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Analgesic effect of adductor canal block combined with infiltration of the interspace between popliteal artery and the capsule of the knee (IPACK) block versus genicular nerves block in knee arthroscopy, a prospective randomized controlled study

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Abstract
Background: The management of pain following knee surgeries is constantly advancing, as more effective therapeutic approaches are being developed to enhance patient' satisfaction, clinical outcomes, and minimize the usage of opioids postoperatively. This research examined the pain-relieving effects of combining adductor canal block (ACB) with infiltration of the space between the popliteal artery and the capsule of the posterior knee (IPACK) block after surgery, in comparison to genicular nerves block, among individuals having knee arthroscopy.
Patient and Methods: Thirty-five patients randomized in each group; control group, genicular nerves block group and ACB combined with I significantly PACK block group. First 24h postoperative morphine consumption, time till 1st rescue analgesic request, Numeric Rating Scale (NRS) score, Time Up and Go (TUG) score, Medical Research Council (MRC) score and satisfaction of patients had been evaluated.
Results: 24h post op. morphine consumption was significantly reduced in GNB group contrasted to ACB+IPACK and control groups ($p< 0.05$). NRS at rest & mobility was lower in GNB group contrasted to ACB+IPACK and control groups at 4, 6, 12, 18 and 24h post operatively. Time till 1st rescue analgesic request was significantly longer in GNB group contrasted to ACB+IPACK and control groups ($p< 0.05$). TUG was significantly reduced in GNB group contrasted to ACB+IPACK and control groups ($p< 0.05$). According MRC, quadriceps muscle was more powerful in GNB group patients compared to IPACK+ACB and control patients, patient satisfaction was greater in GNB group contrasted to ACB+IPACK and control groups.
Conclusion: Genicular nerves block provided less postoperative morphine consumption, longer duration of analgesia, better muscle power and lower pain score at rest and mobility than IPACK combined with ACB in patients undergoing Knee arthroscopy.

Keywords: Adductor canal block, ultrasound, IPACK and genicular nerves block

Introduction
Effective perioperative pain treatment has been documented to facilitate accelerated rehabilitation and recuperation, hence providing improved functional outcomes among individuals following knee surgeries. As a result, there has been a need to create multimodal analgesic regimens that include the usage of both regional anesthetic and systemic analgesics. [1]

Knee arthroscopy is a frequently performed operation that is commonly done as day-case surgeries. A large percentage of well-chosen and well-informed individuals choose ambulatory arthroscopic surgeries of the knee [2, 3]. Studies have shown that a considerable proportion of individuals have moderate to severe pain within 24 hours following ambulatory surgeries, including knee arthroscopy [4, 5], This discomfort has a negative impact on the activity level and satisfactions of the patients [6].

The combination of IPACK and an ACB for analgesia following complete knee arthroscopy results in a slight motor block, little influence on postoperative muscle strength, and provides better pain relief compared to standard lower limb blocks [7].

The Genicular Nerves Block (GNB) has been developed as a new method to relieve pain after surgery in knee arthroscopy by effectively targeting the anterior knee capsule, as well as the medial and supero-lateral areas of the knee [8-9].

This research aimed to examine the analgesic impact of combining adductor canal block ACB with IPACK block, in comparison to genicular nerves block, among individuals having knee arthroscopy. The 24-hour postoperative opioids intake was the study's primary outcome. The study's secondary objective was to evaluate post-operative pain using Numeric Rating Scale (NRS) and the time until the first request for rescue analgesics.

Patients and Methods

This prospective randomized controlled double blinded work was performed in Tanta University Hospitals in Orthopedic operation theaters within one year from April 2022 to April 2023. Following permission from Institutional Ethics Committee (35236/1/22) and Clinical Trials registry (NCT05269095), each patient provided a well-informed written consent.

Grouping and Allocation

A total of 105 participants were included in this research and were split at random into three groups, each consisting of 35 individuals. The randomization process included the use of computer-generated random numbers that were hidden within sealed opaque envelopes. Group I (Control): Participants obtained spinal anesthesia only. Group II (GNB): Participants obtained spinal anesthesia and US guided Genicular nerves block. Group III (ACB – IPACK): The participants received spinal anesthetic and underwent ultrasound-guided Adductor canal nerve block, as well as infiltration of the space between the popliteal artery and the capsule of the posterior knee (IPACK) block.

The administration of all blocks was carried out by a single anesthesiologist, while the measurement procedures were conducted by another one who was unaware of the research groups and had no further involvement in the study.

Inclusion criteria

The research included participants between the ages of 21 and 60, either genders, who were classified as American Society of Anesthesiologists (ASA) physical status class I to III. These individuals had been planned to have elective unilateral knee arthroscopy under spinal anesthetic.

Exclusion criteria

The criteria for exclusion encompassed patient refusal, neurological deficiencies prior to surgery, chronic opioid users (Individuals who have been taking opioids for in excess of three months), people with chronic pain, significant respiratory and cardiovascular conditions, pre-existing major organ disorders including renal and hepatic impairment, co-existing hematological disorders, individuals who had abnormal coagulation parameters, psychiatric illnesses, and allergies to any of the medication utilized in the trial.

