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RESEARCH ARTICLE

"EFFECTIVENESS OF FASCIA ILIACA COMPARTMENT BLOCK FOR POST OPERATIVE ANALGESIA AFTER SURGERY FOR FEMUR BONE FRACTURE"

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Ultrasound Guided Fascia Iliaca Compartment Nerve Block (FICNB), Postoperative Analgesia, Femur Fractures Lower limb Surgeries (LLS)

Abstract

Background: Multimodal analgesia is given to alleviate postoperative pain in fracture neckfemur.Present study is done to assess the effectiveness of fascia iliaca compartment block for post operative analgesia after surgery for femur fractures.

Aims & Objectives:

1) To study effect on pain at rest and with movement

2) To study duration of post operative analgesia with fascia iliaca compartment block

3) TO study post operative analgesic requirement

Methods: Afer approval from institution review board committee, this prospective randomised observational study was conducted at our institute after taking informed consent from each patient. Total 60 adult patients (ASA I/II) aged 18 to 70 years, of either sex undergoing femur bone fracture surgery under subarachnoid block were included. Sub arachnoid block was performed in the sitting posture under strict aseptic precautions in theL2-L3 or L3-L4 space using 23G Quincke needle with 3.5ml of 0.5%Bupivacaine (hyperbaric, dextrose 80mg/ml) in all patients. Patients were randomly divided in two groups, **Group A (n=30):** The FICNB group was received ultrasound guided fascia iliaca compartment block with 0.25% bupivacaine 30ml at the end of the operation. **Group B (n=30):** were managed without FICNB Hemodynamic variables like heart rate, non invasive blood pressure, saturation of oxygen, were recorded after the block. The analgesia provided by either of the modes was assessed by using Visual analogue scale scores at 5 mins,10 mins,15 mins,20 mins,25 mins,30 mins,40 mins,50 mins,1, hr,then hourly upto,12 hour,then 2 hourly upto 24 hour. Postoperative hemodynamic monitoring was done and depicated in tabular form. Patients were watched for adverse effects of drugs and complications of procedure itself.The duration of postoperative analgesia was compared between the 2 groups using visual analogue scale and in terms of first rescue analgesic and total analgesic dose requirement with inj. diclofenac sodium75 mg.The

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data were studied using mean values and mean ± SD and then compared using unpaired 't'test. p value <0.05 was considered significance

Results: The result obtained in study

At 1hr Mean VAS in group A was 2.23 ±0.43 and in group B it was 4.93±0.25

At 7hr Mean VAS in group A was 2.96 ± 0.18 and in group B it was 4.9±0.31

At 12hr Mean VAS in group A was 4.66±0.80 and in group B it was 3.83±0.38

At 14hr Mean VAS in group A was 1.86±1.25 and in group B it was4.93±0.25 Post-operative VAS at rest and moment were significantly higher in group B, compared to group A ($p<0.001$). After 24 hr statistically significant difference was not observed in mean VAS between group B and group C. The mean consumption of analgesic was 137.5±28.42 mg diclofenac in Group A and 295±19.03 mg diclofenac in group B.

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Introduction:-

Lower limb surgery (LLS), especially in the region of medial thigh, and front and lateral and knee, is usually performed to relieve joint pain, correct deformity, and improve motor function of the joint. For patient to receive LLS, postoperative pain is the first symptom. Due to the physical symptoms and psychological pressure, patients focus on pain, which aggravates the degree of pain. Severe pain after LLS can affect a patient's mood and result in failure to complete the postoperative exercise, which may limit functional recovery.[3]

Post operative pain relief canbe achieved by a variety of techniques ,including parentral NSAIDS,neuraxial local analgesics and narcotics,epidural analgesia,peripheral nerve block,wound infiltration and patient controlled IV analgesia with opioids(4).Systemic analgesia such as opioids and NSAIDS areassociated with different side effects.(ficb original).opioid medication can be associated with respiratory depression,hypotension,mental status changes,and vomiting.NSAIDS can increases bleeding risk and exacerbate underlying gastrointestinal problems.(5) The use of techniques that alleviates postoperative pain and avoids complications of opioids(6). FICB is a peripheral nerve block, which has become an important part of postoperative multimodal analgesic strategies after surgery for femur bone fracture. FICB was first reported by Dalens et a**l(19**) as an alternative to the 3-in-1 nerve block, it is now one of the major methods of lower limb nerve block and is widely used in postoperative analgesia in patients after LLS. More specifically, the femoral, lateral cutaneous, and obturator nerves of the thigh are blocked by local anesthetic (LA) injected under the fascia of iliacus muscle(3). FICB is placed more laterally than three in one block, thereby decreasing potential for an intravascular or intraneural injection(4).However, the pop technique using fascial click had a low success rate When FICB was performed under real-time ultrasound guidance, the success rate increased . This study is designed to see the effectiveness of fascia iliaca compartment block for post operative analgesia after surgery for femur bone fracture.

