ULTRASOUND GUIDED PAIN CONTROL VERSUS STANDARD TREATMENT IN EMERGENCY DEPARTMENT HIP FRACTURE PATIENTS

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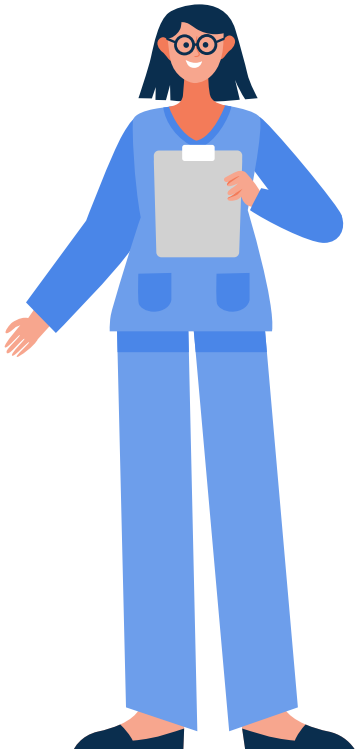
Introduction



Clinical Trial Aim: To assess pain management of hip fractures in an Emergency Department setting and determine possibilities for higher safety and better efficacy

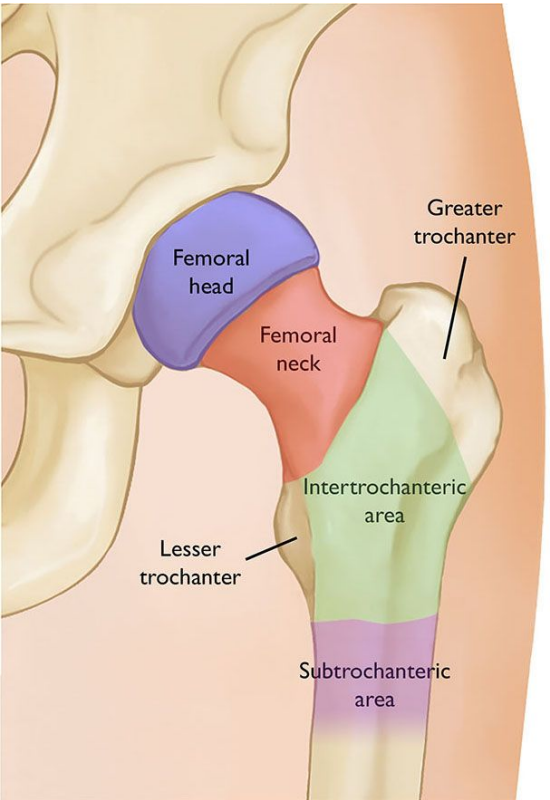
- Is the procedure safe in the ED?
- Is pain controlled better with the nerve block vs. IV Morphine?
- Which nerve block is most effective? (UFNB vs. UFIB)

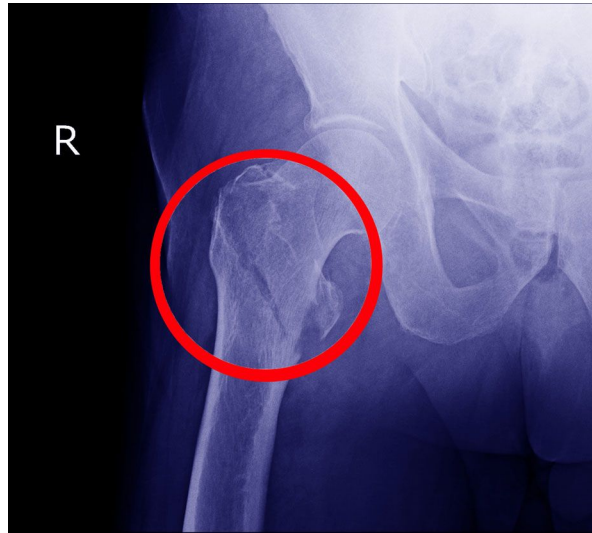
Primary measurable outcome: Participant's pain score at 30 minutes post-administration of pain control treatment

Hip Fracture

Hip fracture - A partial or complete break of the femur at the hip area

- Most common types: Introchanteric and Femoral Neck
- Patients are typically elderly and female
  - Risk increases with age because of loss of bone density and muscle mass
  - Osteoporosis