Anesthetic technique

Preoperative evaluation was conducted by a comprehensive process including patient interviews, clinical assessment, and standard laboratory testing. As part of the pre-anesthetic examination, all patients were introduced to the NRS. Prior to entering the operating room, participants were continuously monitored throughout all surgeries utilizing a 5-lead ECG, noninvasive blood pressure (NIBP), and pulse oximetry. Two intravenous lines were placed, and all participants were administered oxygen (4 L/min) via a face mask continuously throughout the whole procedure. Each patient had spinal anaesthesia in the L3/4 interspaces using a 2-3 ml solution of 0.5% (10-15 mg) hyperbaric bupivacaine and 25 µg fentanyl, administered with a 25G Quinke needle. The regional anaesthesia method was administered at the end of the procedure in accordance with the specific allocations of each group.

US guided Genicular Nerves Block technique [8]

Patients in group II were placed in a supine position, with the operated knee slightly flexed and the foot resting on a support placed on the table.

A 22G nerve block needle was advanced out of-plane, and 16 ml bupivacaine 0.25% was administered, placing 4 ml of this solution at each of the 4 target nerves.

The ultrasound transducer was placed along with the axis of the lower limb, in the region of the target nerves.

For the Superior medial genicular nerve (SMGN) block, the medial epicondyle of the femur and the adductor tubercle were located, followed by visualization of the pulse of the superior medial genicular artery. Administration of local anesthetics (LA) and observation of its spread in the vicinity of the artery were done. Figure (1-A)

For the Superior Lateral Genicular Nerve (SLGN) block, visualization of the pulse of the superior lateral genicular artery, then administration of LA in the vicinity of the artery were done. Figure (1-B)

For the Inferior Medial Genicular Nerve (IMGN) block, the medial tibial plateau and the insertion of the medial collateral ligament of the tibia around medial tibial epicondyle were located. After visualization of the pulse of the inferior medial genicular artery, LA was administered in the vicinity of the artery. Figure (1-C)

Finally, for the Inferior Lateral Genicular Nerve (ILGN) block, the transducer was moved until the inferolateral genicular artery pulsation was visualized, then administration of the LA in the vicinity of the artery was done. Figure (1-D).

US guided Adductor Canal Block (ACB): (figure 2-A)

Patients in group III received ACB in the supine position. The operated leg was externally rotated, the knee slightly flexed, and the thigh was prepared by betadine. The technique was performed using a high frequency ultrasound linear probe placed transversely in mid-thigh halfway between the anterior superior iliac spine and the patella, visualizing a short axis view of the femoral artery and saphenous nerve in the adductor canal. Femoral artery was identified underneath the sartorius muscle, with the vein inferior and the saphenous nerve lateral to the artery A 100 mm 22G block needle was inserted from the lateral side of the transducer using the in-plane technique through the sartorius muscle till the tip of the needle was just lateral to the artery and 16 ml of bupivacaine 0.25% was injected [10].

Technique of infiltration of the interspace between popliteal artery and the capsule of posterior knee block (IPACK): (figure 2-B)

The technique was performed using the ultrasound probe, the patient was placed in lateral position. The popliteal fossa

was prepared with betadine and the ultrasound probe was placed in the popliteal crease until the femoral epicondyles are visualized**.** The probe was then proximally moved until disappearance of the condyles and the shaft of the femur was visualized. At this level, the regional block needle was inserted in the medial thigh using in-plane technique between the popliteal artery and the femur until the needle was placed 1-2 cm beyond the lateral edge of the artery, and 16 ml of 0.25% bupivacaine was injected [11].

Each participant in all groups obtained postoperative analgesic regimen which consisted of ketorolac 30 mg every12 hours and paracetamol 1gm IV/6h. Rescue analgesia in the form of 0.05 mg/kg of morphine IV was administrated if NRS exceeded 3.

All patients remained in PACU room for about half an hour postoperatively for close observation after performing the regional anesthetic technique.

Measurements

Demographic information: (Age, sex, weight, ASA classification). The study measured the amount of opioids consumed by patients 24 hours after surgery (primary outcome) and the time until the first rescue analgesia was administered (secondary outcome). Postoperative pain was evaluated using the NRS, which ranged from 0 to 10. The assessments were conducted at 0, 2, 4, 6, 12, and 24 hours following the surgery, during resting as well as mobility. This evaluation was considered a secondary outcome. Post-operative mobility was evaluated at 12 and 24 hours after the block procedure using the Timed Up-and-Go test [12-13].We conducted a time measurement of the patient's performance in rising from a chair, walking a distance of 3 meters, executing a turn, and returning to the starting point. Every participant utilized a high walker equipped with arm support as an assistive aid throughout the exam. This test was conducted just if the patient considered themselves as able to get up and walk without the possibility of falling. The patients' quadriceps muscular strength was evaluated in the supine position using the Medical Research Council (MRC) scale. The power of the quadriceps muscle was evaluated 12 hours and 24 hours following the block by instructing participants to perform a straight leg raise [14]. The assessment was graded on a scale from 0 to 5, with grade 0 indicating no voluntary contraction, grade 1 indicating muscle flicker or slight contraction without limb movement, grade 2 indicating active movement only when gravity is eliminated, grade 3 indicating active movement against gravity with no resistance, grade 4 indicating active movement against gravity with some resistance, and grade 5 indicating normal motor power against resistance. Observation and treatment of any problems occurring during or after surgery were performed. Patient satisfaction was evaluated utilizing a 3-point satisfaction scale, with 1 indicating satisfaction, 2 indicating acceptable satisfaction, and 3 indicating dissatisfaction.

