A Randomized Controlled Trial of Ultrasound Guided Knee Genicular Nerve Block and Anterior Femoral Cutaneous Nerve Block for Primary Total Knee Arthroplasty

FUNDER: Anesthesiology Research Department

PROTOCOL NO.: 2023-0063

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PROTOCOL SYNOPSIS

Protocol Title:	A Randomized Controlled Trial of Ultrasound Guided Knee Genicular Nerve Block and Anterior Femoral Cutaneous Nerve Block for Primary Total Knee Arthroplasty
Protocol Number:	2023-0063
Protocol Date:	5/23/2023
Sponsor:	Anesthesiology Department
Principal Investigator:	Jiabin Liu, MD/PhD
Products:	N/A
Objective:	The purpose of this study is to conduct a randomized controlled trial on patients undergoing unilateral total knee arthroplasty to assess the benefits of adding genicular and anterior femoral cutaneous nerve block.
Study Design:	Randomized Clinical Trial
Enrollment:	244
Subject Criteria:	Inclusion: • patients age 18-80 • patients undergoing ambulatory unilateral total knee arthroplasty, including 23 hours stay cohort • ASA I-III • BMI < 35
	Exclusion: • history of chronic pain syndromes • chronic opioid use (daily morphine milligram equivalents > 30 mg for at least 3 months) • contraindication to peripheral nerve blocks • contraindication to neuraxial anesthesia • history of peripheral neuropathy or pre-existing neurological deficits • Psychiatric or cognitive disorder that prohibit patient from following study protocol • allergy to local anesthetic or study medications • multiligament surgery • history of substance abuse • infection at the site of injection • chronic kidney disease
Study Duration:	• 2 years

Data Collection:	**Sources:** EPIC, Medical Records, and Patient Reported. **Variables:** Name, MRN, DOB, Race, Ethnicity, Gender, Height, Weight, BMI, phone number, comorbidities, medications to manage existing conditions, surgery details, anesthesia details, opioid consumption, NRS pain scores, length of PACU stay, time to meet discharge, nerve block success, brief pain inventory, patient satisfaction, analgesic duration of the blocks, time of discontinuing opioids, bang blinding index
Statistical Analysis:	Proposed analysis: Two sample t-test (two-sided) Chi-square test (two-sided) proportion Interim analysis planned? No Alpha level: .025 Beta or power level: .80 Number of groups being compared: 2 Resulting number per group: 122 Total sample size: 244

1.0 INTRODUCTION

Adductor canal nerve block (ACB), infiltration between the popliteal artery and the posterior knee capsule (IPACK), with or without peri-articular infiltration of local anesthetics (PAI), is the current standard of practice for analgesia coverage after total knee arthroplasty at the Hospital for Special Surgery. However, we frequently see patients with moderate post-operative knee pain, particularly on the anterior, middle, and lateral sides of the knee. There is limited clinical research on if adding a genicular nerve block could offer TKA patients a more complete analgesia.

2.0 OBJECTIVE OF CLINICAL STUDY

This study will test if the addition of genicular nerve block (including superolateral genicular nerve, superomedial genicular nerve, inferomedial genicular nerve, and nerve to vastus intermedius) and anterior femoral cutaneous nerve block could offer TKA patients a more complete analgesia. The primary outcomes of interest are the numerical rating scale (NRS) pain score, measured as the worst pain experienced, in the PACU and total opioid consumption within the first 24 hours of surgery. Secondary outcomes of interest include post-operative opioid use (up to 7 days) and readiness for home discharge.

3.0 STUDY HYPOTHESES

Hypothesis 1: There is no relationship between adding genicular nerve block and anterior femoral cutaneous nerve block to provide more complete analgesia and the use less oral and intravenous medication after TKA.

Hypothesis 2: There is no relationship between the addition of genicular nerve block and anterior femoral cutaneous nerve block and reduced opioid consumption.

4.0 STUDY DESIGN

4.1 Study Duration

2 years

4.2 Endpoints

4.2.1 Primary Endpoint

- The average pain score in the post-anesthesia care unit
- The cumulative opioid consumption within the first 24 hours after surgery

4.2.2 Secondary Endpoints

- The average pain score at 24 & 48 hours after surgery
- Cumulative opioid consumption at 24, 48, and 168 hours after surgery
- The severity of pain and impact on functioning in the PACU and 168 hours after surgery
- Patient satisfaction with pain management in the PACU and 168 hours after surgery
- Time of discharge
- Bang blinding index

4.3 Study Sites

Hospital for Special Surgery – Main Campus

5.0 STUDY POPULATION

5.1 Number of Subjects

A total of 244 subjects will be enrolled.