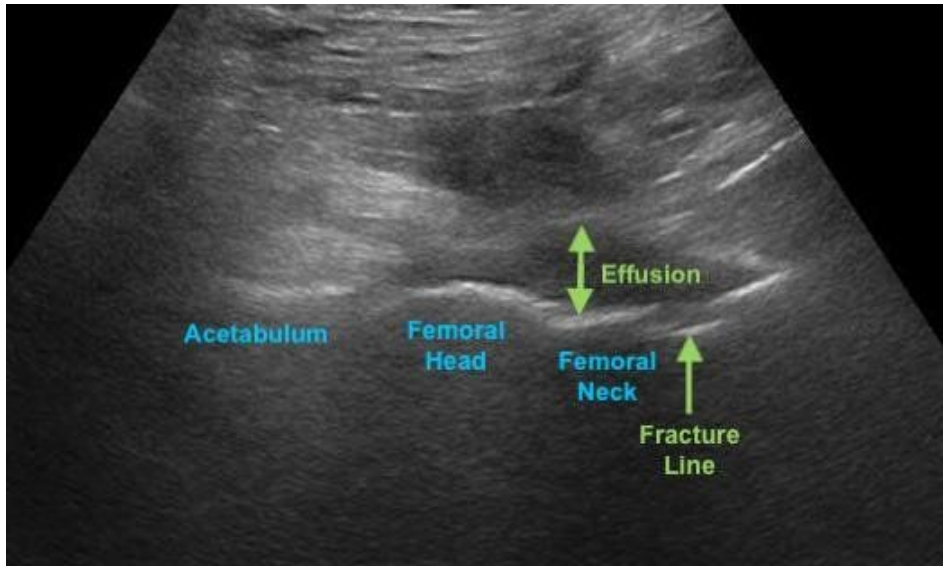




Ultrasound

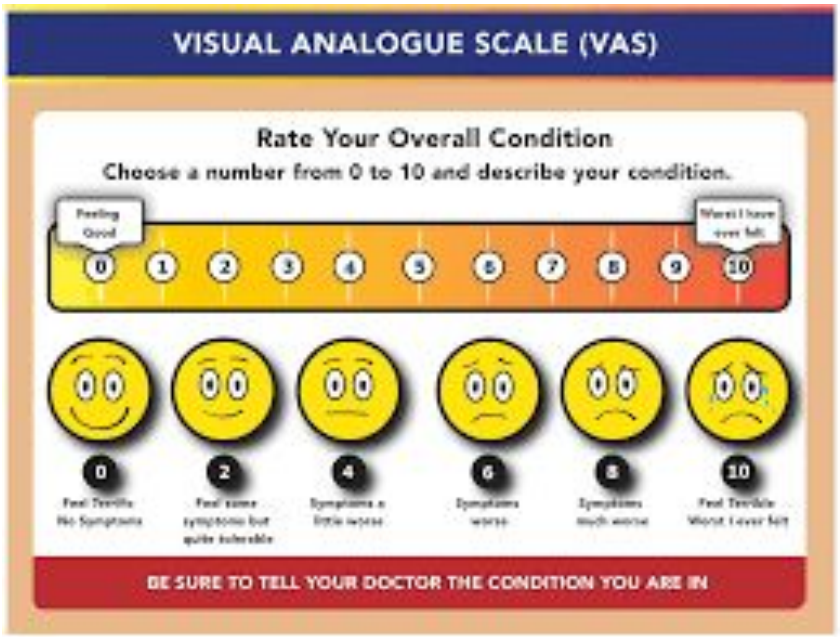
- Noninvasive imaging test
  - Distinguishes between soft tissue and bone injuries
  - Bone is highly reflective, and previously ultrasounds have not been considered for diagnosis as the bone itself isn't seen
  - If there is a "black region" or an effusion around the bone one can assume the bone is bleeding and can lead to diagnosis of hip fracture

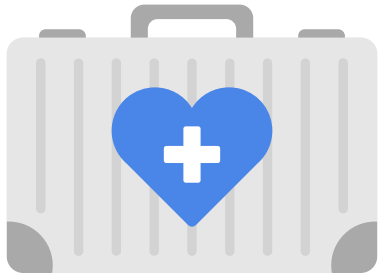
<u>Benefits:</u> low costs, versatile imaging, higher accessibility, less risk, decreased time between diagnosis and treatment



Pain Management

- Measure of pain: VAS Scale
  - On a scale from 1-10; 1 = no pain at all and 10 = worst most excruciating pain
  - A score of 5 was deemed as moderate pain
- Morphine
  - Decreases heart rate, blood pressure, and venous return - continuously monitored
  - Complications: delirium, hypotension, respiratory depression, cyanosis
  - IV Morphine
- Ultrasound guided peripheral nerve blocks (UPNBs)
  - Needles and imaging are used to give anti-inflammatory or pain relieving drugs around a nerve
    - Better results with imaging versus anatomic landmarks to administer nerve block
    - Opioid-sparing effects and reduction of opioid-related adverse effects
  - Innervation of the hip joint: femoral, obturator, and superior gluteal n.