Statistical Analysis of the Data

The sample size and power analysis had been calculated utilizing the Epi-Info software statistical program developed by the World Health Organization and the Center for Disease Control and Prevention, located in Atlanta, Georgia, USA version 2002. The sample size calculation was based on the following criteria: The research aims to determine the predicted optimal postoperative analgesic intake amongst the best treatment group, which is anticipated to be 90%, contrasted to the least beneficial treatment group, which is predicted to be 60% at 95% confidence limit and 80% power. The sample size for each research group was determined to be N>33, according to the specified criteria described earlier. Each group consisted of 35 participants in order to account for any dropouts. The computer received input data and performed analysis utilizing IBM SPSS software package version 22.0, developed by IBM Corp in Armonk, NY. The quantitative data were represented as the mean value ± the standard deviation (SD). The qualitative data were presented in numerical form and percentages. The normality of the distribution was assessed using the Shapiro-Wilk test and by observing histograms.

Results

In this study, we assessed 115 patients for eligibility. Seven individuals were excluded from the trial due to failing to fulfill the requirements for inclusion, and three individuals chose to refuse to participate. A total of 105 patients were divided into three research groups, with 35 individuals in each and all of them received the planned intervention, and none of the patients was excluded from follow up or analysis in the 3 studied groups. (Figure 3)

Demographic information had been comparable between the three studied groups. (Table 1)

Regarding NRS as presented in figure (4), NRS at rest as was significantly reduced in GNB group and ACB+IPACK contrasted to control group with substantial reduced values in GNB group compared to ACB+IPACK group at 4,6,12,18 and 24h post operatively ($p< 0.001$). NRS at mobility was significantly reduced in GNB group and ACB+IPACK contrasted to control group with substantial reduced values in GNB group contrasted to ACB+IPACK group at 4,6,12,18 and 24h post operatively ($p< 0.001$).

First 24h post-operative morphine consumption, as presented in table (2), was significantly reduced in GNB group and ACB+IPACK contrasted to control group with substantial reduced values in GNB group contrasted to ACB+IPACK group ($p = 0.001$).

Time till 1st rescue analgesic, request as presented in table (2), was significantly longer in GNB group and ACB+IPACK contrasted to control group and substantially longer in GNB group contrasted to ACB+IPACK group ($p = 0.001$)

TUG as presented in table (2) was significantly shorter in GNB group contrasted to ACB +IPACK and control groups at 12h ($p = 0.001$) and 24h ($p = 0.001$) post operatively.

Quadriceps muscle strength presented by MRC score as shown in table (2) was significantly better in GNB contrasted to ACB+IPACK and control group at 12h ($p<0.001$) and 24h ($p = 0.008$) post operatively.

Regarding adverse effects in the 3 studied groups we observed no adverse effects in the control and GNB groups while foot drop was observed in 2 (5.7%) cases in the ACB+IPACK group. Foot drop was observed after 4-5 hours after performing the combined block. Once noticed, patients were put under close observation. The condition lasted for 3-4 hours. The clinical symptoms resolved fully. The participants were discharged on the second postoperative day.

Patient satisfaction was greater in the GNB group contrasted to in the ACB+IPACK group however no statistically significant difference was existed among the 2 groups

regarding satisfaction. The prevalence of satisfied patients was 15 (42.9%), 14 (40.0%) fairly satisfied and 6 (17.1) unsatisfied in the control group while the prevalence of satisfied patients was 28 (80%) and 7 (20%) fairly satisfied in the GNB group with no unsatisfied patients and the prevalence of satisfied patients was 21 (60%) and 14(40%) fairly satisfied patients with no unsatisfied patients in the ACB+IPACK group.

Discussion

Ensuring the best possible pain management after surgery is essential for the success of the procedure, both in terms of the well-being of people and in preventing a stress reaction and long-term consequences related to chronic pain. Effective pain management is an essential element for the success of fast-track surgical programs. The text is referenced by the number [15].

Arthroscopy is a surgical technique that involves the insertion of flexible tube with a camera into a joint via a small incision. The surgeon creates a second cut to allow the insertion of surgical tools for the purpose of removing or cutting out specific portions inside the knee while seeing via a scope [16].

Genicular nerve block (GNB) is a new and effective therapy option for relieving acute knee discomfort. This approach relies on the fundamental concept that by blocking the sensory nerve fibers connected to a painful structure, it is possible to reduce pain and restore normal function. The targets of this are the sensory nerves that are located on the periosteum prior to reaching the knee joint capsule [17].