5.2 Inclusion Criteria

Subjects of either gender will be included if they:

- patients age 18-80
- patients undergoing ambulatory unilateral total knee arthroplasty, including 23 hour stay cohort
- ASA I-III
- BMI < 35

5.3 Exclusion Criteria

Subjects will be excluded from the study if they:

- history of chronic pain syndromes
- chronic opioid use (daily morphine milligram equivalents > 30 mg for at least 3 months)
- contraindication to peripheral nerve blocks
- contraindication to neuraxial anesthesia
- history of peripheral neuropathy or pre-existing neurological deficits
- Psychiatric or cognitive disorder that prohibits patient from following study protocol.
- allergy to local anesthetic or study medications
- multiligament surgery
- history of substance abuse
- infection at the site of injection

- chronic kidney disease

5.4 Randomization

A computer-generated, 1:1 ratio randomization schedule with blocks of sizes 4 and 6 will be created by a statistician not otherwise involved in the study. Participants will be randomized to 1 of 2 groups:

- Group 1 Standard Total Knee Arthroplasty
- Group 2 Genicular Total Knee Arthroplasty

6.0 PROCEDURES

6.1 Surgical Procedure

Total Knee Arthroplasty/Replacement

6.2 Medical Record Requirements

EPIC

6.3 Data Collection

The following data will be collected:

Pre-operative/Baseline

- basic demographic data
- patient weight & height, BMI

Surgical procedure

- date of surgery
- type of surgery
- surgery details
- anesthesia details

Follow-up visits (PACU, POD1, POD2, POD7)

- Medication intake
- Numerical Rating Scale (NRS) Pain Score
- Brief Pain Inventory
- Analgesic duration
- Patient satisfaction
- Opioid discontinuation

6.4 Schedule of Assessments

Procedures	Pre-Op	Day of Sugery	PACU	POD 1	POD 2	POD 7
Identify eligible patients on schedule	X					
Introduce study to patient	X	X				
Randomization		X				
Obtain consent		X				
Administer Intervention		X				
NRS Pain Score		X	X	X	X	X
Brief Pain Inventory		X				X
Analgesic Duration				X	X	X
Patient Satisfaction			X			X
Opioid Discontinuation						X
Bang Blinding Index						X

7.0 STATISTICAL ANALYSIS

Proposed analysis:

Two sample t-test (two-sided)

Chi-square test (two-sided) proportion

Interim analysis planned? No

Alpha level: .025

Beta or power level: .80

Number of groups being compared: 2

Resulting number per group: 122

Total sample size: 244

8.0 ADVERSE EVENT ASSESSMENT

All Adverse Events (AEs) will be reported in the final study report. Definitions for Adverse Event (AE) used in this study are listed below and are based on FDA and international guidelines:

8.1 Adverse Event (AE)

Any untoward medical occurrence in a patient or clinical investigation subject administered a pharmaceutical product which does not necessarily have to have a causal relationship with this treatment. An adverse event (AE) can therefore be any unfavorable and unintended sign (including an abnormal laboratory finding, for example), symptom, or disease temporally associated with the use of a medicinal (investigational) product, whether or not considered related to the medicinal (investigational) product.

8.2 Serious Adverse Events (SAE)

The event is serious and should be reported to FDA when the patient outcome is:

Death, Life-threatening, Hospitalization (initial or prolonged), Disability or Permanent Damage, Congenital Anomaly/Birth Defect, Required Intervention to Prevent Permanent Impairment or Damage (Devices), Other Serious (Important Medical Events).

8.3 Adverse Event Relationship

Relationship to study: definitely, probably, possibly, not related.

9.0 INVESTIGATOR RESPONSIBILITIES, RECORD AND REPORTS

9.1 Subject Consent and Information

Research assistants will screen the co-investigating surgeons' patients undergoing ambulatory total knee arthroplasty surgery. Screening will involve reviewing the patient's EPIC chart to ensure that they meet the inclusion criteria and are not excluded due to any of the exclusion criteria listed. Patients who meet the inclusion criteria will be identified as potential study participants. After the investigating anesthesiologists have confirmed the eligibility of all potential participants, one of the investigating anesthesiologists will approach the potential patients in the pre-operative holding area, explain the rationale for the study, and ask if the patient is interested in participating.

9.2 Subject Data Protection

Subject privacy and confidentiality will be maintained through the storage of study data in a password-protected computer database maintained by the Research Director and accessible only to the principal investigator, in addition to other IRB-approved study personnel. Each subject will be assigned a unique study number for identification in the study database. This unique study number will not be derived from or related to information about the individual. The key linking this unique study number to patient identifiers (i.e., name, medical record number, date of birth, registry number) will be maintained in a different password-protected database maintained by Research Director, to which only the primary investigator will have access.

9.3 Staff Information

Primary Investigator: Jiabin Liu, MD/PhD
Research Coordinator: Pa Thor, PhD, 646-797-8535
Research Assistant: Miriam Sheetz

9.4 Protocol Reviews

Study protocol reviewed and approved by:

- Anesthesiology CRP
- Hospital for Special Surgery Institutional Review Board

10.0 REFERENCES

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2. Kim DH, Choi SS, Yoon SH, Lee SH, Seo DK, Lee IG, Choi WJ, Shin JW. Ultrasound-Guided Genicular Nerve Block for Knee Osteoarthritis: A Double-Blind, Randomized Controlled Trial of Local Anesthetic Alone or in Combination with Corticosteroid. Pain Physician. 2018 Jan;21(1):41-52. PubMed ID: 29357330
3. Rambhia M, Chen A, Kumar AH, Bullock WM, Bolognesi M, Gadsden J. Ultrasound-guided genicular nerve blocks following total knee arthroplasty: a randomized, double-blind, placebo-controlled trial. Reg Anesth Pain Med. 2021 Oct;46(10):862-866. doi: 10.1136/rapm-2021-102667. Epub 2021 Jul 14. PubMed ID: 34261807