Ultrasound guided approach(ficb ref 12)

In the supine position , a high frequency (6-14 MHz) linear probe is placed transversely to identify the femoral artery at the inguinal crease. The iliopsoas muscle with the overlying fascia iliaca is identified and the hyperechoic FN is typically seen lying between the iliopsoas and fascia iliaca at a depth of 2-4 cm, lateral to the femoral artery (Fig. 4). The fascia lata may also be identified above the fascia iliaca, although this is neither always reliably seen nor essential to the performance of the block. The probe may be tilted cranially and caudally until optimal images of the FN and fascia iliaca are obtained. The triangular shaped sartorius muscle and the ASIS are identified on moving the probe laterally. After skin disinfection and LA infiltration, a 50-100 mm blunt ended needle is inserted using an in-planetechnique with the aim of placing the needle tip beneath the fascia iliaca around the lateral third of a line between the ASIS and pubic tubercle. Aspiration is performed before injection of 1-2 ml LA. Correct needle placement is confirmed by separation of the fascia iliaca from the iliopsoas muscle with LA spreading towards the FN medially and the iliac crest laterally. Volumes of 30-40 ml, ensuring compliance with safe dose limits for the LA, are routinely used to ensure optimal spread

Study Design:
Prospective, Randomized, single-blind, Controlled study.

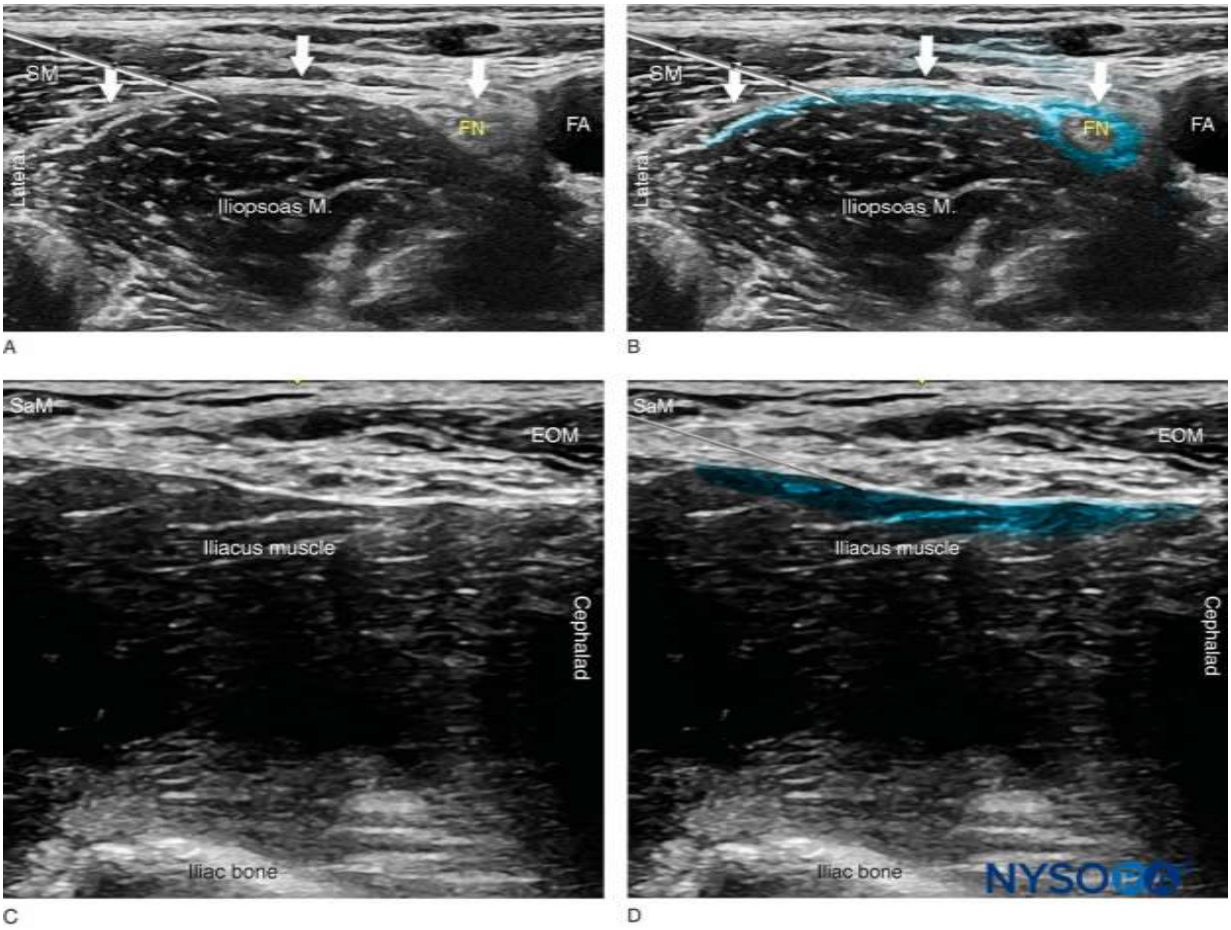
Inclusion Criteria:
1. Patients belonging to ASA grade I and II.
2. Patients of either sex, between the age group 18 to 70 years.
3. Patients with fracture femur, posted for surgery under sub-arachnoid block.
4. Patients who give a valid informed consent.