The primary objective of the research was to examine the analgesic impact after surgery of combining an ACB with IPACK block, in contrast to using a genicular nerves block, in knee arthroscopy.

Our study results revealed that administrating genicular nerves block achieved lower 24h postoperative opioid consumption, longer time to 1st rescue analgesic request, lower NRS score, better muscle power and comparable satisfaction than administrating ACB in combining with IPACK blocks among patients underwent knee arthroscopy.

Explaining our results, the ACB primarily provides pain relief for the anterior and medial aspects of the knee joint, while the IPACK block provides analgesia for the posterior knee joint which ACB fails in. However, it is important to note that the IPACK+ACB technique may not fully address pain in other areas, such as the lateral aspects of the knee [18], on contrary, The Genicular Nerves Block (GNB) effectively covers the anterior knee capsule, as well as the medial and supero-lateral parts of the knee [9].

Multiple studies have assessed the impact of GNB in knee surgery. Akesen *et al*. performed research involving sixty participants to examine the effectiveness of the IPACK block and GNB in reducing the requirement for additional pain relief medication. According to their research, the GNB group had a decreased overall intake of morphine compared to both the IPACK group and the control group [19].

In a study conducted by Shifaat *et al*., the researchers examined 61 participants in order to determine the efficiency of combining us-guided ACB with IPACK versus ACB alone in managing postoperative pain among individuals undergoing knee arthroscopy. The study concluded that the combination of ACB plus IPACK is a superior method for controlling postoperative pain in arthroscopic ACL repair. The researchers determined that including IPACK into the ACB resulted in an extended period of pain relief and a significant decrease in the need for further pain medication [20].

Our research may be corroborated by Kampitak *et al*., who sought to assess the analgesic effectiveness of the IPACK and GNB or each alone nerve blocks when combined with continuous ACB in 72 individuals following total knee arthroplasty. According to the research, the IPACK group had a noticeably larger amount of intravenous morphine use compared to the GNB group. The IPACK + GNB group had the lowest opioid intake within the first 48 hours after the operation [21].

Regarding the comparison among the three groups that were examined, our research found a significant difference among the three groups we examined in terms of NRS at 6 hours and 12 hours, as determined by statistical analysis. The control group had the greatest NRS score, followed by the ACB+IPACK group, while the lowest score was seen in the GNB group at 6 hours and 12 hours.

As the basis for our research, a case study conducted by Zeng *et al*. that studied the efficacy of combining GNB with IPACK block for postoperative pain relief in total knee arthroplasty. The researchers determined that the combination of GNB and IPACK may effectively give pain relief in both the front and back of the knee joint. Additionally, both techniques contribute to longer-lasting postoperative pain relief and lower pain ratings 24 hours following surgeries [22].

In their study, Amin *et al*. compared the effectiveness of combining IPACK block with ACB versus using ACB alone in 60 individuals who underwent total knee arthroplasty. They found that individuals who obtained ACB with IPACK experienced reduced VAS scores in the first 48 hours after surgery compared to those who received just ACB [23].

In their study, Donghai *et al*. examined the effectiveness of combining ACB with other analgesic techniques for postoperative pain relief in 200 individuals who underwent total knee arthroplasty. They found that the group receiving both ACB and IPACK had decreased pain scores and a longer duration of pain relief compared to the group receiving only ACB [24].

Furthermore, in contrast to our findings, a comprehensive evaluation conducted by Albrecht *et al*. in 2021 shown that IPACK did not provide any apparent advantages when used with ACB for pain relief following total knee arthroplasty. According to the research, IPACK offers limited advantages in the short term, no benefits in the medium term, and its advantages in the long term have not been recorded. These findings indicate that the inclusion of IPACK to a multimodal analgesic approach for knee surgery is not very effective [25].

The findings of our study revealed a substantial statistical variance among the three groups examined in terms of TUG. The control group exhibited the longest duration, while the disparity between the GNB and ACB+IPACK groups was similar at 12 hours, but shorter in the GNB group at 24 hours. Furthermore, in relation to the MRC at 12 and 24 hours, a substantial and statistically significant disparity was seen among the three groups under investigation. The quadriceps muscular strength was superior in the GNB group contrasted to the ACB+IPACK group, while there was no statistically substantial distinction between the two groups. However, both groups showed

considerably improved quadriceps muscle strength contrasted to the control group.

As part of our research, Kukreja *et al*. conducted a retrospective analysis on 82 individuals in order to assess the effectiveness of combining GNB with ACB against using just ACB in total knee arthroplasty. According to their findings, the use of GNB in conjunction with ACB led to improved ambulation. Participant who had GNB had a substantially longer ambulation distance on postoperative day 1 (POD1) [26].

Shabayek *et al*. performed research involving fifty participants to compare the effectiveness of analgesia between ACB alone and ACB and IPACK block for knee surgery. The researchers determined that the combination approach of ACB + IPACK yields superior results in terms of increased walking distance and enhanced range of motion, as contrasted with using ACB alone [27].