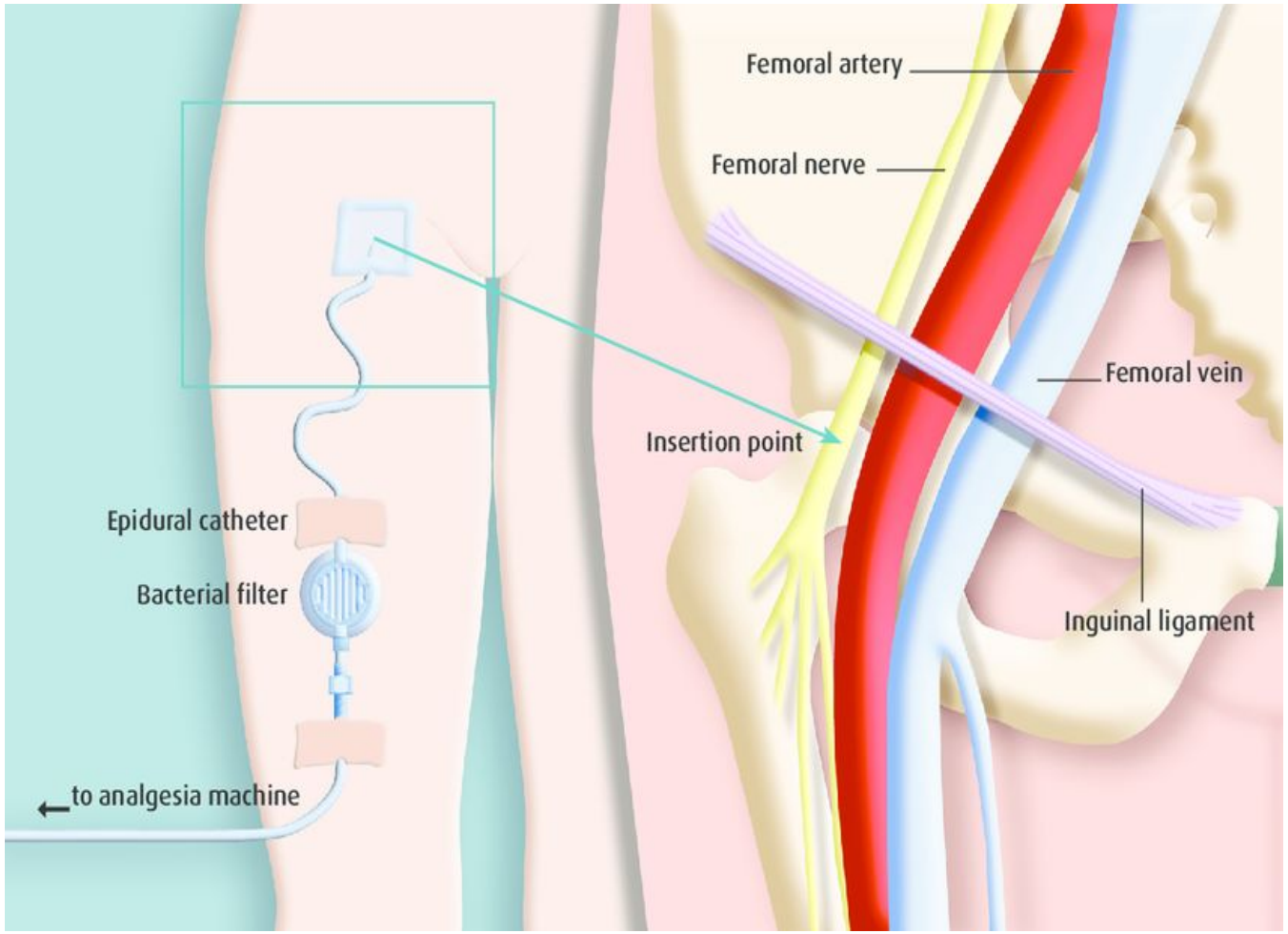


Mechanism of Action

Ultrasound guided 3-in-1 femoral nerve block (UFNB)

The Ultrasound guided femoral nerve block was performed by locating the femoral nerve below the waist; The site of injection was directly below the inguinal ligament and left of the common femoral artery

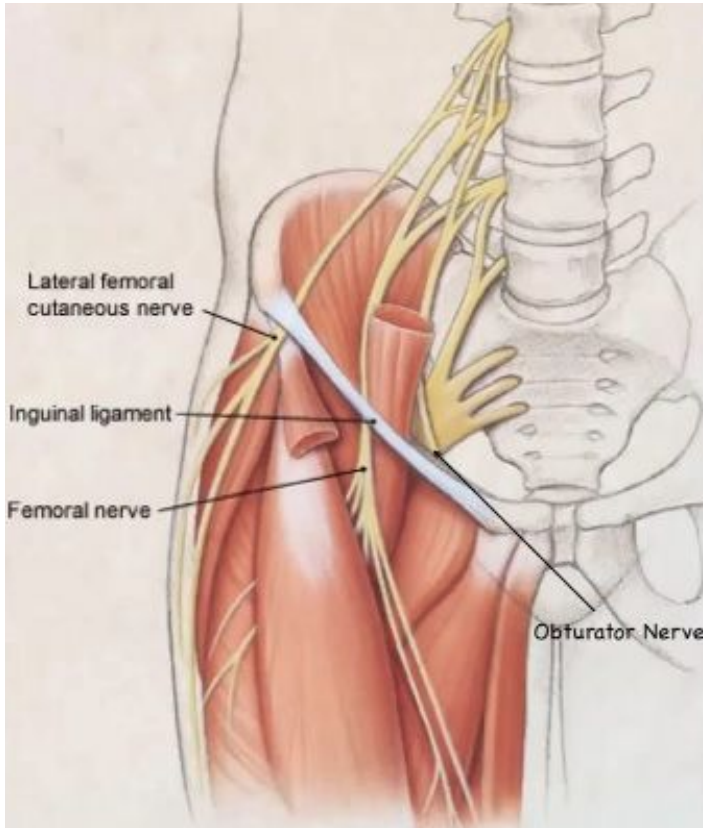
-Known as a 3-in-1 block due to how it provides regional anesthesia to the femoral, obturator, and lateral cutaneous nerves

