


**EVALUATION OF ADDUCTOR CANAL BLOCK FOR POST OP ANALGESIA AFTER
ARTHROSCOPIC ACL RECONSTRUCTION UNDER SPINAL ANAESTHESIA.**

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ABSTRACT

Background: Arthroscopic ACL repair (ACLR) is a common surgery among young productive adults. These adults need to be rehabilitated and discharged back to home at the earliest. Good post-op analgesia without muscle weaknesses plays a very important role in this early mobilization and rehabilitation. Adductor Canal Block (ACB) is fast becoming a mainstay among the various modes of analgesia employed by Anaesthesiologists in such cases. This study was undertaken to evaluate effectiveness of ACB as a post-op analgesia technique in these cases and its usefulness in reducing post-op opioid consumption. **Methods:** In a zonal government hospital, 100 patients were selected prospectively for ACLR. They were randomly divided in two groups SAB and ACB. SAB group received Sub Arachnoid Block (SAB) with Hyperbaric Bupivacaine with ACB group received SAB followed by ACB under ultrasound guidance with Bupivacaine with Dexamethasone. Post-operatively they were evaluated at hourly intervals for pain score with VAS from 0 to 10 for 6 hours, two hourly for next 6 hours and four hourly for next 12 hours. They all received intravenous (IV) Paracetamol 1000 mg eight hourly. If the pain score crossed 4 they were given intramuscular (IM) Pethidine 50 mg. The time to requirement/demand of rescue analgesia was noted and total doses of opioids given were noted. **Results:** Mean time to first analgesic rescue was significantly prolonged in Group ACB as compared to Group S. Mean time to rescue analgesia was 978.34 min and 426.57 min in group ACB and SAB respectively. All the patients of the SAB group required at least one opioid dose and 46% needed two doses. **Conclusion:** ACB is a very effective modality for post-op pain relief after ACLR.

KEYWORDS: Adductor canal block; Knee Arthroscopy; ACL Repair; Sub Arachnoid Block; Spinal Anaesthesia; regional anaesthesia.

INTRODUCTION

Knee Arthroscopy is a very common orthopaedic surgery required generally by young adults. This is an active and productive age group. They need to get back to their productive life as soon as possible. They need aggressive rehabilitation program after the surgery. As with most of the orthopaedic surgeries post-op pain relief is a very important concern especially in case of Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL) repairs where drilling of tibia and femur are involved. Post-op analgesia is very important contributing factor in the quality and speed of rehabilitation and return to productive life. Femoral nerve block was a very popular method of achieving an excellent post-op analgesia but along with this technique came the concerns about quadriceps weakness leading to delay in mobilization and possible chances of fall and injuries.^[1] With

popularization of use of ultrasound in regional blocks, a number of blocks are coming to forefront which were hitherto either not in the ambit of Anaesthesiologists or were difficult to perform or the success rate were not good enough to make them consistent and reliable. Adductor canal block (ACB) is one such block which is fast becoming popular.^[2] The main reason is that it is mainly a sensory block with some element of nerve to Vastus medialis getting blocked. This is an excellent block for knee surgery with almost equivalent analgesia as Femoral nerve block sans the quadriceps weakness.^[2,3] This technique mainly blocks the saphenous nerve which is purely sensory but there is a strong belief that the geniculate branches of Obturator nerve also traverse the Adductor canal which also get blocked leading to a much superior and wider area of analgesia than expected out of mere Saphenous

nerve block.^[4] There are a number of reports advocating Adductor canal block for post op analgesia for total knee arthroplasties.^[5-7]

With the above back ground it was envisaged to evaluate Adductor Canal Block as a technique for post op analgesia after Knee Arthroscopy under Spinal Anaesthesia in 50 patients and compare it with 50 patients who underwent the same surgery under same form of anaesthesia and were managed conventionally without the Adductor Canal Block.

METHODS

After the approval of Institutional Ethical Committee and written informed consent, 100 American Society of Anesthesiologists (ASA) Grade I and II patients scheduled to undergo Arthroscopic Anterior Cruciate Ligament Repair (ACLR) were randomly divided into two groups SAB group and ACB group. The SAB group acted as control and were given Spinal Anaesthesia (SA) with 0.5% Bupivacaine Heavy 3.5 ml in L3-4 sub arachnoid space with a 27G Whitacre point spinal needle in lateral position with affected side down. They were kept in that position for two min before they were turned supine. ACB group patients received the same Spinal Anaesthesia but immediately after turning in supine position they were also given Adductor Canal Block under Ultra Sound Guidance with 23G 100 mm needle with 0.5% Bupivacaine 20 ml along with Dexamethasone 4mg. Since ACB is mainly a pure sensory block and we were giving it as a single shot we wanted it to have the maximum duration. There are a number of studies which suggest that adding dexamethasone to local anaesthetic prolongs the duration of the block hence we chose to add it to the LA.^[8,9] All the patients were given IV Paracetamol 1000 mg eight hourly for 48 hrs. All the patients were monitored for level of sensory block of SA every 15 min during the surgery and every 30 min in the post-op period till the effect wore off below L1 level. Motor level was also monitored in pre-op period by leg raising and then in post-op period every 30 min along with sensory level checking till the SA wore off. Pain Score was monitored in the post-op period, every hour for 6 hours and 2 hourly for next 6 hours and 4 hourly for next 12 hours with Visual Analog Scale from 0 to 10 with 0 being no pain and 10 being maximum pain they could imagine. When the pain score came above 4, patient was given IM pethidine 50mg and time to rescue analgesia was noted. If the pain score persisted above 4 even after 30 min of giving pethidine IM Diclofenac sodium 75mg IM mg was given. Vital parameters were monitored every 10 min during intra-op period and half hourly for 24 hours in the post-op period.