In addition to corroborating our research, Eccles *et al*., who conducted a study on a sample size of 100 individuals, found that the usage of combined ACB and IPACK sensory blocks resulted in enhanced early ambulation and reduced duration of hospital stay, exceeding the benefits of using a femoral block in conjunction with a sciatic block. The proposal suggests that the patient's ability to walk immediately is facilitated by the active functioning of the quadriceps, hamstring, and ankle muscles, as well as the absence of any motor impairments, thanks to the use of IPACK and ACBs. However, the patient's ability to walk successfully is limited by the motor impairments caused by the femoral and sciatic nerve blocks [28].

A study by Padhy *et al*., who carried on their study 82 patients demonstrated that TUG test Time (sec) in the IPACK group was lower than the Sensory Posterior Articular Nerves of the Knee (SPANK) group and ACB with IPACK block offered better knee rehabilitation parameters in the immediate postoperative period following TKA contrasted to ACB with SPANK block [29].

Regarding adverse effects in the 3 studied groups, we observed no adverse effects in the control and GNB groups while foot drop was observed in 2 cases in the ACB+IPACK group. The foot drop was observed after 4-5 hours after performing the combined block. Once noticed, patients were put under close observation. The condition lasted for 3-4 hours then the clinical symptoms resolved fully. The participant was discharged on the second day postoperative with no residual motor deficit.

Considering the motor block in our investigation, the precise reason for quadriceps motor block following ACB remains incompletely comprehended, while it is believed to be associated with the diffusion of LA inside the adductor canal. Throughout an ACB, a regional anaesthesia is administered by injecting it into the fascial sheath that encloses the femoral artery and its branches in the adductor canal. The femoral nerve courses parallel to the femoral artery and emits a motor branch that innervates the quadriceps muscle. If the local anaesthesia extends to the femoral nerve' motor branch, it may cause transient weakening or paralysis of the quadriceps muscle. Multiple variables may impact the dissemination of LA throughout the adductor canal and the likelihood of motor blockage. These parameters include the volume and concentration of the local anesthetic utilized, the placement of the injection site inside the adductor canal, and individual variances in the anatomy of the femoral nerve and its branches **[31]**. For instance, Chen *et al*. documented a case where a patient had muscular weakness in her thigh and had no ability to extend her leg at the knee following undergoing ACB. An assessment of the patient's nervous and muscular system revealed that she had complete weakness in her quadriceps muscle. Additionally, she had a loss of sensation in the medial-anterior lower leg and the region in front of the knee up to the mid-thigh [31].

The findings of our study indicate a significant and statistically significant disparity in satisfaction levels across the three groups examined. The GNB group had a greater number of satisfied patients compared to the ACB+IPACK group. However, no statistically significant variation existed in satisfaction among the two groups.

Alparslan *et al*. provided support for our research by demonstrating a statistically singnificant disparity in satisfaction among patients between the IPACK and control groups, with the IPACK group exhibiting greater levels of satisfaction. [32].

A study by Padhy *et al*., demonstrated better patient satisfaction in the IPACK combined ACB than the SPANK combined with ACB group [29].

Our study had some limitations such as:

1. The sample size was relatively small so we recommend that Future research should ensure that their sample size is sufficiently large to yield significant findings and effectively account for confounding variables.
2. Our evaluation of patients was limited to 24 hours after the surgery. Studies should extend the duration of their follow-up period. 3- Our investigation is conducted at a single center.

Table 1: Demographic data in the three studied groups

	Control	GNB	ACB+ IPACK	Test of Sig.	p
Age (Years)	27.20±4.08	27.94±4.64	29.31±5.25	F=1.838	0.164
Gender					
Male (%)	27 (77.1%)	26 (74.3%)	26 (74.3%)	χ^2=0.102	0.950
Female (%)	8 (22.9%)	9 (25.7%)	9 (25.7%)		
Weight (kg)	74.06±7.31	72.14±6.22	73.17±5.95	F=0.755	0.472
ASA					
Class I (%)	20 (57.1%)	20 (57.1%)	21 (60%)	χ^2=0.292	0.990
Class II (%)	12 (343%)	11 (31.4%)	11 (31.4%)		
Class III (%)	3 (8.6%)	4 (11.4%)	3 (8.6%)		

Data presented as Mean ± SD or patient number and percentage.

F: F for One way ANOVA test

χ^2: Chi square test

Table 2: Comparison between the three studied groups according to total post-operative morphine consumption, time till 1st rescue analgesia, TUG score and MRC score at 12hr and 24hr.