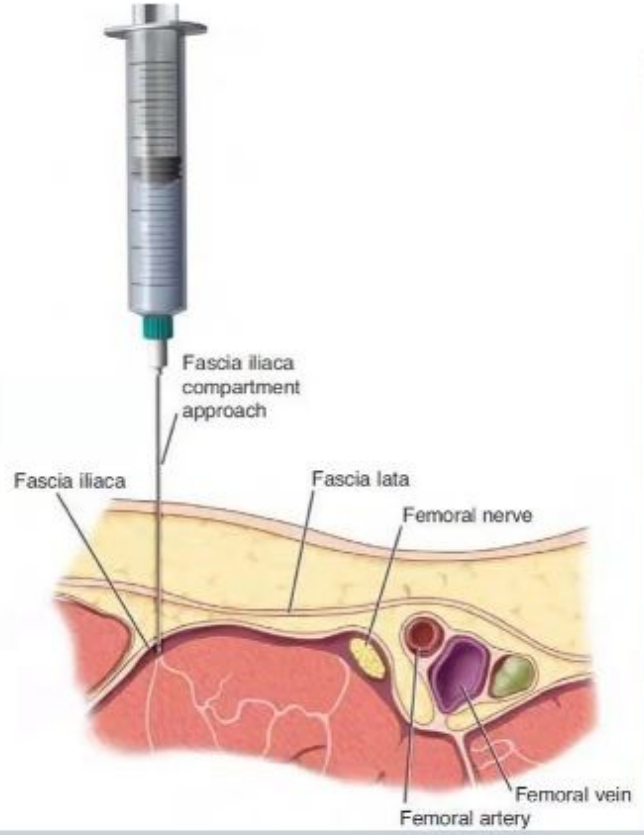


Mechanism of Action

Ultrasound guided fascia iliaca compartment block (UFIB)

For the UFIB, the two fascial planes, the fascia lata and the fascia iliaca, were made visual using an ultrasound probe. The two facial planes are located just below the inguinal ligament and one-third of the distance from the anterior superior iliac spine to the pubic tubercle.





★ Fascia is **a thin casing of connective tissue that surrounds and holds every organ, blood vessel, bone, nerve fiber and muscle in place**.

★ The fascia lata (FL) is **a fascial plane that surrounds the deep tissues of the thigh**.

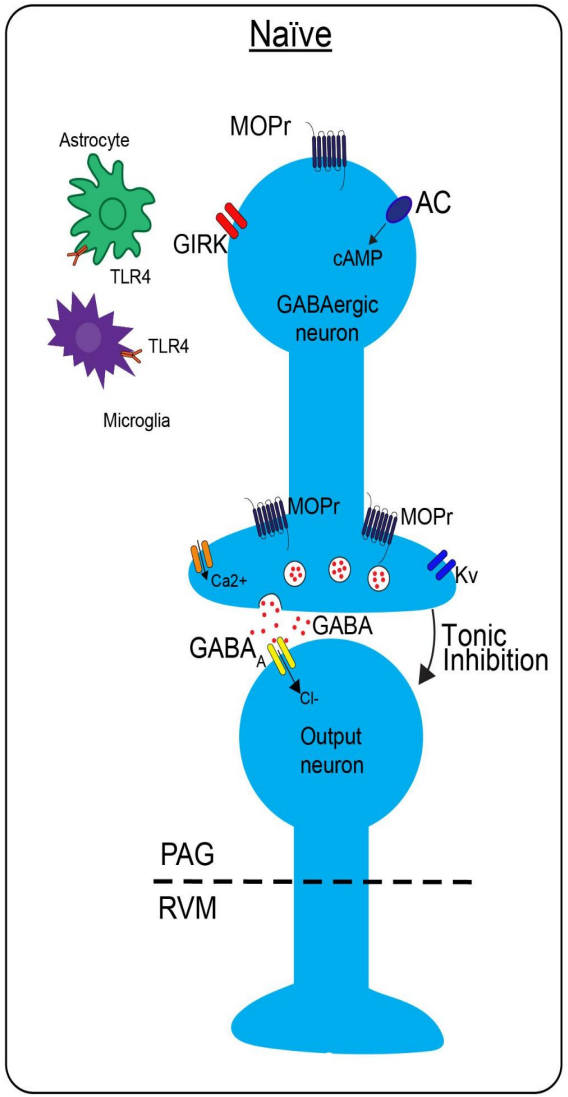
★ The iliac fascia **is a fascia in the region of the ilium of the pelvis.**

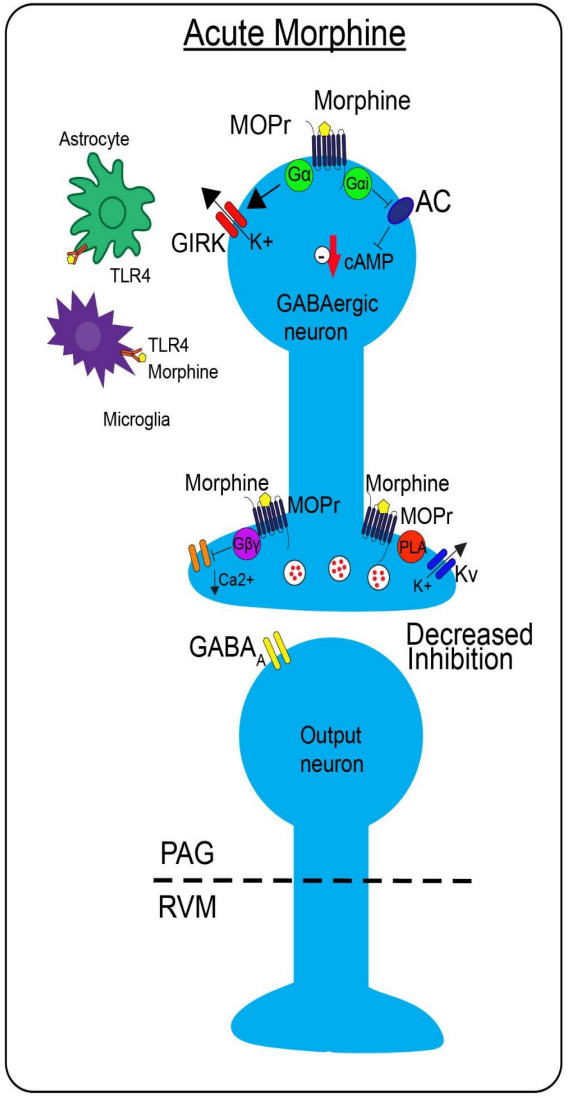
Mechanism of Action

Intravenous Morphine Sulfate (IVMS)

