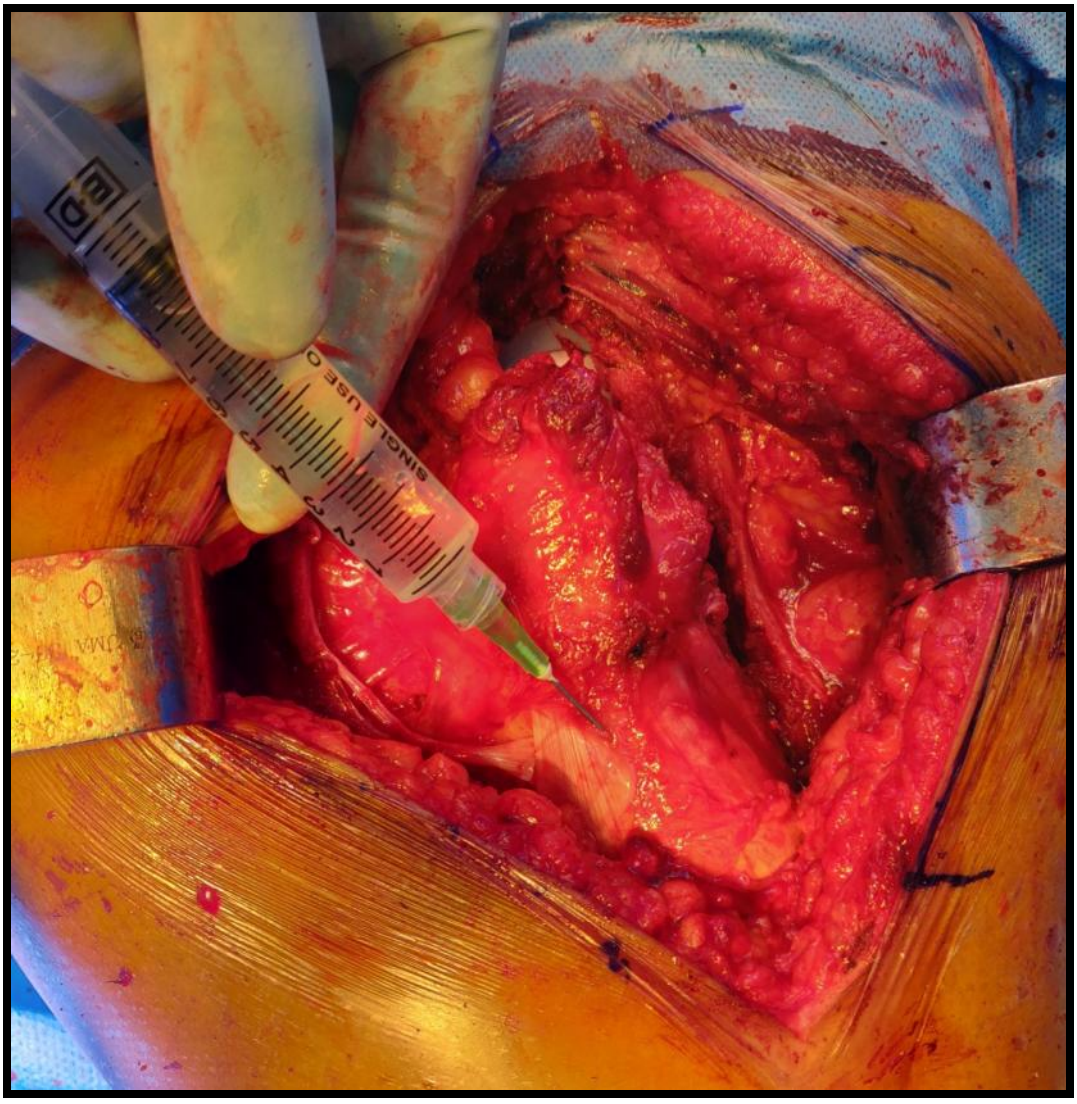


Figure 11. Infiltration into the iliotibial band

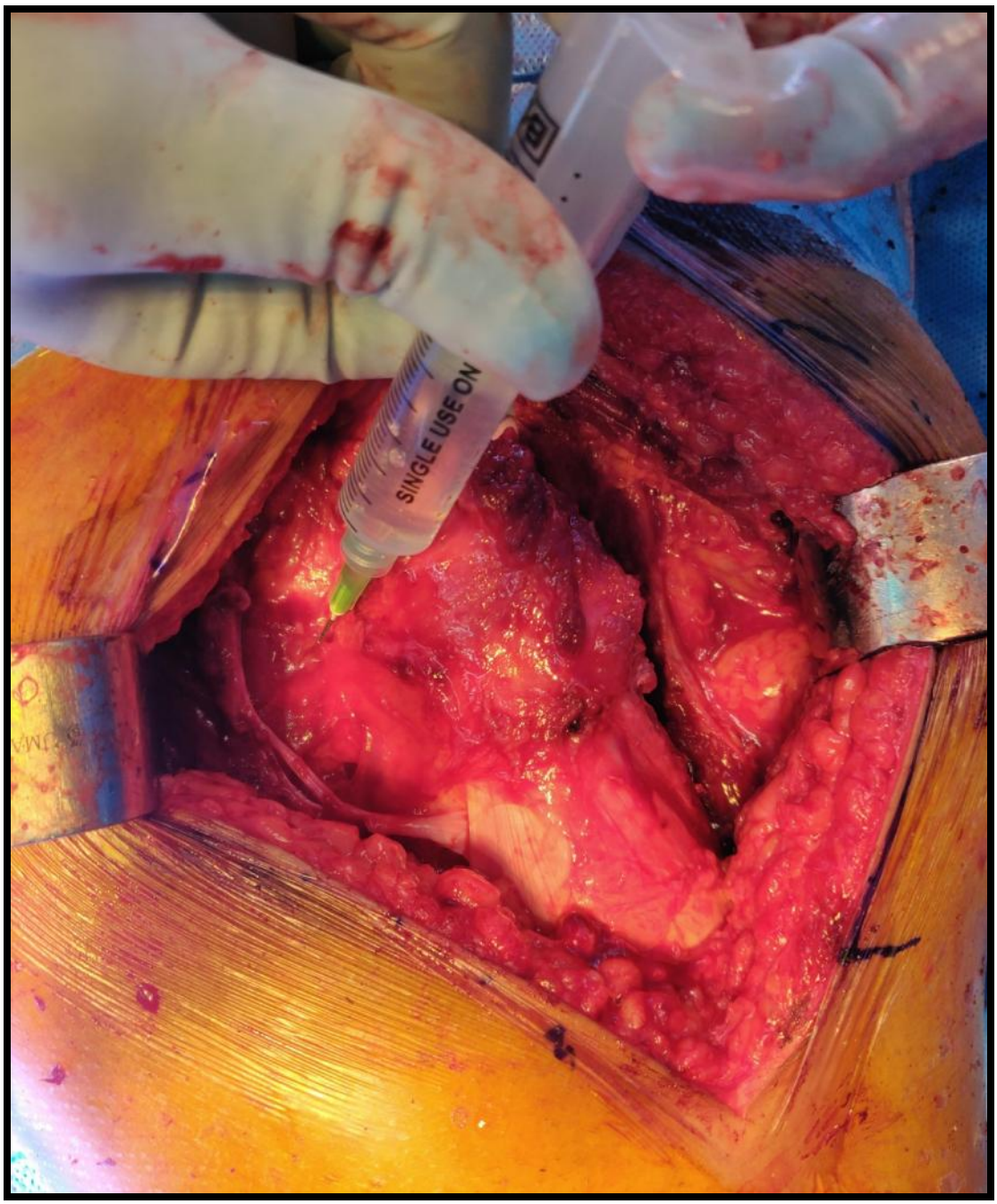


Figure 12. Infiltration into the gluteal tendon and external rotators

A thorough wash was given. Suturing of the capsule, followed by the gluteus medius and then the gluteus maximus has done.