		Control	GNB	ACB+ IPACK	P	P1	P2	P3
24h post-op. morphine consumption (mg)		11.13 ± 2.31	5.23 ± 1.91	8.72 ± 2.02	0.001*	0.001*	0.001*	0.001*
Time till 1st rescue analgesic request (min.)		577.0 ± 101.50	891.41 ± 132.62	660.57 ± 112.55	0.001*	0.001*	0.003*	0.001*
TUG (sec.)	12 h.	76.34±30.28	29.71±11.88	37.09±10.96	0.001*	0.001*	0.001*	0.123
	24 h.	72.23±23.77	26.03±8.51	38.40±11.31	0.001*	0.001*	0.001*	0.002*
MRC Grades 0\1\2\3\4\5	12 h.	0\2\20\13\0\0	0\0\5\19\11\0	0\2\5\13\15\0	< 0.001*	0.001*	0.001*	0.291
	24 h.	0\0\0\1\17\17	0\0\0\0\6\29	0\0\0\2\6\27	0.008*	0.009*	0.020*	0.355

Data presented as mean ± SD
- F: F for One way ANOVA test,
- Pairwise comparison bet. Each 2 groups was done using Post Hoc Test (Tukey)
P: p value for comparing between the three studied groups
p_1: p value for comparing between Control and GNB
p_2: p value for comparing between Control and ACB+IPACK
p_3: p value for comparing between GNB and ACB+IPACK
*: Statistically significant at $p < 0.05$

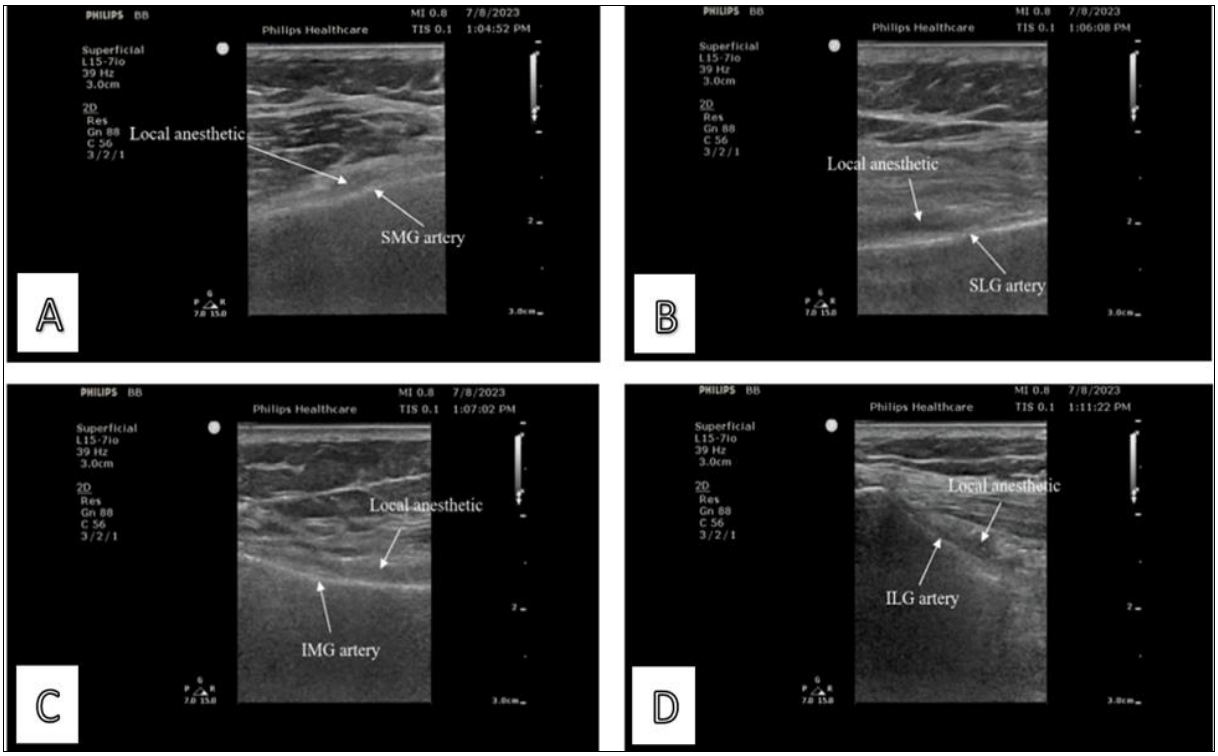


Fig 1: Genicular nerves block; A. US guided Supero-Medial Genicular Nerve block, B. US guided Supero-Lateral Genicular Nerve block, C. US guided Infero-Medial Genicular Nerve block, D. US guided Infero-lateral Genicular Nerve block