IV Morphine patients were administered 0.1mg/kg of morphine upon arrival. After radiographs confirmed the participant had a hip fracture, they were administered a second dose of morphine (0.1mg/kg).

- Relieves moderate to severe pain
  - Opiate analgesic
- Changes how the brain responds to pain: activates descending inhibitory pathways of the CNS and inhibition of nociceptive afferent neurons of the PNS





Study Goals, Hypothesis, and Objectives

Hypothesis

- The study set to figure out the effectiveness of treating hip fracture pain through the use of ultrasound guided nerve blocks or intravenous morphine sulfate; and whether or not there was a significant decrease of pain with ultrasound guided nerve block compared to normal pain relief methods, including intravenous morphine.

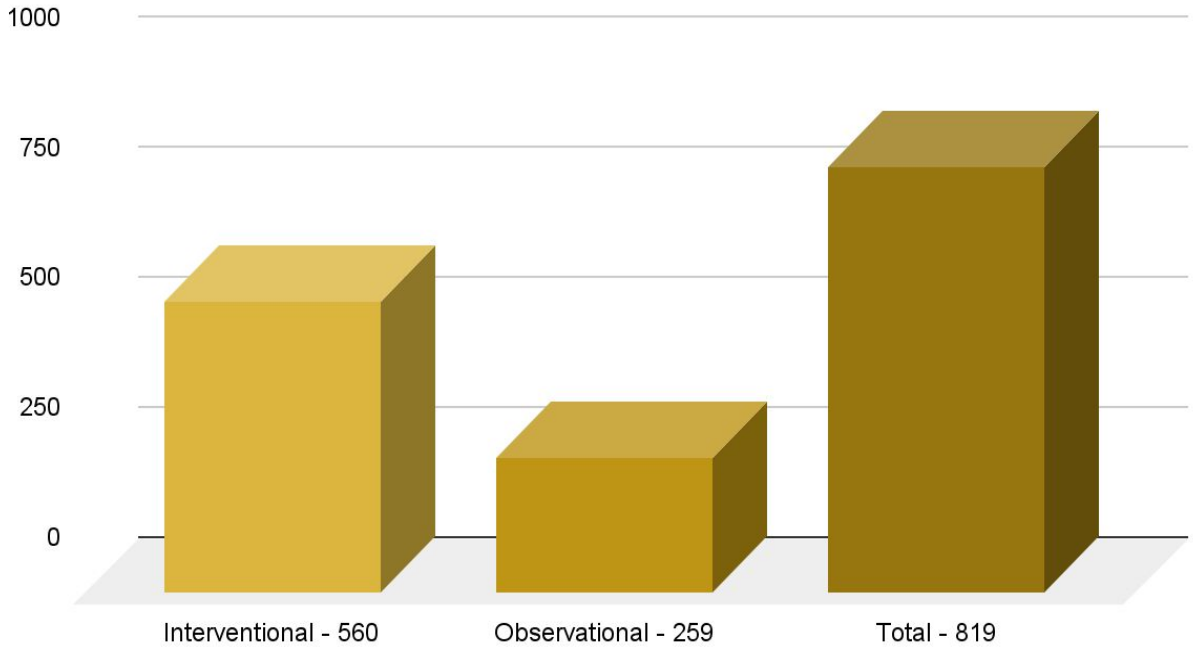
* there is no explicitly stated null hypothesis