Exclusion Criteria:
1. Patients not satisfying inclusion criteria.
2. Patients belonging to ASA grade III or IV.
3. Patients with hemorrhagic diathesis, neurological disorders, psychiatric disorders.
4. Previous femoral bypass surgery.
5. Patients with allergy to local anaesthetics or opioids.
6. Patients with polytrauma, infection over the injection site.
7. Patients on previous opioid therapy.
8. Morbid obesity.
9. Patients who will be administered with supplementary epidural or general anaesthesia. (In patients with prolonged surgeries when conversion is required).
10. Patients with spinal deformities.
11. Patients who decline consent
12. Patients with language barrier.

Methodology:-

After talking permission of Institution Review Board, Patients satisfying the inclusion criteria were selected, counselled about the risks and benefits involved in the study. After obtaining informed consent, patients who were willing to be included in the study were enrolled. They were preoperatively evaluated, clinically examined and assessed. A total of 60 patients were included in the study. They were randomly allocated into two groups.

Group A -The FICNB group was received ultrasound guided fascia iliaca compartment block with 0.25% bupivacaine 30ml at the end of the operation. **Group B-** were managed without FICNB**(24,25,26) .** Entire procedure was explained to the patient with written informed consent.All patient were kept nil per oral for atleast 6 hours before the procedure.Baseline vitals such as pulse rate,non invasive blood pressure ,saturation in room air,respiratory rate,ECG pattern were recoreded.Intravenous access was obtained and IV fluid started. Sub arachnoid block was performed in the sitting posture under strict aseptic precautions in the L3-L4 space using 23G Quincke needle with 3.5ml of 0.5%Bupivacaine (hyperbaric, dextrose 80mg/ml) .Time to perform spinal anaesthesia was recorded. On completion of surgery, Group A patients were placed in supine position. The local anaesthetic solution was prepared with 15 mL of 0.5% bupivacaine and 15ml of distilled water and hence 30ml of 0.25% bupivacaine. The Ultrasound Machine was powered on and the linear array probe was covered with sterile dressing after applying ultrasound gel. The probe was placed in a horizontal direction over the anterior part of thigh just below the inguinal ligament. The ultrasound setting used to visualise was at a frequency of 10 MHz and a depth of 3-4cm. The gain and focus were adjusted according to the image scanned. Femoral artery was identified first .Then the iliacus muscle covered by fascia iliaca was identified lateral to the artery. An 23G Quinke needle was then inserted in plane to the ultrasound beam. The needle was advanced until the tip of the needle was placed beneath the fascia iliaca (appreciating the give as the fascia is perforated) and after negative aspiration, the local anaesthetic was injected and its spread visualized on the screen.


SM
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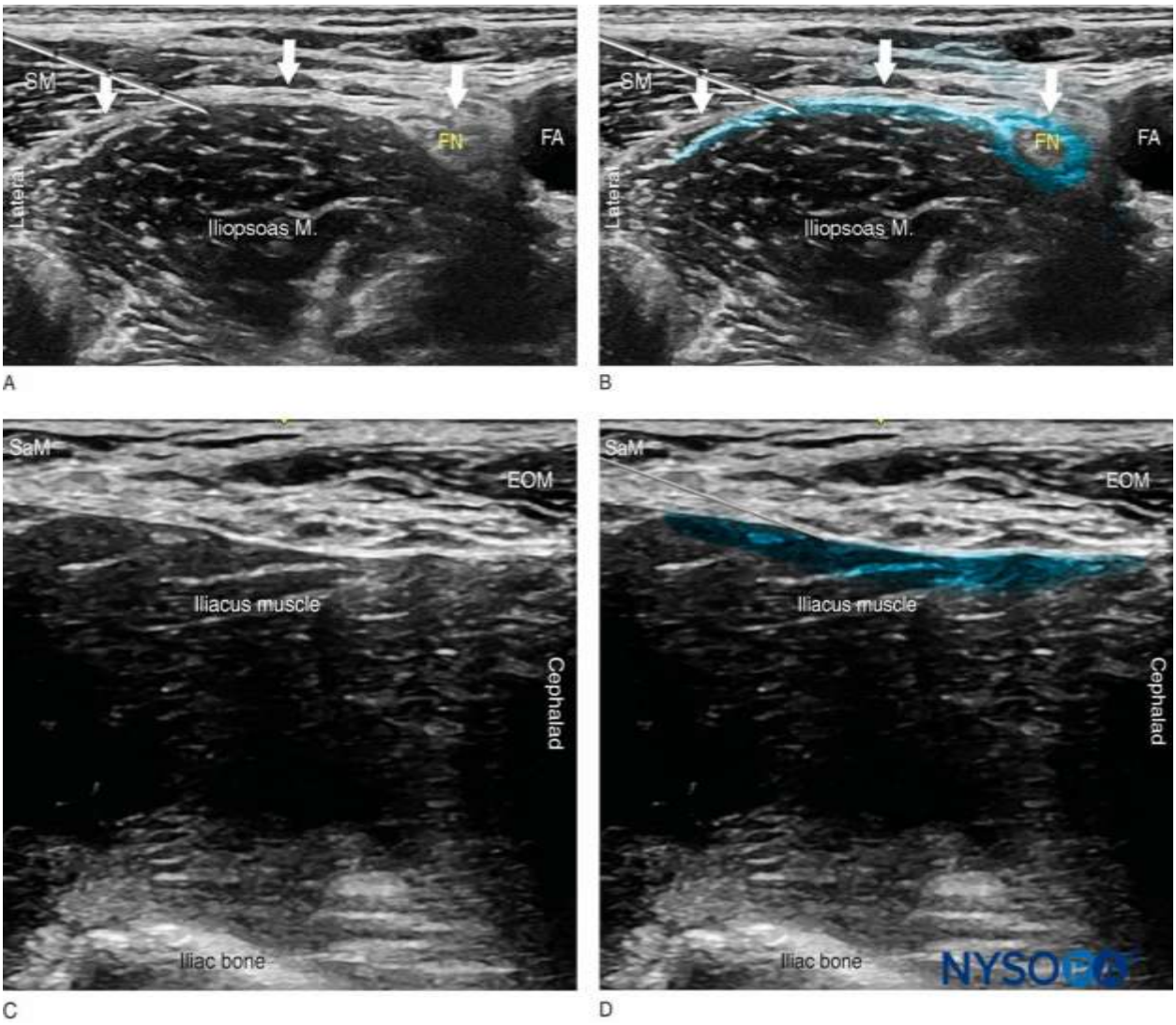
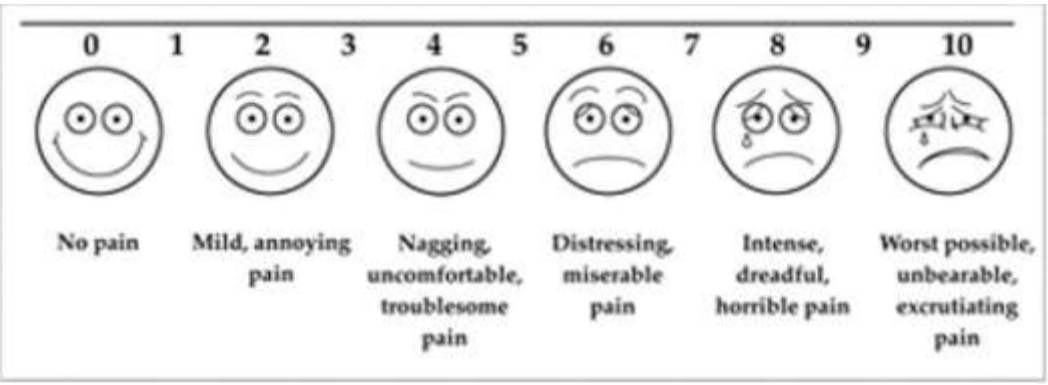