Local infiltration analgesia 20 mL injected into the subcutaneous before the closure of the skin. [55]

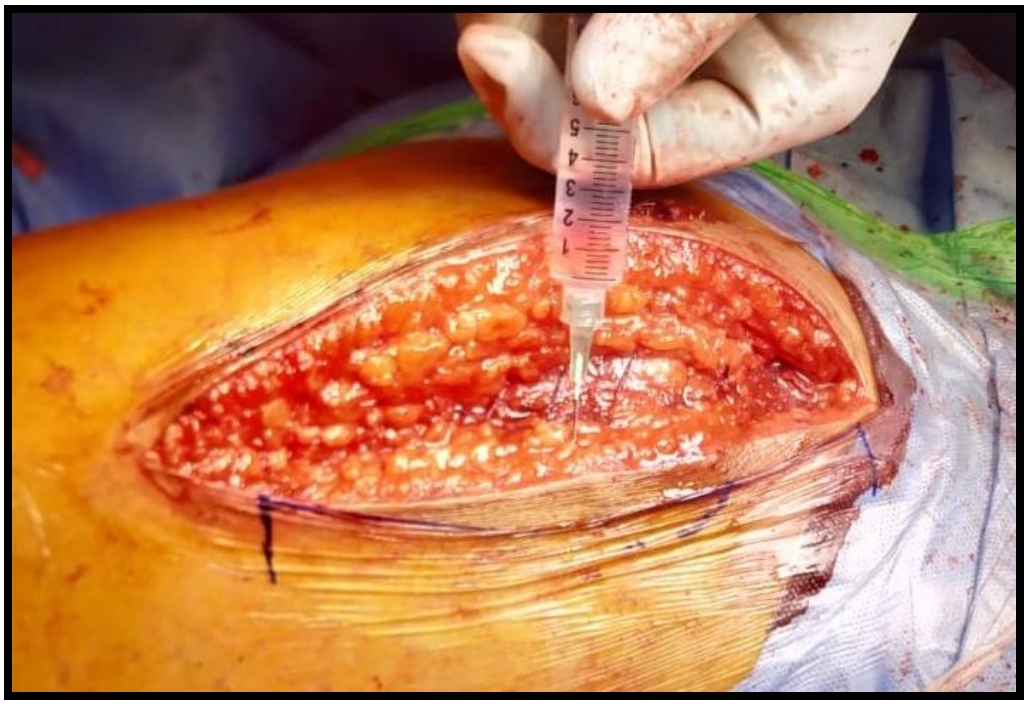
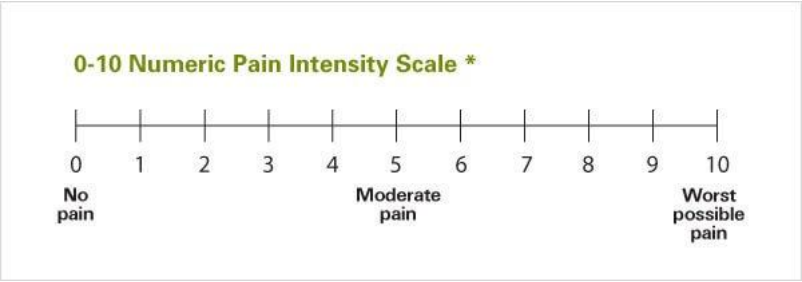


Figure 13. Infiltration into the subcutaneous tissue

ASSESSEMENT OF POST OPERATIVE PAIN

The assessment of pain at rest and movements was based on visual analogue score (VAS) from 0 to 10 at 6th hour interval for first 24hrs post operatively.



RATING	PAIN LEVEL
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)

ADLS: ACTIVITIES OF DAILY LIVING

Assessment of mobilization postoperatively for 10 steps was considered to be 1st walk

Assessment of stay in hospital was based on number of days in hospital postoperatively

STATISTICAL METHODS:

Data were entered into Microsoft excel data sheet and analyzed using SPSS 22 version software. Categorical data represented in the form of frequencies and proportions. Chi-square used as test of significance. Continuous data represented as mean and standard deviation. For qualitative data, median and interquartile ranges were estimated. Independent t-test used as a test of significance to identify the mean difference between two groups. p value <0.05 was considered as statistically significant.

RESULTS

Thirty patients were included in the study, and the observations of these patients were compiled and analyzed.

Age-wise distribution of study subjects:

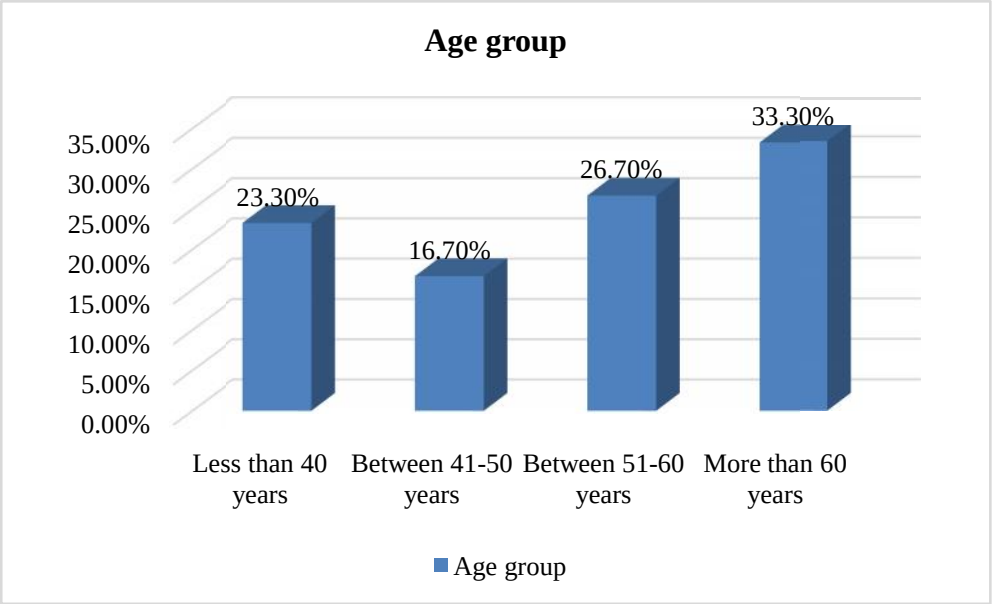
The age of patients ranged from less than 40 to more than 60 years.

The patients in the study were divided into 4 age groups, viz., less than 40 years, between 41 and 50 years, between 51 and 60 years and more than 60 years. There were7 patients (23.3%) in <40 years age group, 5 (16.7%) in between 41 and 50 years age group, 8 (26.7%) in between 51 and 60 years age group and10 (33.3%) in >60 years of age group as shown in Table 1, Figure14. Higher incidence of patients was seen in between 51 and 60 years and >60 years with 26.70% and 33.30%, respectively.

Table 1. Age-wise distribution

		Frequency	%
Age Group	Less than 40 years	7	23.3%
	Between 41–50 years	5	16.7%
	Between 51–60 years	8	26.7%
	More than 60 years	10	33.3%

Graph 1.Age-wise distribution



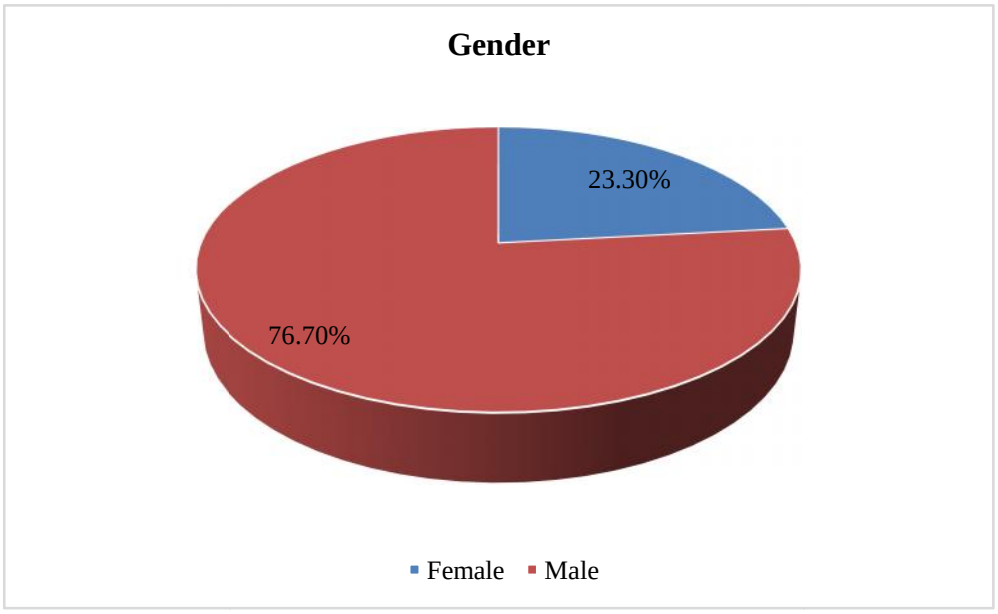
Gender-wise distribution of study subjects:

Among 30 patients included in the study, 23 (76.7%) were male and 7 (23.3%) were female.