Secondary Goals and Objectives

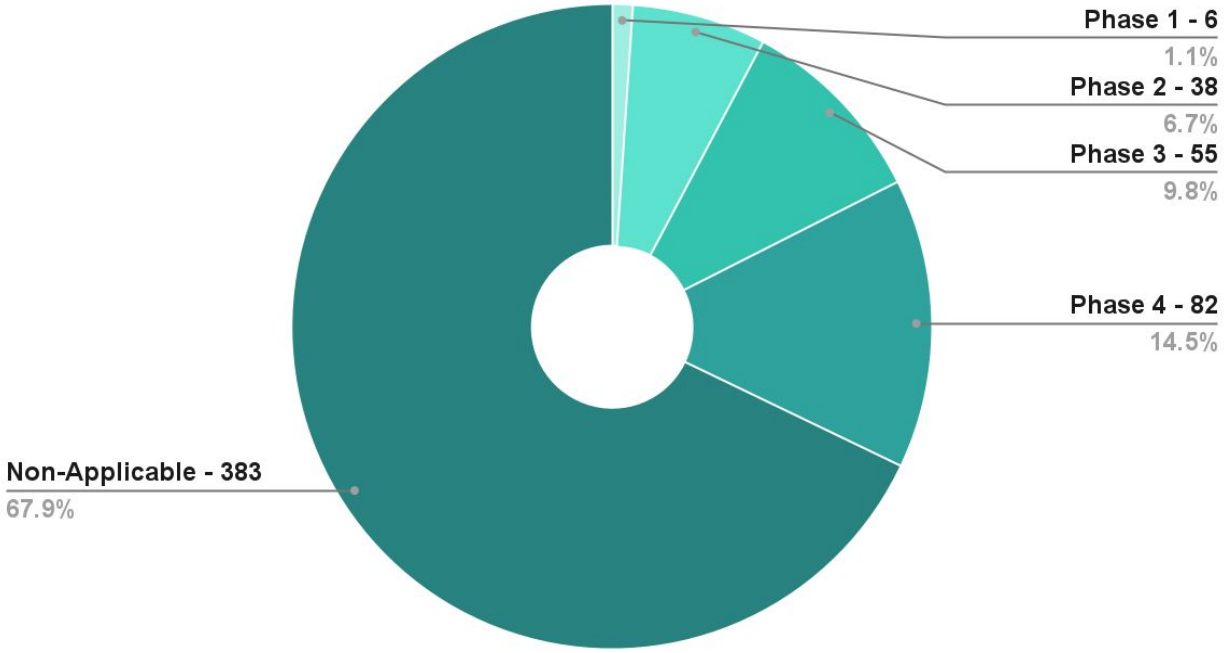
- The study also wanted to determine whether or not it is safe to perform UPNB in the emergency department, as well as which method of UPNB (UFNB or UFIB) is most effective in treatment by observing the relative pain patients experienced after treatment.

Clinical Trials Charts for Database Analysis

Study Classification



Study Phases



- The cross-section between the number of interventional studies and phase 4 studies equates to a selection of 14 studies.
- Out of the total 819 studies done, there is a 1.7% chance that the study has been FDA approved and there was an intervention used to attempt treatment of hip fractures.

- There were more trials done that used a mechanism of intervention than just observing topics related to hip fracture.

Study Design & Layout

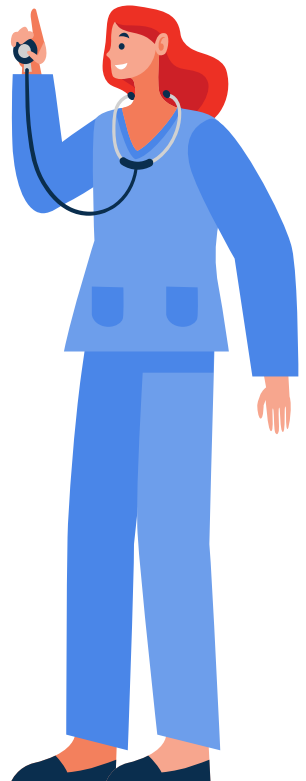
Study Type	Interventional Trial using a convenience sample of participants
Study Phase	Phase 4
Study Length	October 2008- August 2010
Interventional Model	Parallel Assignment using… 1) Ultrasound guided femoral nerve block 2) Ultrasound Guided Fascia Iliaca Compartment Block 3) Intravenous Morphine Sulfate

Participant Criteria

- English speaking patients
- Older than 18 years of age
- Radiographic evidence of a hip fracture injury
- Patient must be awake, alert, and well oriented
- Must rate their pain greater than 5 out of 10 on the Numerical Rating Scale

Exclusion Criteria

- Any cognitive deficit
- Any allergies to amide-type local anesthetic or morphine
- Participant presents with more injuries than just a hip fracture



Study Design

64 Participants enrolled in the trial

- Ultrasound Guided 3-in-1 Femoral Nerve Block
  - 24 Participants total
    - 17 Females
    - 7 Males
    - Average age was 82
- Ultrasound Guided Fascia Iliaca Compartment Block
  - 20 Participants total
    - 11 Females
    - 9 Males
    - Average age was 82
- Intravenous Morphine Sulfate
  - 20 Participants Total
    - 13 Females
    - 7 Males
    - Average age was 85

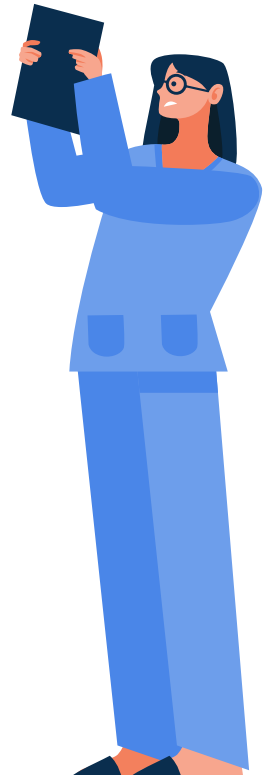
- All 64 Participants completed the trial; some participants provided incomplete data

STUDY DESIGN

Each trial group followed the same study design.