(A) Position of the needle tip for the fascia iliaca block. The needle is shown underneath the fascia iliaca lateral to the femoral artery but not deep enough to be lodged in the iliac muscle. **(B)** A simulated spread (blue-shaded area) of local anesthetic to accomplish a fascia iliaca block. **(C)** Ultrasound view of the supra-inguinal approach with the probe oriented in a sagittal plane along the iliacus muscle. **(D)** Needle path and simulated local anesthetic spread (blue-shaded area) just deep to the fascia iliaca and the external oblique muscle (EOM). SaM, sartorius muscle.

Hemodynamic variables like heart rate, non invasive blood pressure, saturation of oxygen, respiratory rate were recorded after the block.

The analgesia provided by either of the modes was assessed by using Visual analogue scale scores at 30 mins,1 hour,2 hour,4 hour,6 hour,10 hour,14 hour,18 hour,24 hour.



Visual Analogue Scale score Post operative analgesia was standardized in all patient of both group with inj.diclofenac sodium 75mg IV slowly.first dose given whenever patient complain of pain.

Observation & Results:-

The prospective, observational study was carried out in 60 patients, belonging to ASA Grade I and II scheduled for femur bone fracture surgery.In the study, all patients received spinal anaesthesia with 23 G spinal needle with 3.5, 0.5% bupivacaine heavy at L2-L3 or L3 – L4 vertebral interspace. The patients were randomly allocated in two groups of 30 patients each.

GROUP A	Group A was received ultrasound guided fascia iliaca compartment block with 0.25% bupivacaine 30ml at the end of the operation.
GROUP B	Group B were managed without FICNB .(received sabarachnoid block 3.5 ml 0.5%bupivacaine only)

Table 1:- Demographic variables.

CHARACTERISTIC	GROUP A (n=30)	GROUP B(n=30)	P VALUE
AGE(YEARS)	51.76 ±13.93	51.9 ±15.49	0.97
SEX(M:F)	18:12	21:9	
BMI(kg/m2)	23.03±1.49	23.5±1.38	0.21
ASA GRADE (I:II)	11:19	17:13	