Table 2. Gender-wise distribution

		Frequency	%
Gender	Female	7	23.3%
	Male	23	76.7%

Graph 2 .Gender-wise distribution



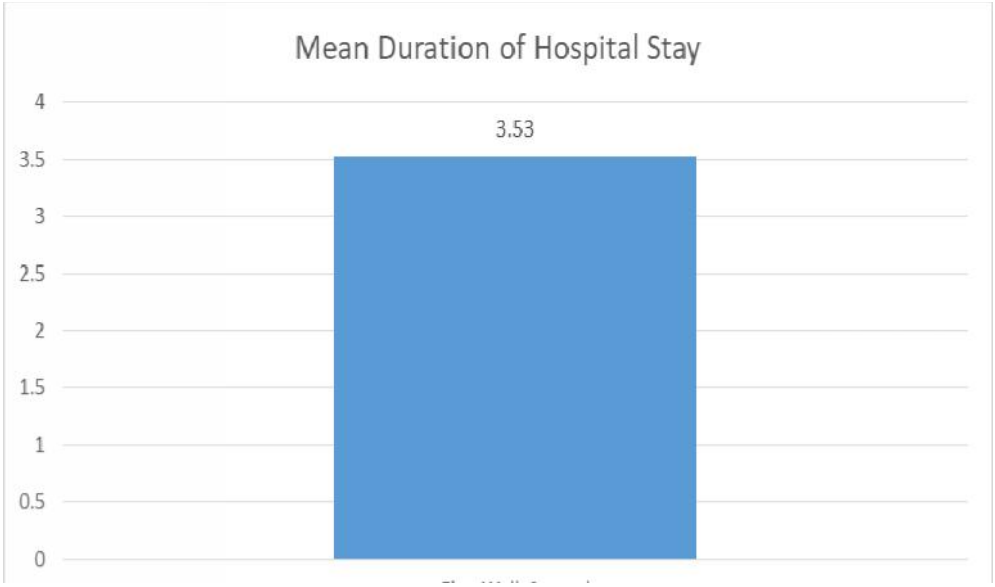
Mean duration of hospital stay:

Of total 30 patients included in the study, the mean duration of hospital stay was 3.53days

Table 3.Mean duration of hospital stay

	Mean	Standard Deviation
Means days of hospital stay	3.53	1.04

Graph 3.Mean duration of hospital stay



Mean time duration of starting first walk among study subjects:

Of total 30 patients included in the study, the mean time duration of starting first walk was 14.1467 hours.

Table 4.Mean time duration of starting first walk

	Mean	Standard Deviation
First walk started in minutes	14.1467	2.1279

Graph 4.Mean time duration of starting first walk

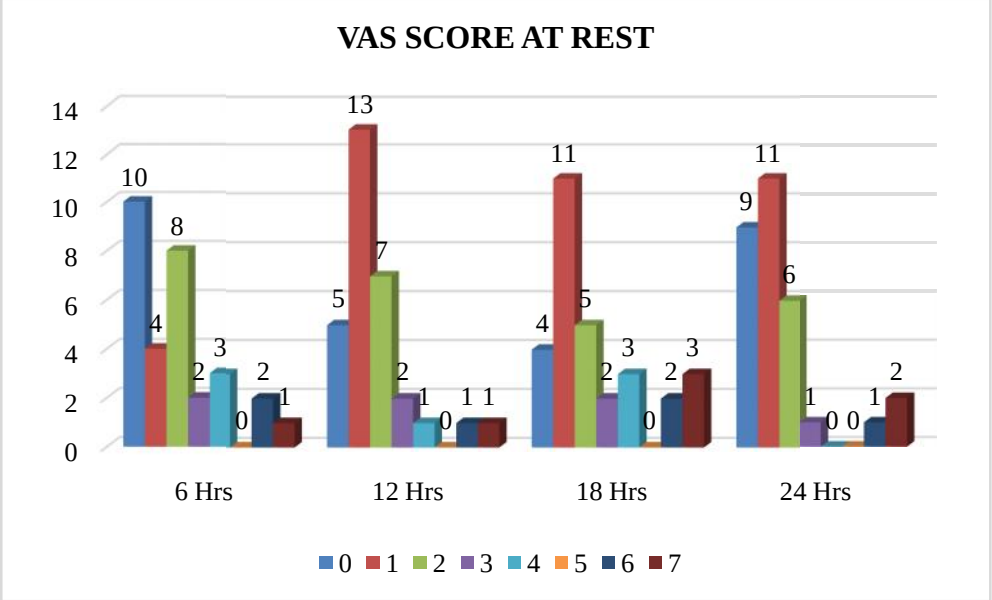
Distribution of VAS scores at rest, at 6, 12, 18 and 24 hrs:

Of total 30 patients (100%), 10 (33.3%), 5 (16.7%), 4 (13.3%) and 9 (30%) patients had no pain at 6, 12, 18, 24 hrs, respectively. VAS score 1 was seen in 4 (13.3%), 13 (43.3%), 11 (36.7%) and 11 (36.7%) patients at 6, 12, 18, 24 hrs, respectively. VAS score 2 was seen in 8 (26.7%), 7 (23.3%), 5 (16.7%) and 6 (20.0%) patients at 6, 12, 18, 24 hrs, respectively. VAS score 3 was seen in2 (6.7%), 2 (6.7%), 2 (6.7%) and 1 (3.3%) patients at 6, 12, 18, 24 hrs, respectively. VAS score 4 was seen in3 (10.0%), 1 (3.3%), 3 (10.0%) and 0 (0%) patients at 6, 12, 18, 24 hrs, respectively. VAS score 6 was seen in 2 (6.7%), 1 (3.3%), 2 (6.7%) and 1 (3.3%) patients at 6, 12, 18, 24 hrs, respectively. VAS score 7 was seen in 1 (3.3%), 1 (3.3%), 3 (10.0) and 2 (6.7%) patients at 6, 12, 18, 24 hrs, respectively.

Table 5. Distribution of VAS score at rest,at 6,12,18 and 24 hrs

VAS Score Rest		@ 6 Hrs		@ 12 Hrs		@ 18 Hrs		@ 24 Hrs	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
VAS Score	0	10	33.3	5	16.7	4	13.3	9	30.0
	1	4	13.3	13	43.3	11	36.7	11	36.7
	2	8	26.7	7	23.3	5	16.7	6	20.0
	3	2	6.7	2	6.7	2	6.7	1	3.3
	4	3	10.0	1	3.3	3	10.0	0	0
	5	0	0	0	0	0	0	0	0
	6	2	6.7	1	3.3	2	6.7	1	3.3
	7	1	3.3	1	3.3	3	10.0	2	6.7

Graph 5. Distribution of VAS score at rest, at 6, 12, 18 and 24 hrs



X-axis: Time in hours

Y-axis: VAS score (patients)

Table 6.Mean distribution of VAS score at rest, at 6, 12, 18 and 24hrs

VAS score at rest	Mean	Median	Standard Deviation	P value (Wilcoxon Signed Rank test)
VAS 6 hrs	2	2	2	
VAS 12 hrs	2	1	2	0.197
VAS 18 hrs	2	2	2	0.007*
VAS 24 hrs	2	1	2	0.012*

(VAS 12 *vs*. VAS 18 – p=0.002*

VAS 12 *vs*. VAS 24 – p=0.166

VAS 18 *vs*. VAS 24 – p=0.000*)

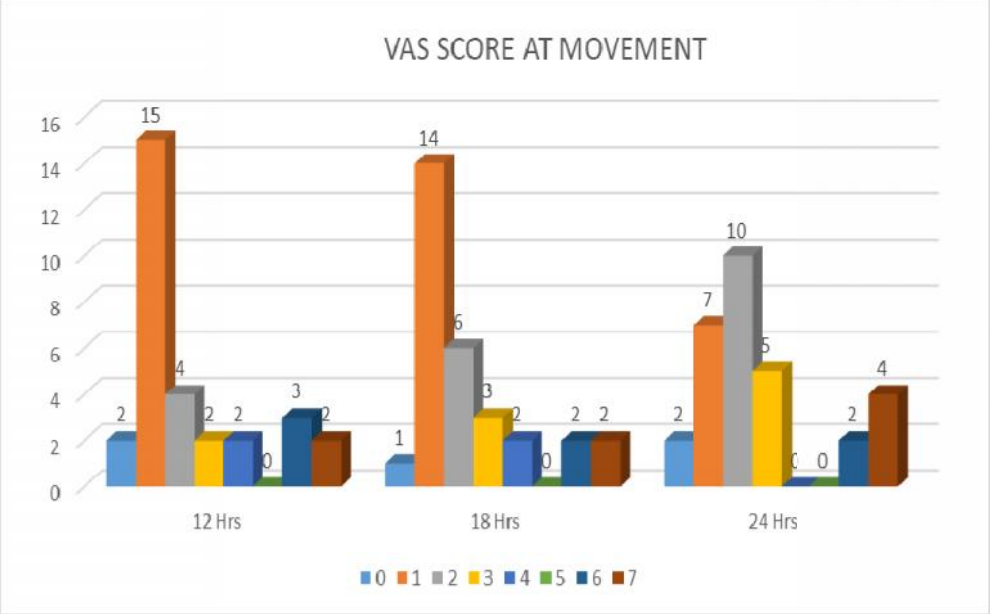
Distribution of VAS scores at movement of study subjects at 12, 18 and 24 hrs:

Of total 30 patients (100%), 2 (6.7%), 1 (3.3%) and 2 (6.7%) had no pain at 12, 18, 24 hrs, respectively. Total 15 (50.0%), 14 (46.7%) and 7 (23.3%) patients had VAS score at movement of 1 at 12, 18, 24 hrs, respectively; 4 (13.3%), 6 (20.0%) and 10 (33.3%) patients had VAS score at movement of 2 at 12, 18, 24 hrs, respectively; 2 (6.7%), 3 (10.0%) and 5 (16.7%) patients had VAS score at movement of 3 at 12, 18, 24 hrs, respectively; 2 (6.7%), 2 (6.7%) and 0 (0%) had VAS score at movement of 4 at 12, 18, 24 hrs, respectively; 3 (10.0%), 2 (6.7%) and 2 (6.7%) patients had VAS score at movement of 6 at 12, 18, 24 hrs, respectively; and 2 (6.7%), 2 (6.7%) and 4 (13.3%) patients had VAS score at movement of 7 at 12, 18, 24 hrs, respectively.

Table 7. Distribution of VAS score at movement, at 12, 18 and 24 hrs

VAS Score Movement		@ 12 Hrs		@ 18 Hrs		@ 24 Hrs	
		Frequency	%	Frequency	%	Frequency	%
VAS Score	0	2	6.7	1	3.3	2	6.7
	1	15	50.0	14	46.7	7	23.3
	2	4	13.3	6	20.0	10	33.3
	3	2	6.7	3	10.0	5	16.7
	4	2	6.7	2	6.7	0	0
	5	0	0	0	0	0	0
	6	3	10.0	2	6.7	2	6.7
	7	2	6.7	2	6.7	4	13.3

Graph 6. Distribution of VAS score at movement, at 12, 18 and 24 hrs



X-axis: Time in hours

Y-axis: VAS score (patients)

Table 8.Mean distribution of VAS Score at movement, at 6, 12, 18 and 24 hrs

VAS score movement	Mean	Median	Standard Deviation	P value (Wilcoxon Signed Rank test)
VAS 12 hrs	2	1	2	
VAS 18 hrs	2	2	2	0.739
VAS 24 hrs	3	2	2	0.003*

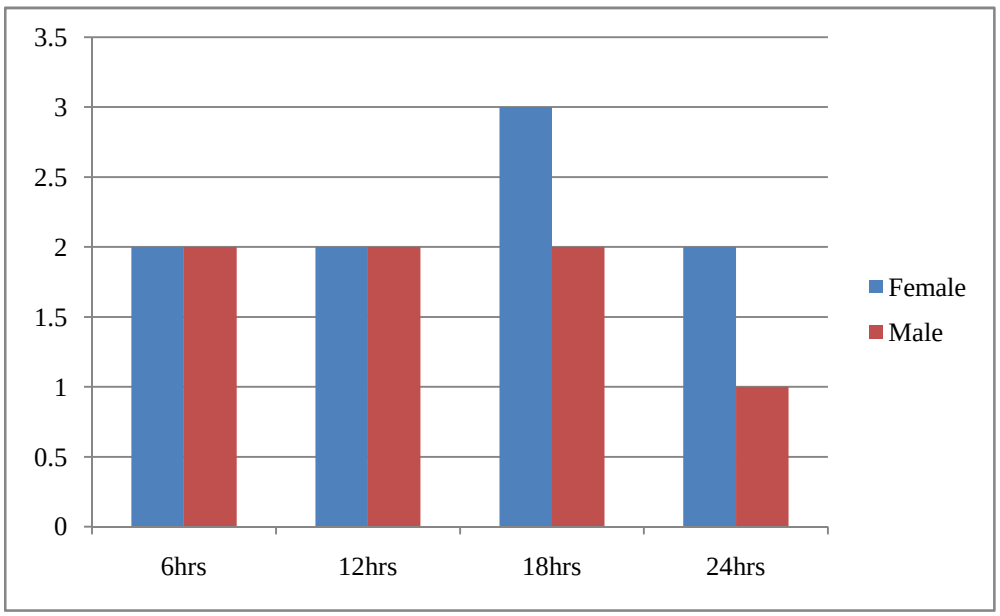
Distribution of Gender and VAS Score at rest:

Mean VAS scores at rest at 6 hrs were 2+2 for both male and female, respectively (p=0.350). Mean VAS scores at rest at 12 hrs were 2+1 and 2+2 for female and male, respectively (p=0.302). Mean VAS scores at 18 hrs were 3+2 and 2+2 for female and male, respectively (p=0.561) whereas mean VAS scores at 24 hrs were 2+2 and 1+2 for female and male, respectively (p=0.398).

Table 9.Distribution of Gender and VAS Score at rest

VAS score at rest	Gender						P value (**Mann Whitney U test)**
	Female			Male			
	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation	
VAS 6 hrs	2	2	2	2	2	2	0.350
VAS 12 hrs	2	2	1	2	1	2	0.302
VAS 18 hrs	3	2	2	2	1	2	0.561
VAS_24 hrs	2	1	2	1	1	2	0.398

Graph 7. Distribution of Gender and VAS Score at rest



X-axis: Time in hours

Y-axis: Mean VAS score at rest

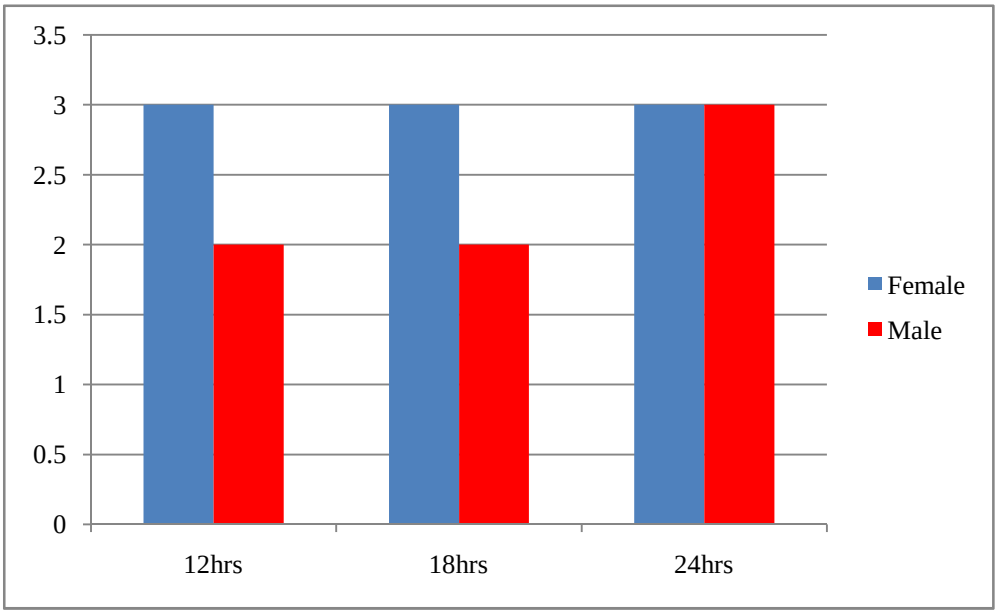
Distribution of Gender and VAS Score at movement:

Mean VAS scores at movement at 12 and 18 hrs were3+2 and 2+2 for both female and male, respectively, and their p values were p=0.431 and p=0.483. Mean VAS scores at movement at 24 hrs was 3+2 and 3+2 for female and male, respectively (p=0.391).