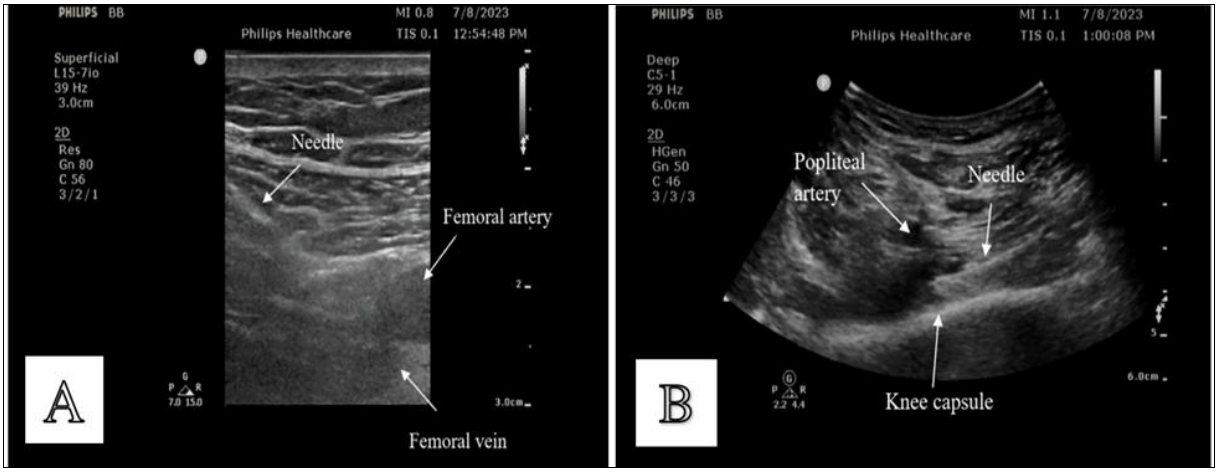


Fig 2: A. US guided adductor canal block. B. US guided IPACK block

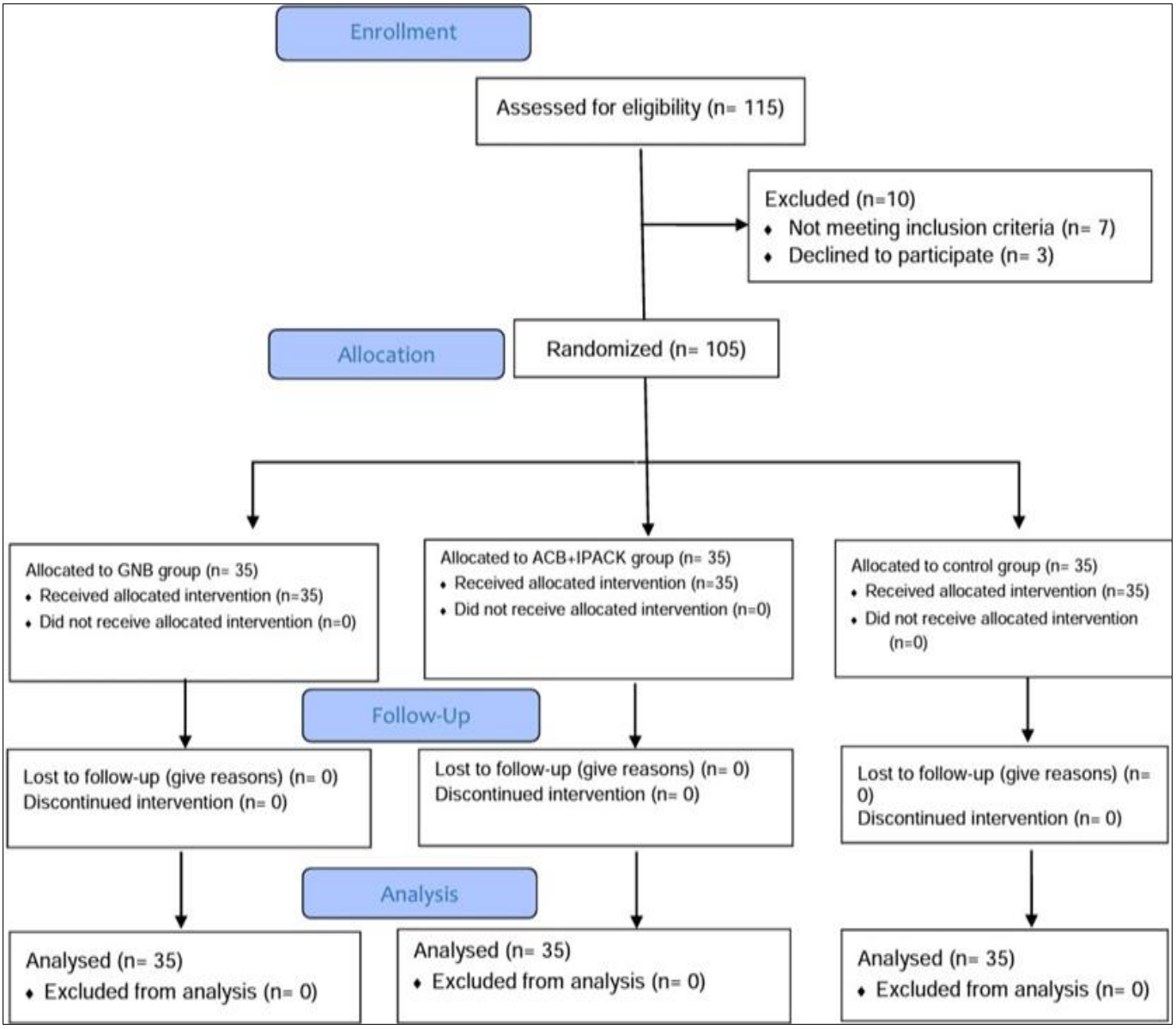
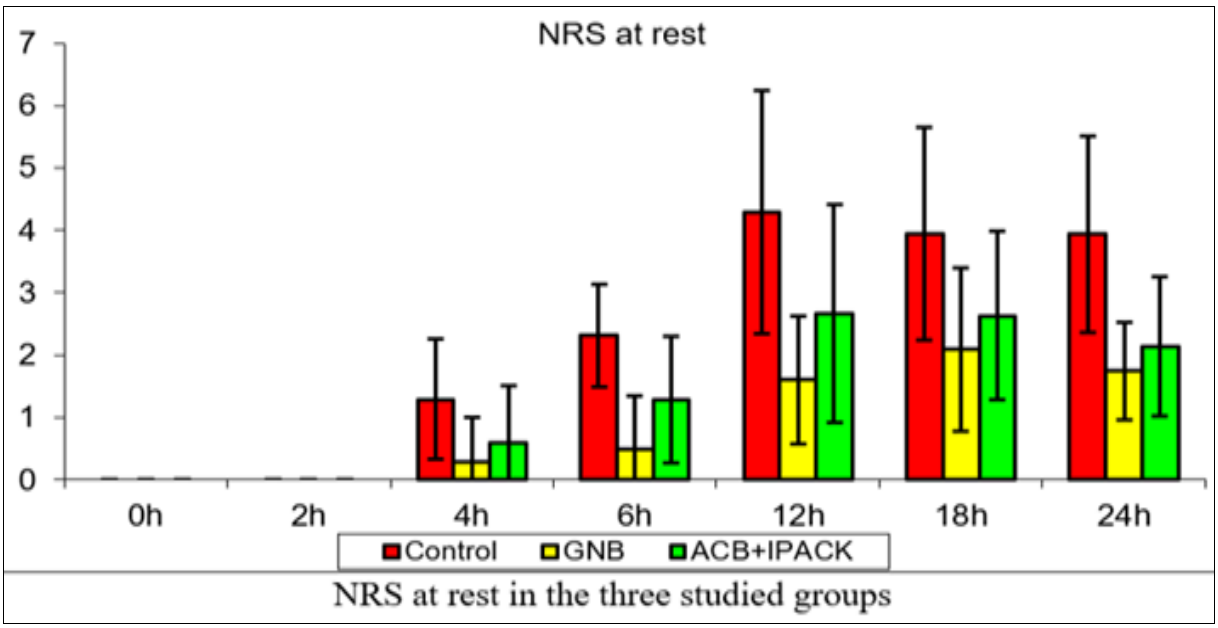