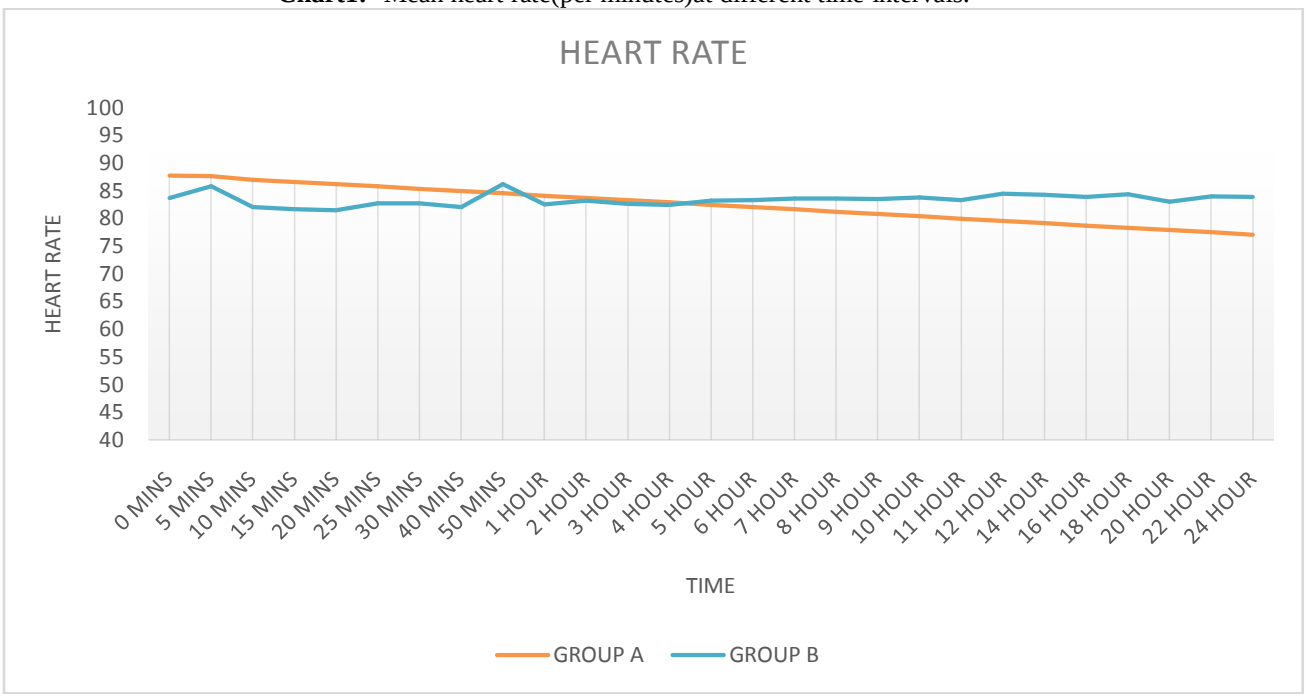
There is no significant difference in both groups in term of demographic variables.The mean age in years was in 51.76±13.93 in GroupA,while 51.9±15.49 in Group B with p value 0.97 which was not significant.BMI(kg/m2) in Group A was 23.03±1.49 while in Group B was 23.5±1.38 with p value 0.21 which was also not significant.Group A had sex ratio of M:F 18:12 while Group B had 21:9.The ASA physical status I:II ratio was 11:19 in Group A and 17:13 in Group B (table 1).

Table 2:- Duration Of Surgery.

Duration of surgery in minutes				
Group	No.of patients	Mean	SD	P value
A	30	134.66	24.73	0.54
B	30	130.5	28.48	

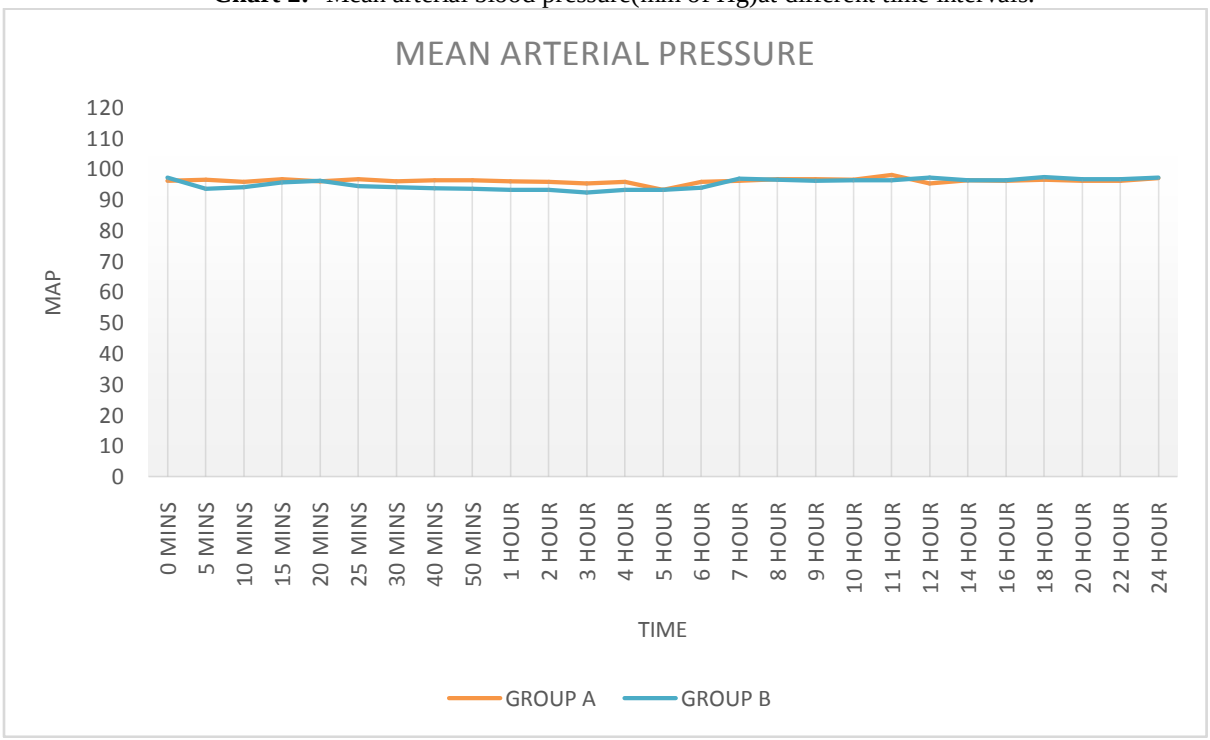
In group A mean duration of surgery was 134.66±24.73 minutes whereas in group B it was 130.5±28.48 minutes.There was no statistical significant in mean duration of surgery among both group(p>0.05).