Table 10.Distribution of Gender and VAS Score at movement

VAS Score in Movement	Gender						P value (**Mann Whitney U test)**
	Female			Male			
	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation	
VAS 12 hrs	3	2	2	2	1	2	0.431
VAS 18 hrs	3	2	2	2	1	2	0.483
VAS24 hrs	3	2	2	3	2	2	0.391

Graph 8.Distribution of Gender and VAS Score at movement



X-axis: Time in hours

Y-axis: Mean VAS score at movement

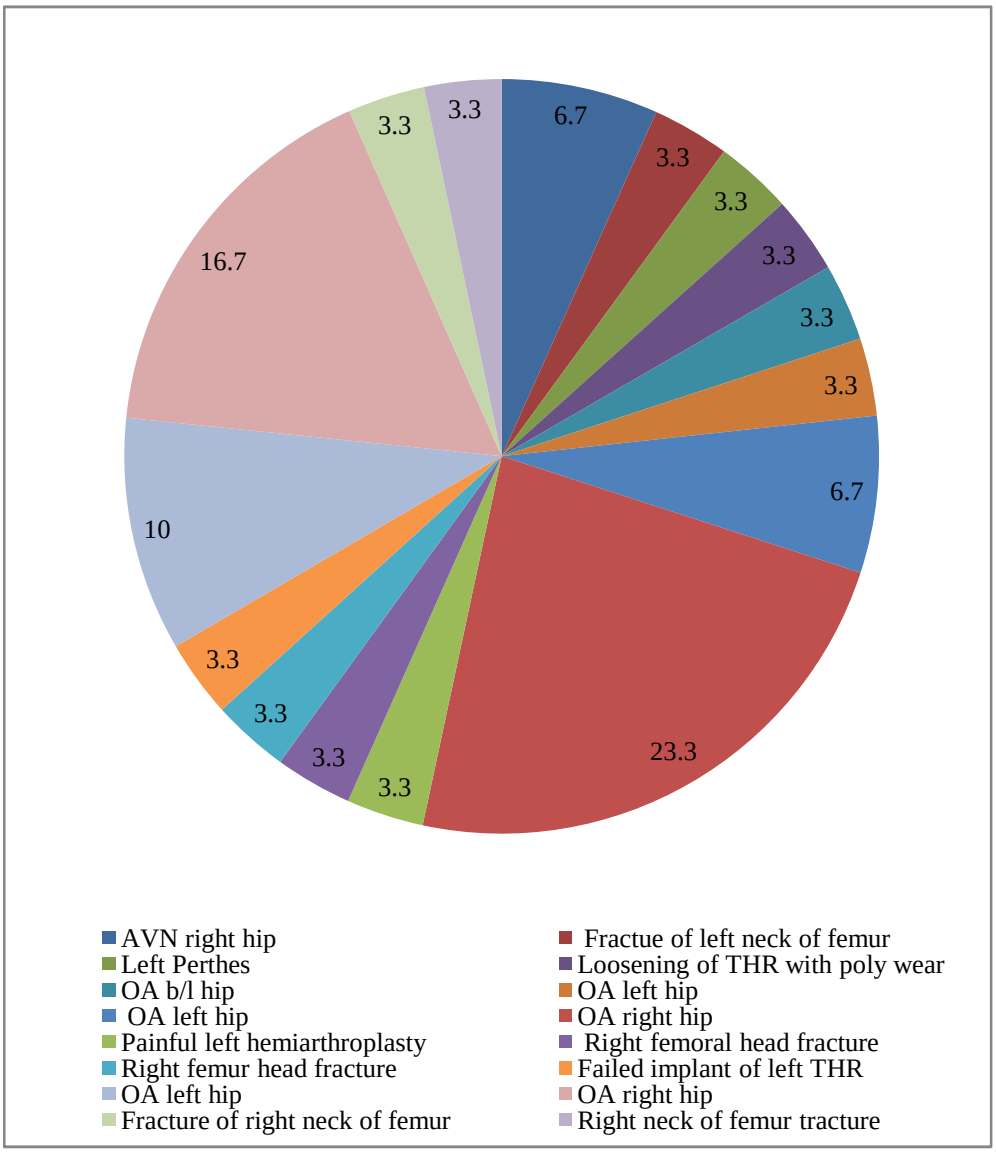
Diagnosis:

Out of 30 patients (100%), 2(6.7%) patients were diagnosed with AVN of right hip, 1 (3.3%) with fracture of left neck of the femur, 1 (3.3%) with left Perthes, 1 (3.3%) with loosening of THR with poly wear, 1 (3.3%) with OA b/l hip, 1 (3.3%) with OA of left hip, 2 (6.7%) with OA of left hip, 7 (23.3%) with OA of right hip, 1 (3.3%) with painful left hemiarthroplasty, 1 (3.3%) with right femoral head fracture, 1 (3.3%) with right femur head fracture, 1 (3.3%) with failed implant of left THR, 3 (10.0%) with OA of left hip, 5 (16.7%) with OA of right hip, 1 (3.3%) with fracture of right neck of femur and 1 (3.3%) with right neck of femur fracture.

Table 11. Diagnosis

		Count	Column N %
Diagnosis	AVN, right hip	2	6.7%
	Fracture of left neck of femur	1	3.3%
	Left Perthes	1	3.3%
	Loosening of THR with poly wear	1	3.3%
	OA b/l hip	1	3.3%
	OA left hip	1	3.3%
	OA left hip	2	6.7%
	OA right hip	7	23.3%
	Painful left hemiarthroplasty	1	3.3%
	Right femoral head fracture	1	3.3%
	Right femur head fracture	1	3.3%
	Failed implant of left THR	1	3.3%
	OA left hip	3	10.0%
	OA right hip	5	16.7%
	Fracture of right neck of femur	1	3.3%
	Right neck of femur fracture	1	3.3%

Graph 9.Distribution of diagnosed characteristics



DISCUSSION

Van DenEeden YNT, et al., conducted a study named "Local infiltration analgesia with anterior total hip arthroplasty under general anesthesia does reduce opioid consumption and pain: a randomized, double-blind, placebo-controlled trial involving 106 patients."High-volume LIA is widely used in Total Hip Arthroplasty (THA) to reduce postoperative pain and opioid requirements. The efficacy of LIA in THA with different approaches to the joint remains unclear. Therefore, the study examined whether intraoperative high volume LIA in addition to a multimodal oral analgesic regimen with Direct Anterior Approach (DAA) for THA under general anesthesia would further reduce acute postoperative pain and early opioid requirement consumption. In total, 106 patients were recruited. Patients scheduled for unilateral, primary DAA THA under general anesthesia were included in this trial receiving high-volume (150mL) wound infiltration with ropivacaine 0.2%, epinephrine (10µg/mL) and ketorolac (30mg) or 150mLsaline 0.9% to evaluate the effect on early postoperative opioid consumption and on acute postoperative pain. The primary endpoint was opioid consumption 24hrs after surgery. The secondary endpoints were visual analogue pain-scale scores mobilized at 4hrs with full weight-bearing and at rest at 1hr, 2hrs, 3hrs, 12hrs, and 24hrs after surgery. The chronic analgesic consumption and surgical result at 6 weeks and 1 year after surgery were investigated. Results concluded that wound infiltration with LIA did reduce postoperative opioid requirements. The average pain level 4hrs postoperatively mobilized was less in the LIA group. The rehabilitation progress or chronic pain after 6 weeks and 1 year showed no difference between both groups. Hence LIA was effective reducing opioid

consumption and diminishing postoperative pain during mobilization using DAA THA under general anesthesia.[56]

Kerr DR, et al., conducted a study named, "Local infiltration analgesia: a technique for the control of acute postoperative pain following knee and hip surgery." In this study, they developed a technique called "local infiltration analgesia" (LIA) for pain management post-surgery for the hip and knee. This practice involves in infiltration of the combination of drugs i.e. ropivance, ketorolac and adrenaline into the tissues during the procedure for pain management, immediate mobilization and early discharge from the hospital, without much adverse effects. This was an open non-randomized study, involving 325 patients for hip resurfacing (HRA), primary THR and primary TKR, from January 1, 2005, to December 31, 2006. They noted down pain scores, mobilization time, and the amount of usage of morphine in all patients. They concluded that pain was satisfactory (pain score ranging from 0-3). In two-third of the patients, morphine was not used. The first assisted walk was between 5 to 6 hours post-surgery and the independent walk was between 13-22 hours post-surgery. Out of 325 patients, 230 patients got discharged home after one single night stay in hospital postoperatively. Therefore LIA is a simple and safe practice in managing post-surgical pain .[57]

Andersen LO, et al., conducted a study on pain and function after hip and knee replacement. In this study, they included LIA intraoperatively for total hip and knee arthroplasty and also intake of oral analgesia i.e. celecoxib, gabapentin, and paracetamol for 6 days post-surgery. It is a prospective observational study for evaluating the sub-acute post-surgery pain; opioid-related side effects, use of analgesics and functional ability on 1 to 10 and 30 days postoperatively.