1. Participants rated their pain on a scale of 1-10 prior to any treatment being administered
2. Participants received one of the following treatment options; UFNB, UFIB, or IVMS
3. The patients were asked to re-evaluate their pain on the numerical rating scale 30, 60, 120, and 240 minutes post treatment

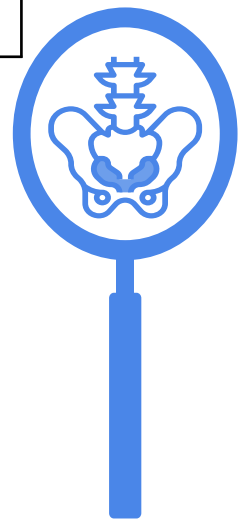
4. At the 240 minute mark, patients were evaluated for any adverse effects to the treatment
5. If no adverse effects were present, the participant was monitored for another 240 minutes; Participants were monitored for 480 minutes total



Results

X Minutes Post Treatment	Ultrasound guided 3-in-1 femoral nerve block (UFNB) Pain Score	Ultrasound guided fascia iliaca compartment block (UFIB) Pain Score	Intravenous Morphine Sulfate (IVMS) Pain Score
Prior to Treatment	5.17	5.50	6.98
30 Minutes	1.94	2.05	5.13
60 Minutes	2.58	1.90	4.40
120 Minutes	2.65	1.30	4.00
240 Minutes	3.15	1.72	4.83
480 Minutes	3.20	2.35	3.74

- **120 Minutes:** Pain score was not obtained for one patient in the IVMS group
- **240 Minutes:** Pain score was not obtained for one patient in the UFNB group
- **480 Minutes:** Pain scores were not obtained for four patients in the UFNB group, three patients in the UFIB group, and three patients in the IVMS group
- There were no adverse events nor mortalities reported in any of the three trial groups as a result of the treatment



Data Interpretation

Hypothesis: Do UFNB, and IFIB nerve blocks show greater efficacy in pain management than IV morphine?

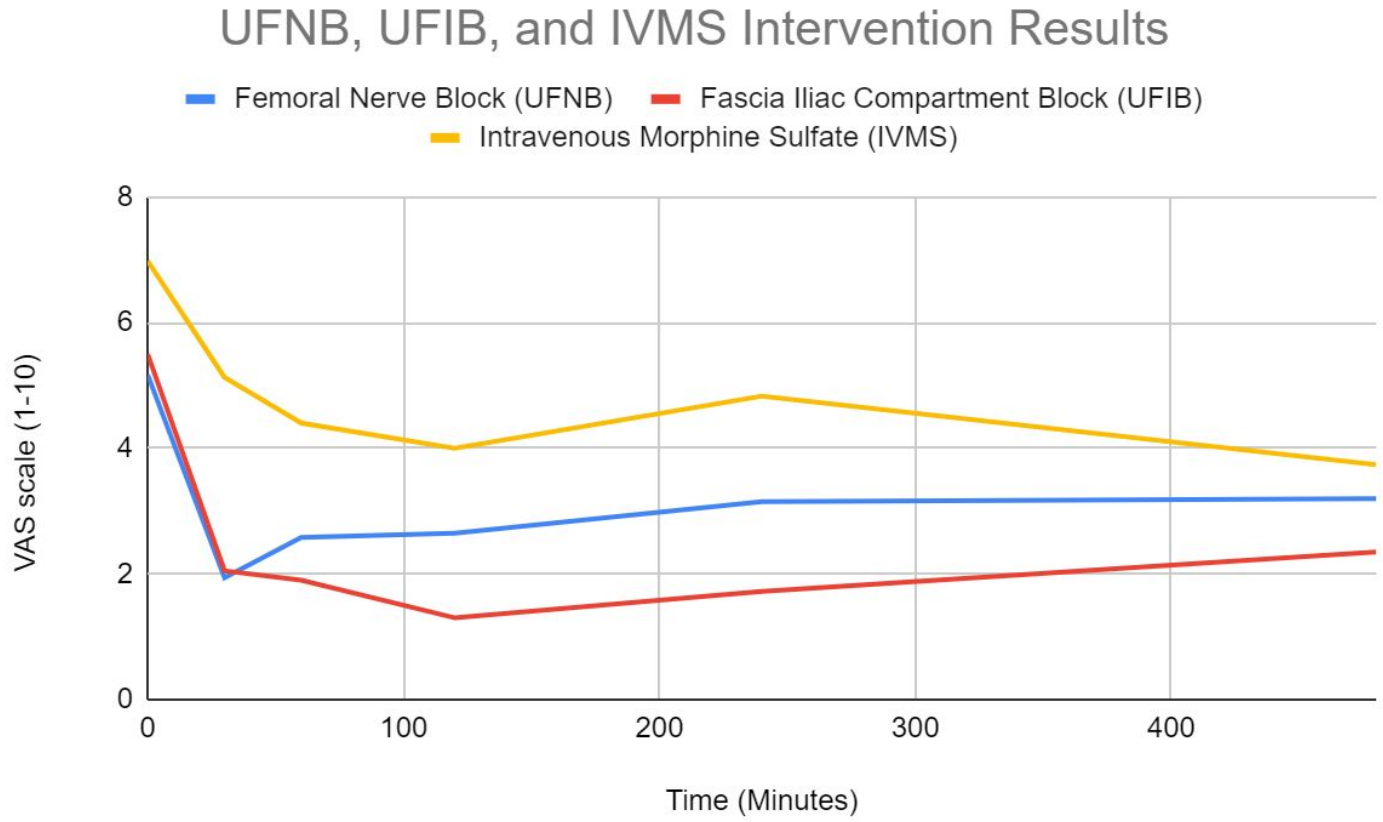
1) Greater short term analgesic effects noted in nerve blocks compared to IVMS.

2) UFNB and UFIB fastest in rate of pain reduction (VAS/min) at primary measurable outcome of 30 mins.

3) UFNB greatest increase in pain after 30 mins, Least effective out of any intervention at pain abatement over testing interval.

4) Morphine proved to be most effective in reducing pain over 8 hours. Acting less quickly but having the greatest total pain reduction.