Chart1:- Mean heart rate(per minutes)at different time intervals.



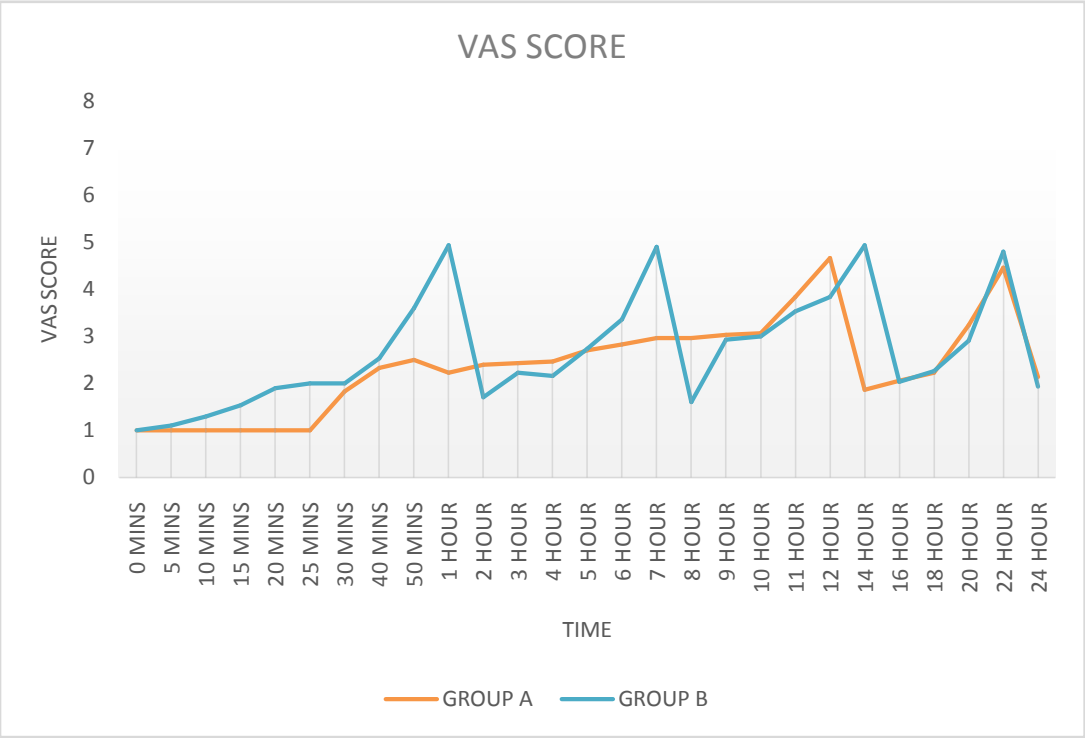
Heart rate in two group at different time intervals from the time of completion of surgery to 24 hours post operatively showing no significant difference.p valus>0.05

Chart 2:- Mean arterial blood pressure(mm of Hg)at different time intervals.



Mean arterial pressure in two group at different time interval from the completion of surgery to 24 hours post operatively no significant difference.p value>0.05

Chart3:- Mean Visual Analogue Score(VAS)at different time intervals.



Visual Analogue Score(VAS)in block group(group A)at different time interval ,from the time performing USG guided FICB block to 24 hour post operatively is significantly lower than control group(group B).

At 1hr Mean VAS in group A was 2.23 ±0.43 and in group B it was 4.93±0.25
At 7hr Mean VAS in group A was 2.96 ± 0.18 and in group B it was 4.9±0.31
At 12hr Mean VAS in group A was 4.66±0.80 and in group B it was 3.83±0.38
At 14hr Mean VAS in group A was 1.86±1.25 and in group B it was4.93±0.25

Table 3:- Post operative analgesic consumption in 24 hours.