Postoperatively patients who underwent fast track THR and TKR had early discharge (<3days) with an acceptable level of pain for >95% of patients after discharge before postoperative 10th day. 52% of patients after THR reported having experienced moderate pain and 16% severe pain while walking one-month post-operative with increased opioids intake. This study concluded to increase intake of analgesia post-discharge for better rehabilitation.[58]

Kuchalik J, et al., conducted a study named, "Postoperative pain relief after total hip arthroplasty: a randomized, double-blind comparison between intrathecal morphine and local infiltration analgesia."Postoperative pain after THA can delay mobilization. This study contained eighty patients, among which intrathecal morphine (ITM) 0.1mg and LIA (ropivacaine 300mg+ketorolac30mg+epinephrine 0.5mg) (total volume 151.5ml) were compared. According to results morphine consumption was equal in both the groups at 0-24hrs, but it was lower in the LIA group when compared with ITM during 24hrs – 48hrs. At 8hrs at rest ITM recorded lower pain scores. Whereas LIA group recorded lower pain scores at 24hrs – 48hrs on standing and mobilization. Rescue analgesia was recorded to be low in the LIA group. According to the study, it concludes that lower pain scores were recorded early post-procedure in the ITM group. Rescue analgesia, pain on mobilization and adverse effects were low in the LIA group of patients. Hence LIA is a good replacement for ITM in pain management post THR.[59]

Andersen KV, et al., conducted a study named "The effect of postoperative intra-articular bolus injections after THA remains unclear." The study aimed to test the efficacy of intra-articular LIA for pain management post THR, which was infused for the first 24hrs for every 6 hrs.

The study compromises of 80 patients undergoing THR, receiving high volume LIA (200mg ropivacaine and 30 mg ketorolac) following with 4 intra-articular injections with ropivacaine (100mg) and ketorolac (15mg) (treatment group) or saline (the control group).

The results concluded that there was no significant difference in the intake of IV morphine PCA post-surgery between the two groups. Pain scores on walking, recorded post-surgery were higher in the treatment group from 24-72hrs. Other pain scores were the same between the groups. No of days of hospital stay was increased in the treatment group. Hereby the study concludes that postoperative intra-articular bolus injection of ropivacaine and ketorolac are not a good suggestion for pain control post THR.[60]

According to the study of "local infiltration analgesia: a technique for the control of acute postoperative pain following knee and hip surgery: A case study of 325 patients" by **Dennis R Kerr and Lawrence Kohan**[55], conclude that pain score of 0-10 (0 representing no pain and 10 representing worst pain) was recorded at 4thhr, 15-22 hr and 40-48hrs post THR, was found to has Satisfactory pain scores at rest and walking i.e. in the range of 0-3 scores. Meantime for 1st walk was 11 hrs for THR patients.41% of the THR patients had a single night overstay in the hospital.

In our study of a total of 30 patients, 23 (76.7%) were male and 7 (23.3%) were female. The mean duration of hospital stay was 3.53days, and the mean time duration of starting the first walk was 14.1467 hours. At rest, 10 (33.3%), 5 (16.7%), 4 (13.3%) and 9 (30%)patients had no pain at 6, 12, 18, 24 hrs, respectively (p = 0.000*); 15(50%), 14 (47%) and 7 (23%)patients had VAS one at 12, 18, 24 hrs at movement (p=0.016*).Gender distribution of mean VAS score at 24 hrs was 2+2(SD) and

1+2(SD)for female and male, respectively at rest (p=0.398) and 3+2(SD) and3+2(SD) for both female and male, respectively, at movement, and the p-value was0.391.

When comparing our study with the above-mentioned study (Dennis R Kerr and Lawrence) majority of the patients had VAS score 0-3 at 6th hrs interval for 1st 24 hrs post THR at rest and at 12th, 18th and 24th-hour interval on walking. This is found to be a satisfactory VAS score, in managing post-operative pain, post THR.

According to our study, the average first walk of the patient's post THR was 14.1467 hr. Which, when compared to the study by Dennis and Lawrence et al was 11hr for 1st walk, which is still a significant result to be considered.

According to our study, 46% of the patients who underwent THR had 3 days and 10% had 2 days of hospital stay. Which when compared to the study by Dennis and Lawrence et al was 1 day overnight stay for 41% of the THR patients. More than 50% of the patients had less than or equal to 3 days of hospital stay, which is a considerable results for not staying to long at the hospital post THR.

CONCLUSION

In the past LIA for managing post operative pain has not be successful. – both because there has been no systemic technique available for effective drug delivery to all relevant parts of surgical sites .Currently continuous wound infiltration with local anesthetics through wound catheters and continuous nerve block techniques may perhaps be considered to be gold standard for analgesia after hip replacement surgery. In our study, local infiltration analgesia was infiltrated at 3 stages intraoperatively. Postoperatively pain was graded based on VAS, our observations shows that it is possible to achieve satisfactory control of pain using local infiltration analgesia. Local infiltration analgesia can be considered as safe practice in efficiently controlling pain after total hip arthroplasty.

SUMMARY

- This prospective observational study was conducted in 30 patients of both sexes
- The age of patients ranged from 17yrs to 83 years
- Among 30 patients included in the study, 23 (76.7%) were male and 7 (23.3%) were female
- As per concluded by our study, the mean duration of hospital stay was 3.53 days.
- As per concluded by our study, the mean time duration of first walk was 14.1467hrs.
- Of total 30 patients 83% of the patients had a VAS of 0-3 at rest for 6^{th},12^{th}, 18^{th} and 24^{th} hour intervals and on movements 80% of the patients had a VAS of 0-3 at rest for 12^{th}, 18^{th} and 24^{th} hour intervals, which is a satisfactory VAS score recorded post THR.
- **At Rest:** Mean VAS scores at 24 hrs were 2+2(SD) and 1+2(SD) for female and male, respectively (p=0.398)
- **At Movement:** Mean VAS scores at movement at 12, 18, 24 hrs were 3+2(SD) and 2+2(SD) for both female and male, respectively and the p value was p=0.431

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ANNEXURE I – CONSENT FORM

INFORMED CONSENT

***Title of Research Study*:**

PROSPECTIVE STUDY OF LOCAL INFILTRATION ANALGESIA FOR POSTOPERATIVE PAIN CONTROL FOLLOWING TOTAL HIP REPLACEMENT

Principal Investigator: ***Co-investigator:***

INTRODUCTION AND PURPOSE: You are requested to participate in a study that is an attempt to find out the effectiveness of local infiltration analgesia for postoperative pain control following total hip replacement based on visual analogue pain score, mobilization and length of the hospital stay.

This study will be conducted by Dr. V M Srujan Post Graduate in Department of Orthopaedics, under the direct supervision and guidance of Dr.S.T.Sanikop Professor, Department of Orthopaedics, J. N. Medical College, Belagavi-10.

BENEFITS: This study effect of local infiltration analgesia.

RISK INVOLVED: The side effects of this study are nil.

COMPENSATION: Taking part in the study will not affect the cost of treatment i.e. it will be similar to the cost of standard procedure. In the event that you become injured as a result of taking part in this study, treatment will be offered to you

or you will be given information about where to receive medical care. But you/your insurance company will be responsible for the costs. However, no reimbursement, compensation or free medical care will be given.

CONFIDENTIALITY: Every effort will be made to protect the confidentiality of the information you provide. This means that the researchers will not let anyone, not a part of the study, see the information you provide. Only Dr. V M Srujan and Dr. S T SANIKOP will have access to the information collected. Results of this study may be published but your name will not be revealed.

VOLUNTARY PARTICIPATION / WITHDRAWAL: Taking part in this study is voluntary; you may choose not to enroll in this study. Your decision will not change the present or future health care services offered to you at KLES Dr. Prabhakar Hospital, Belagavi. The alternative that you have is to undergo the traditional procedure that is carried out in KLES Hospital.

If you have any questions about your rights or research participation you may contac Dr. Roopa M Bellad Chairperson of Ethical Committee JNMC Belgavi-590010 Phone No.9448113403 You will be given a copy of this form for your information and to keep for your records.

CONSENT TO PARTICIPATE IN THE STUDY

I Mr./Ms._____ have been explained about the research study, the need of the study, the intervention, their risks, benefits and alternatives available in my own vernacular language.

I voluntarily agree to participate in this study by signing up this form below. I understand that I may withdraw at any time from this study. I have been given adequate time to clarify my doubts about the study and my rights as a study participant.