Fig 3: Consort flow chart of Participants through each stage of the randomized trial



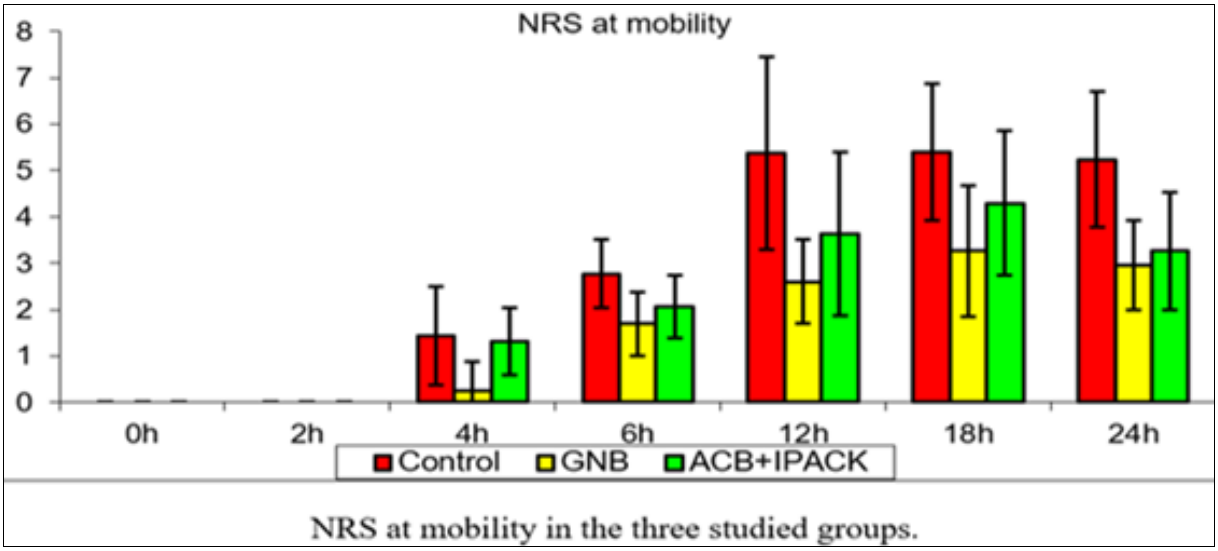


Fig 4: NRS at rest and at mobility in the three studied groups

Conclusion

Our study concluded that genicular nerves provide less postoperative morphine consumption, longer duration of analgesia, with better pain relief at rest and mobility, comparable quadriceps muscle power and satisfaction than IPACK combined with ACB in patients undergoing knee arthroscopy.

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Nil.

Conflict of Interest

Nil.

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