Total analgesic required(mg)in 24 hours			
	Mean	SD	P value
Group A(n=30)	137.5	28.42	<0.0001
Group B(n=30)	295.0	19.03	

The mean consumption of analgesic was 137.5±28.42 mg diclofenac in group A and 295±19.03 in group B.
By using unpaired t-test,the p value was <0.0001(highly significant),therefore there is significant difference between mean analgesic consumption in group A and group B.
Chart4

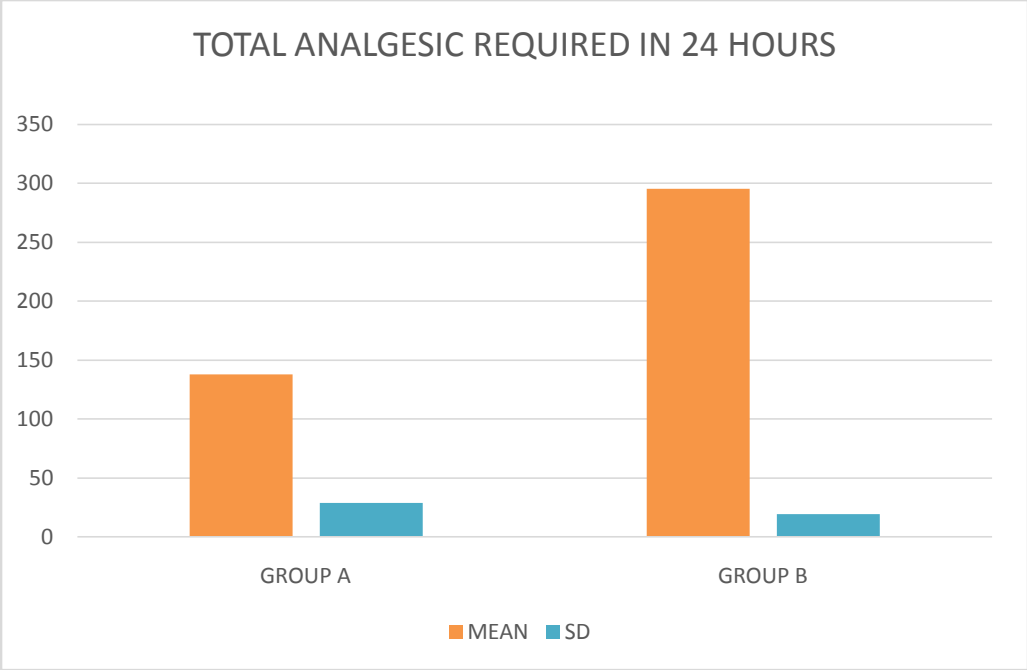


Chart 4:- Post operative analgesic consumption in 24 hours.

None of the patient in either group had any adverse effect such as local anesthetic toxicity,nausea,vomiting and hematoma

Discussion:-

Pain is the most frequent cause of suffering and disability which seriously impairs the quality of life of millions of people worldwide. (1)

Relief of pain during surgery and in post-operative period is one of the mainstays of balanced anaesthesia. Post-operative pain is a growing concern for anaesthesia as an uneventful postoperative period makes surgery a comfortable proposition for surgical patient. The benefits of postoperative analgesia are clear, and include a reduction in the postoperative stress response, reduction in postoperative morbidity, and in certain types of surgery, improved surgical outcome. **(2**)Effective pain control also facilitates rehabilitation and accelerates recovery from surgery. Other benefits of effective regional analgesic techniques include reduced pain intensity, decreased incidence of side effects from analgesics and patient comfort.

FICNB is Peripheral nerve block which can be used

In fracture femur patients preoperative even,prehospital care**(22**) in emergency department,(**20**)in Trauma unit**(7**),when giving Position for spinal anaesthesia**(13,14),** adjuvant to General Anaesthesia **(23**)to alleviate pain at each level&also for Postoperative Analgesia.**(2,3,6,10).shaimaa mostafaa etal(5) have c**ompared Patient control FICNB or Patient control fentanyl & proved that Patient control FICNB is more effective for Postoperative Analgesia.

FICNB is a peripheral nerve block, which has become an important part of postoperative multimodal analgesic strategies after surgery for femur bone fracture. FICB was first reported by **Dalens et al (19)**as an alternative to the 3-in-1 nerve block, it is now one of the major methods of lower limb nerveblock and is widely used in postoperative analgesia in patients after LLS. More specifically, the femoral, lateral cutaneous, and obturator nerves of the thigh are blocked by local anesthetic (LA) injected under the fascia of iliacus muscle(**3**). FICB is placed more laterally than three in one block, thereby decreasing potential for an intravascular or intraneural injection**(4**)

The present study was undertaken to assess analgesic efficacy of ultrasonography guided FICB for post-operative pain in 60 patients belonging to ASA grade I or II, scheduled for fracture femur bone surgery. All patients were

given spinal anaesthesia with3.5ml Bupivacaine heavy 0.5%. After completion of surgery, the patients were randomly allocated in two groups of thirty patients each. **Group A** -The FICNB group was received ultrasound guided fascia iliaca compartment block with 0.25% bupivacaine 30ml at the end of the operation.

Group B- were managed without FICNB .

In our study adult patients were enrolled for study,in **Dalens etal(19)** they have also given FICNB to paediatric patients.

We have given Ultrasound guided FICNB as a bolus.**Song J, Qiao Y**, **(17)**etal have used FICNB for total hip arthroplasty,we have used for Fracture femur surgeries

Joseph Pepe etal(4),Devendra Kumar etal(11) have also given US guided FICNB.