My signature/thumb impression below indicates that I have read or information in the consent been read to me including the risks and benefits and have cleared my doubts.

Name of participant: **Signature/LTI:**

Name of legally authorized **Signature/LTI:**

Representative (if applicable):

Relationship with participant:

Name of witness: **Signature:**

Name of investigator: **Signature:**

Date:

Place:

ANNEXURE-II

PROFORMA

PROFORMA / QUESTIONNAIRE TO BE USED FOR DATA COLLECTION

The proposed Performa / questionnaire to be used for data collection for the study titled "PROSPECTIVE STUDY OF LOCAL INFILTRATION ANALGESIA FOR POST OPERATIVE PAIN CONTROL FOLLOWING TOTAL HIP REPLACEMENT" is as follows:

1. PATIENT IDENTIFICATION DATA

Group		**Ward**	
Name		**IP Number**	
Age and Sex		**D O A**	
Address			
Education		**Marital status**	
Religion		**Socio-Economic status**	
Occupation			

2. CHIEF COMPLAINTS:

3. HISTORY OF PRESENTING COMPLAINTS:

Past History:

Personal History:

Family History:

4. GENERAL PHYSICAL EXAMINATION:

Built and Nourishment:

Weight:

Pallor / Icterus / Cyanosis / Clubbing / Edema / Lymphadenopathy

Vital Signs: PR: /min; BP: mmHg; RR: /min; Temp:

5. LOCAL EXAMINATION:

6. SYSTEMIC EXAMINATION

CNS:

CVS:

R S:

ABDOMEN:

7. CLINICAL IMPRESSION:

8. INVESTIGATIONS:

Blood routine :Hb : total leucocyte count : platelet :

Random blood sugar:

Blood urea:

Serum creatinine:

LFT:

PT/INR:

URINE ROUTINE AND MICROSCOPY:

X- RAY:

9. MANAGEMENT:

10. DATE OF SURGERY:

11. TYPE OF ANESTHESIA:

12. PROCEDURE: 1. CEMENTED TOTAL HIP REPLACEMENT

2. UNCEMENTED TOTAL HIP REPLACEMENT

POST OPERATIVE PAIN IS ASSESED BY VISUAL ANALOGUE SCALE (VAS)

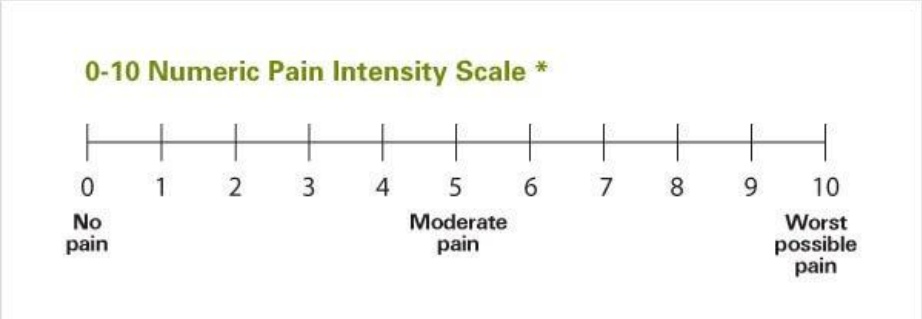
LOCAL INFILTRATION ANALGESIA

COCKTAIL IN TOTAL HIP REPLACEMENT	**UNILATERAL**	**BILATERAL**
INJ. ROPIVICANE 0.75	40 ml	50 ml
INJ. CLONIDINE	0.6ml	0.8 ml
INJ. ADRENALINE	0.3ml	0.3 ml
INJ. KETOROLAC	1 ml	2 ml
NORMAL SALINE	18 ml	64 ml
TOTAL	60 ml	120 ml