5) Both nerve blocks show increasing pain over time interval. IVMS only intervention with decreased pain over time.



Rate of change from 30 mins to 8 hours::

IVMS → (3.74 - 5.13)/ 480 - 30 = - .003 VAS/Min

UFNB → (3.20 - 1.94)/ 480 - 30 = +.003 VAS/Min

UFIB → (2.35 - 2.05)/480 - 30 = +.0006 VAS/Min

Supplemental literature

Article #1

Ultrasound-guided continuous femoral nerve block vs continuous fascia iliaca compartment block for hip fracture in the elderly.

Methods: Randomized control trial involving 60 elderly patients undergoing a hip replacement were assigned to receive either continuous femoral nerve block or continuous fascia prior to the procedure.

UFNB (6hrs)	UFIB (6hrs)	UFNB (12hrs)	UFIB (12hrs)	UFNB (24hrs)	UFIB (24hrs)	UFNB (48 hrs)	UFIB (48hrs)
1.0 -1.3	.5 - .8	.8 - 1.1	.7 - .8	.5 - .7	.6 - .8	.2 - .6	.3 - .7

Relevance: The aim of this study was to compare effectiveness of the femoral and iliac nerve blocks without the use of morphine. Consistent with data from our previous study, Fascia Iliac Compartment Block has the lowest VAS score and greatest short term analgesic efficacy. However, this study measures pain outcomes over a 48 hour interval revealing lower pain scores for UFNB at upper time limits.

Supplemental literature

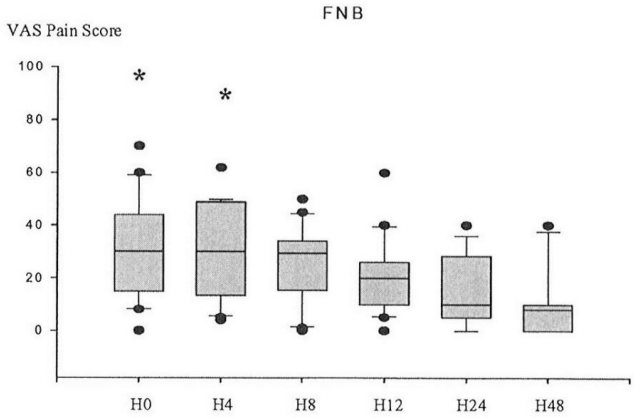
Article #2

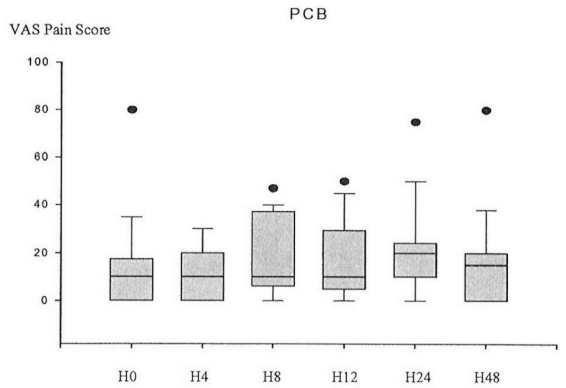
Comparison of intravenous patient controlled analgesia with morphine and single injection of femoral nerve or psoas compartment block.

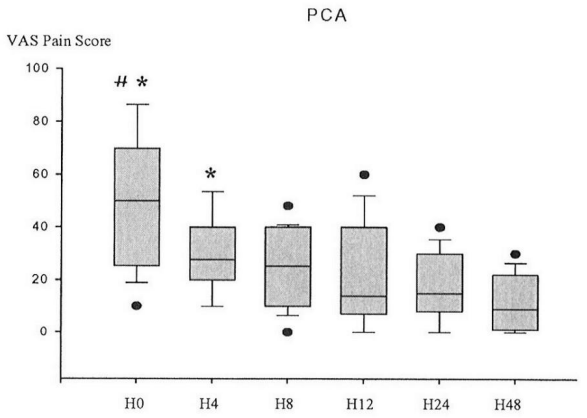
Methods: Double blind randomized control trial involving 45 patients assigned to patient controlled morphine (PCA), femoral nerve block (FNB), or psoas iliac compartment block (PCB).

Results: Measured pain on VAS scale over a 48 hour interval. Data is organized into three box plots with varying degrees of pain measured.

Relevance: Psoas iliac block reveals lowest VAS pain scores of the three interventions. Corroborating data from the second study, FNB shows a surprising reduction in pain after the 24hr mark.







Room for Improvement

- Compare different dose options of each drug administered in the body
- State the degree of the hip fracture within the experiment to compare the severity of each participant's case
- Acknowledge the effects of being in the Emergency Department, along with the risks of nerve blocks
- Use a less subjective way to measure pain or discomfort.
- Use the same number of participants with similar demographics for all treatments, and have the same number of participants in each group

Next Steps in Terms of Relevance to Clinical Practice

- According to the study, the type of relief the patient wants best determines which nerve block they should receive
  - Want instant fast relief?
    - Nerve block within the first 30 min has the highest decrease of pain
  - Want lasting relief?
    - Morphine would provide the most lasting relief, but…
- This study discourages the need for morphine to be used in such cases in the ED, as there's shouldn't be a need for patients to be there that long.
- We believe this study could do significantly better and should not be put into effect without further investigation
- Thorough studies should be continued to determine if the classic use of morphine is the best treatment plan for emergency department patients