Seunguk Bang et al (21) study where twenty-two patients aged 70 to 90 years who underwent bipolar hemiarthroplasty for femoral neck fracture were recruited and allocated randomly into 2 groups: FICB group (n = 11) and Non-FICB group (n = 11). All patients received spinal anesthesia with 10 mg of 0.5% hyperbaric bupivacaine. After surgery, the FICB was conducted using a modified technique with 0.2% ropivacaine (40 mL) under ultrasonographic guidance, and the intravenous PCA was administered to patients in both groups in the separate block room. The PCA was set up in the only bolus mode with no continuous infusion.**Rahimzadeh P etal(12)** have given FICNB ultrasound guided with 0.2% or 0.3% Bupivacaine.

Anarki etal(8) have compared FICNB& Gabapentine & measure Postoperative morphine consumption & prove that FICNB is more effective than Gabapentine.**Kumudha Lingaraj etal(10)** compare continuous epidural & continuous FICB & prove that both are effective to alleviate Postoperative pain.

Hesham Said etal(16) have also used US guided FICNB for orthopaedic fractures as multimodal analgesia**.Capdevilla X, etal(18)** proved that FICNB is more effective than 3 in 1 block .**Kapdi MS etal (23)** have given US guided FICB with General anaesthesia for hip & femur Surgeries and conclude that preemptive analgesia of FICB along with General anaesthesia decrease perioperative Fentanyl consumption, & endtidal sevoflurane concentration, haemodynamic stability &management of BIS more accurately then group with out FICB(control group).

This study shows that FICB provides effective postoperative analgesia when it is used as an analgesic technique in the first 24 hours as measured by pain on VAS, total analgesic consumption, and the time for the first analgesic request. In this study, there was no difference in VAS scores at 15 minutes,20 minutes,25 minutes,30 minutes,35 minutes,40 minutes between the group A(FICB) and group B(control groups). This finding was consistent with a study by **Fentahun Tarekegn Kumie et al (9)** where there was no different VAS score on 15 minutes.[9] This may be due to the analgesic effect of spinal anesthesia that might be continued in the FICNB and control groups upto 50 minutes.

The postoperative VAS score was reduced more significantly in the group A(FICB)group than in the control group at 1, 7, 14 hours. **Fentahun Tarekegn Kumie et al (2015),** postoperative VAS score was reduced more significantly in the FICNB group than in the control group at 2, 6, 12, and 24 hours.However, our finding was consistent with that of a study from the **Fentahun Tarekegn Kumie et al(9)** The similarity might be due to the same dose of a local anesthetic, 30 mL of 0.25% bupivacaine .

The median VAS score at 1 hours post operatively (<0.0001) was more significantly reduced in the group A(FICNB)2.23±0.43 than in the group B(control group)4.93±0.25. Our finding was comparable with that of a **Fentahun Tarekegn Kumie et al** .**(9**)VAS scores difference between FICNB group and control group is significant at 2 hours (*P*=0.001); This similarity might be related to the wear off analgesic effects of spinal anesthesia in the group B(control group), and the efficacy of nerve block in the group A(FICB group)continued since the duration of FICB was expected for 10-12 hours.

The VAS score at 7 hours ,group A 2.96±0.49 group B 4.9±0.31(p<0.0001) at 14 hours group A 1.86±1.25 Group B 4.93±0.25.(p <0.0001) was lower in the group A than in the group B ; this finding was compaired with **Fentahun**

Tarekegn Kumie et al .(9) study where VAS score at 6 hours(p 0.000)and at 12 hours(p 0.006)significantly reduced in FICB group compared to control group.[12] This might be due to pain management using the same class of drug, i.e. diclofenac was given repeatedly at this time interval for both groups.

Regarding the postoperative total analgesic consumption of diclofenace in 24 hours, The mean consumption of analgesic was 137.5±28.42 mg diclofenac in group A and 295±19.03 in group B.($p<0.0001$). In **Fentahun Tarekegn Kumie et al(9) .** study the patients undergoing FICNB showed a reduced total diclofenace consumption at 12 and 24 hours after operation (FICNB vs. controls) i.e. at 12 hours [75.00 (18.75) vs. 100.00 (75), P=0.000] and at 24 hours .**Seunguk Bang et al (21**) study,The visual analog scale (VAS) and the opioid consumption were noted at 4, 8, 12, 24, and 48hours postoperatively.The VAS was similar in both groups. The fentanyl requirement at 4, 8, and 12hours was low in the FICB group. The total amount of fentanyl required in the first 24hours was 246.3μg in the FICB group and 351.4μg in the Non-FICB group. The FICB has a significant opioid-sparing effect in first 24hours after hemiarthroplasty. In our study, the time for the first analgesic request was prolonged in the FICNB group. The FICNB group had the first analgesic request after 752.90 minutes, and the control group after 68 minutes (taken baseline 0 mins after completion of surgery). **Fentahun Tarekegn Kumie et al(9) ,** study the time for the first analgesic request was prolonged in the FICNB group. The FICNB group had the first analgesic request after 417.50 minutes, and the control group after 139.25 minutes .

Conclusion:-

To conclude, the ultrasound guided FICNB could relieve pain during the first 24-hour postoperative period, decrease the total postoperative analgesic consumption in 24 hours, and significantly prolonged the time for the first analgesic requirment after femoral bone fracture surgery. We recommend FICNB for postoperative analgesia after surgery for femoral bone fracture .

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