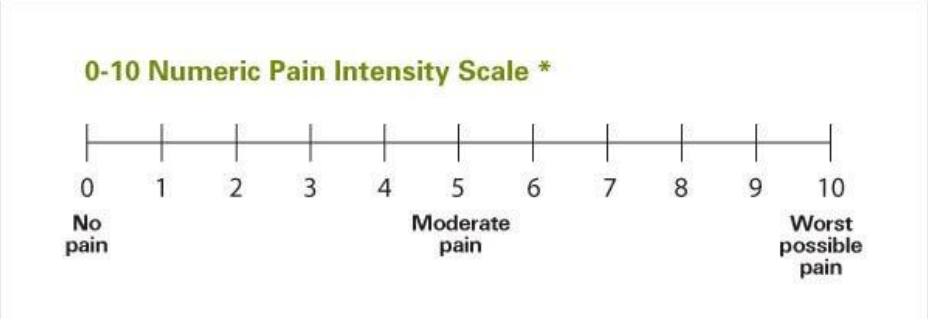
POSTOPERATIVE ANALYSIS

VAS SCORE AT REST

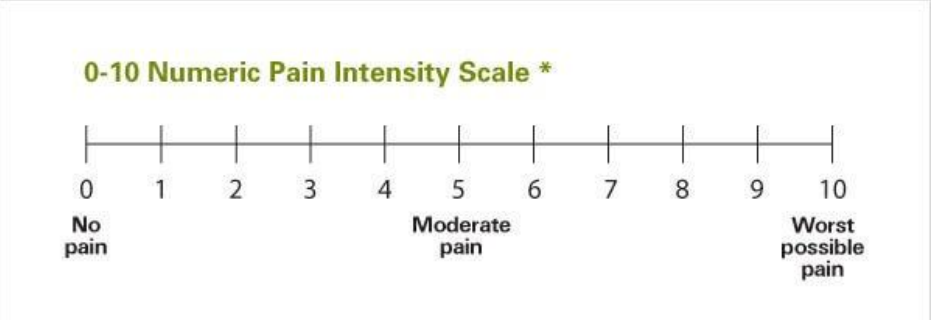
VAS AFTER 6TH HOUR



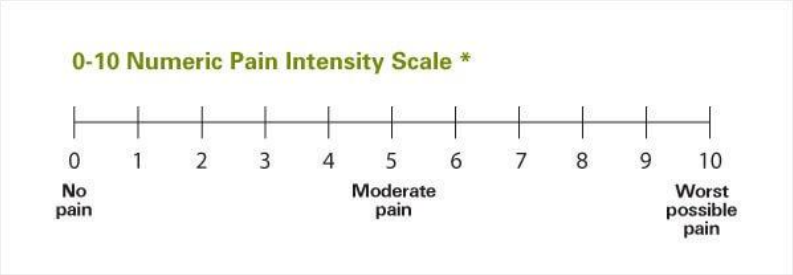
VAS SCORE 12TH HOUR



VAS SCORE AT 18TH HOUR

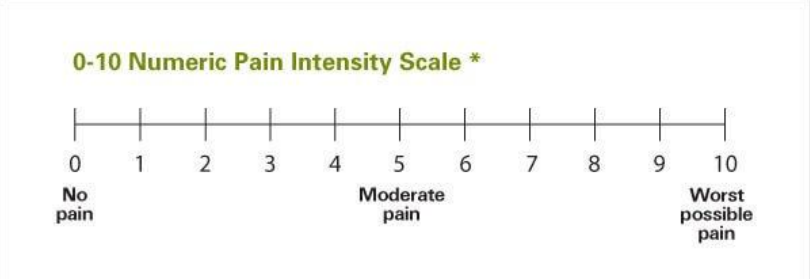


VAS SCORE AT 24TH HOUR

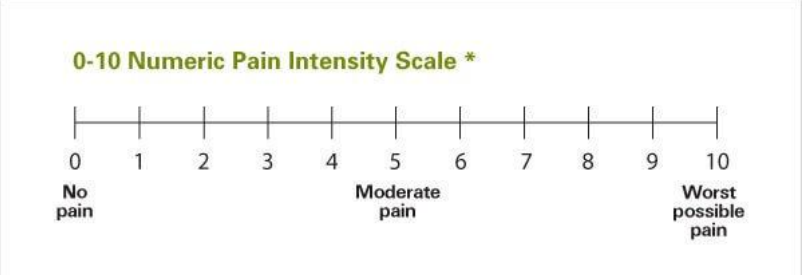


VAS SCORE ON RANGE OF MOVEMENTS

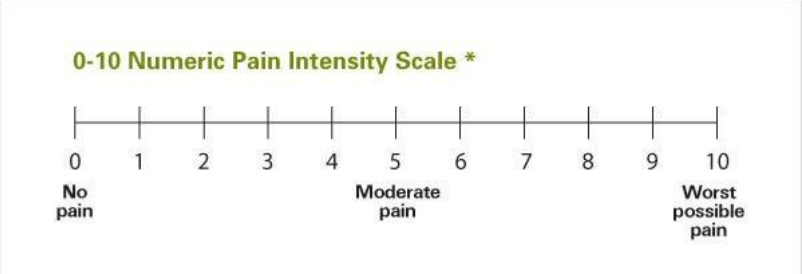
VAS AFTER 6TH HOUR



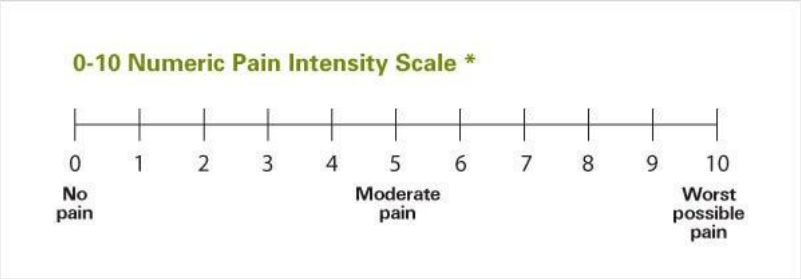
VAS SCORE 12TH HOUR



VAS SCORE AT 18TH HOUR



VAS SCORE AT 24TH HOUR



RATING	PAIN LEVEL
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)

ADLS:ACTIVITIES OF DAILY LIVING

ANNEXURE-III- ETHICAL CLEARANCE LETTER

K.L.E. UNIVERSITY'S
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
(Accredited 'A' Grade by NAAC)

Website: http://www.jnmc.edu
E-Mail : dome@jnmc.edu

Phone: (+ 91-(0)831 Office : 2471350
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 66

Date: 22/11/2017

To.

REG NO.BL0117003

Sub: Institutional Ethical Clearance for the study.

With reference to the above. we wish to inform you that your proposed research project titled **"PROSPECTIVE STUDY OF LOCAL INFILTRATION ANALGESIA FOR POST OPERATIVE PAIN CONTROL FOLLOWING TOTAL HIP REPLACEMENT"**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Arathi Darshan)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research.
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

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ANNEXURES IV - MASTER CHART

SL NO	Name	Age	Sex	IP no	Hospital stay(days)	VAS score rest					VAS score movements				First walk(hr)	
						6th hr	12th hr	18th hr	24th hr		6th hr	12th hr	18th hr	24th hr		Diagnosis
1	Raju rama bansode	62y	M	836450	3	0	0	0	0		NIL	0	0	0	11.5	OA left hip
2	Praveen ashok patil	29y	M	838912	2	0	0	0	0		NIL	0	1	0	11.4	OA keft hip
3	Moulasab ani	57y	M	839267	3	0	0	0	0		NIL	1	1	1	12.2	Right femoral head fracture
4	Shivagonda bagel	63y	M	848012	3	0	0	0	0		NIL	1	1	1	12.1	AVN right hip
5	Murshadhusain peerz	44 y	M	849575	3	0	0	1	0		NIL	1	1	1	12.5	Painfull left hemiarthroplasty
6	Rajeshwari masilama	60y	F	849238	3	0	1	1	0		NIL	1	1	1	12.3	right femur head fracture
7	Nikhil tulaskar	17y	M	926427	2	0	1	1	0		NIL	1	1	1	12.2	OA right hip
8	Shabra gurumuppayy	40y	M	850998	3	0	1	1	0		NIL	1	1	1	12.4	OA left hip
9	Preeti lorraine	40y	M	859049	3	0	1	1	0		NIL	1	1	1	13.3	Loosening of THR with poly wear
10	Surendra narayan	53y	M	870959	3	0	1	1	1		NIL	1	1	2	12.3	OA left hip
11	Deelip shinde	33y	M	884138	3	1	1	1	1		NIL	1	1	2	12.4	OA right hip
12	Shashikala mulimani	50y	F	893746	3	1	1	1	1		NIL	1	1	2	13.5	OA right hip
13	Smita badakere	59y	F	903736	3	1	1	1	1		NIL	1	1	2	13.1	OA right hip
14	tanaji	58y	M	916842	4	1	1	1	1		NIL	1	1	2	12.4	AVN right hip
15	Sachin salokhe	40y	M	909951	2	2	1	1	1		NIL	1	1	2	12.1	OA right hip
16	Babu bhujabali aita	w49y	M	914325	3	2	1	2	1		NIL	1	2	2	12.5	OA left hip

17	Mohan Bhimarao	54y	M	916280	3	2	1	2	1		NIL	1	2	2	13.4	OA left hip
18	Shivappa chimmalagi	48y	M	905291	3	2	1	2	1		NIL	2	2	2	15.5	OA right hip
19	Susmita ekawde	59y	F	917087	4	2	2	2	1		NIL	2	2	2	14.5	OA right hip
20	Chandabee naikodi	59y	M	909770	4	2	2	2	1		NIL	2	2	3	15.2	right neck of femur tracture
21	Vijay dattatarya	63y	M	911166	4	2	2	4	2		NIL	2	2	3	16.4	Failed implant of left THR
22	Akash rotti	21y	M	921701	3	2	2	3	2		NIL	3	3	3	16.3	Left perthe's
23	Appasaheb	75y	M	927305	4	3	2	4	2		NIL	4	4	3	17.2	OA right hip
24	Akkamahadevi wali	71y	F	924667	4	4	2	3	2		NIL	3	3	3	16.2	left fractue Neck of femur
25	Drakshayani hiremat	83y	F	925070	6	3	2	4	2		NIL	4	4	6	15.2	OA right hip
26	Gopalkrishna laxman	74 y	M	893028	5	4	3	7	2		NIL	6	3	7	17.4	OA b/l hip
27	Mahalingappa huyal	73y	M	895127	6	4	4	7	3		NIL	7	6	7	17.5	OA right hip
28	Shanti ram Sharma	75y	F	877306	5	6	3	6	6		NIL	6	7	7	16.5	OA right hip
29	Ramanagouda malna	76y	M	909184	4	7	6	7	7		NIL	6	6	7	17.5	right fracture neck of femur
30	Dinakar Appaji	47y	M	858064	5	6	7	6	7		NIL	7	7	6	17.4	OA right hip

ANNEXURE-V

KEY TO MASTER CHART

M: Male

F: Female

VAS: visual analog scale

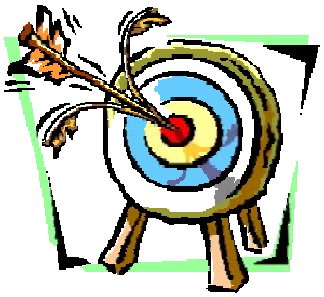
Hr: Hour

SL NO: serial number

Y: Years

OA: Osteoarthritis

Introduction



Objectives

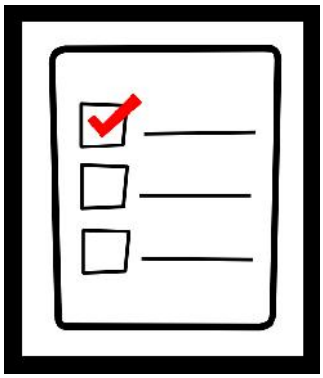
Review of Literature

Methodology

Results

Discussion

Conclusion

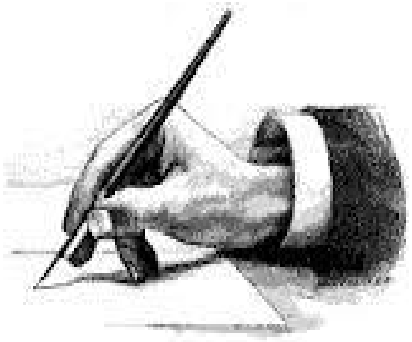


Limitations

Recommendations

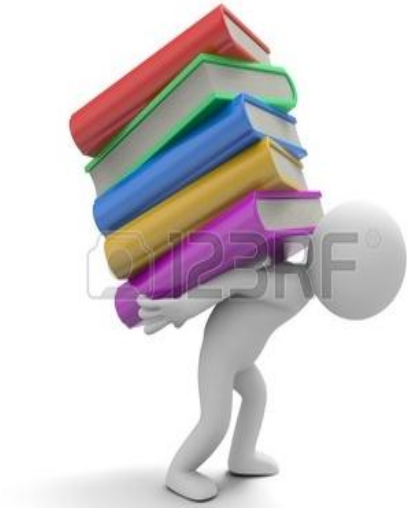
Summary

Bibliography



Annexure-I

Annexure-II



Annexure-III

Annexure-IV

Annexure-V