Exclusion Criteria: All the patients in ASA-III or above, who were unwilling, allergic to LA, on anticoagulants and those with local infection in the thigh.

ADDUCTOR CANAL BLOCK

Anatomy: Adductor canal, also known as sub sartorial canal begins in the upper thigh at the apex of the femoral triangle where the femoral vessels along with the terminal branch of femoral nerve, Saphenous Nerve go under Sartorius muscle and enter the adductor canal. The adductor canal runs on the medial side of the thigh surrounded laterally by Vastus Medialis, posteriorly by Adductor Magnus and the roof is formed by Sartorius. It ends medially in lower 1/3 of thigh with femoral vessels exiting into popliteal fossa through a hiatus in Adductor Magnus. Nerve to vastus medialis also traverses the canal. Geniculate branch of Obturator Nerve is also known to cross the adductor canal.^[10]

Procedure: After local cleaning and draping high frequency linear probe was kept horizontally on the medial aspect of mid-thigh with depth adjusted to 4 cm (more or less depending on the patient's size), depth was later adjusted depending how deep was the femoral artery. Femoral artery was identified under the Sartorius muscle. Sartorius appears as a boat shaped muscle with a convex hull and flat top. The muscle is frequently seen to have a horizontal tendinous intersection, remnant of the period of evolution when we had two sartorii. The probe was moved to bring the femoral artery close to medial edge of the field. Probe marker was kept on the lateral side. 23 G 10 cm short bevel needle is used, approaching from lateral side with in-plane technique. The depth of the Femoral artery was noted and needle was inserted lateral to the probe by that much distance and the probe was tilted laterally. This helped in needle appearing horizontally in the ultrasound field thereby improving needle visualization. Needle tip was taken very close to the lateral aspect of the artery (Fig 1). After careful aspiration to avoid intravascular injection 1 ml of LA mixture is injected and when drug was seen spreading next to the artery and not above the sartorial fascia or into other muscles, 20 ml of 0.5% Bupivacaine 20 ml with 4 mg Dexamethasone mixture was injected. When injected in the correct plane the drug is seen to be spreading on anterior and posterior aspects of the artery also (Fig 2).



Figure 1: Adductor Canal Block.



Figure 2: Spread of Drug in Adductor Canal.

RESULTS

The two groups were comparable with regards to age, ASA status and duration of surgery (Table 1). In SAB group there were all males and in ACB group there were only two females, in order to keep the data comparable, they were excluded from the study.

Characteristics of subarachnoid blocks were similar in both groups including sensory and motor block onset as well as regression time when assessed with unpaired t test.

Statistical analysis by unpaired t test showed that the mean time to first analgesic rescue was significantly prolonged in Group ACB as compared to Group SAB. Mean time to rescue analgesia was 426.57 ± 54.23 min and 978.34 ± 413.76 min ($p<0.001$) in group SAB and ACB respectively (Table 1 & Fig 3).

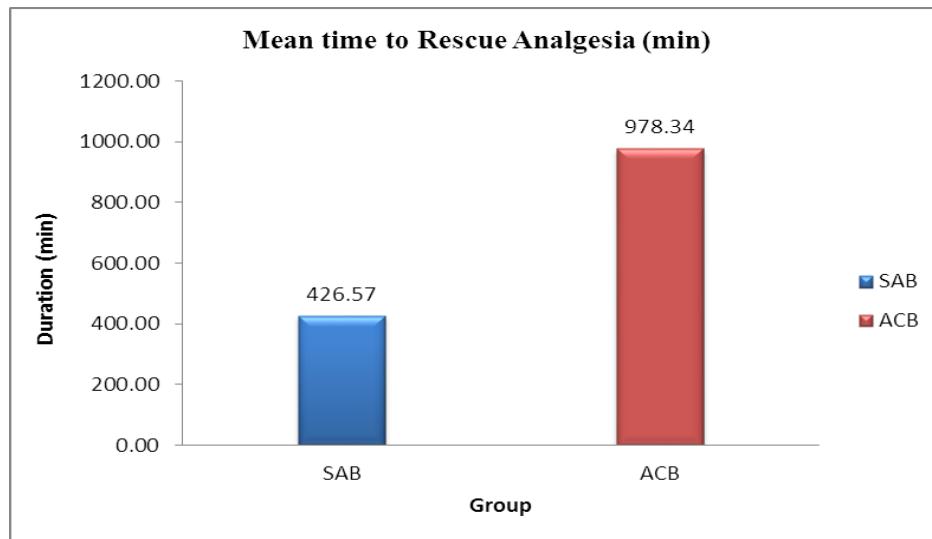
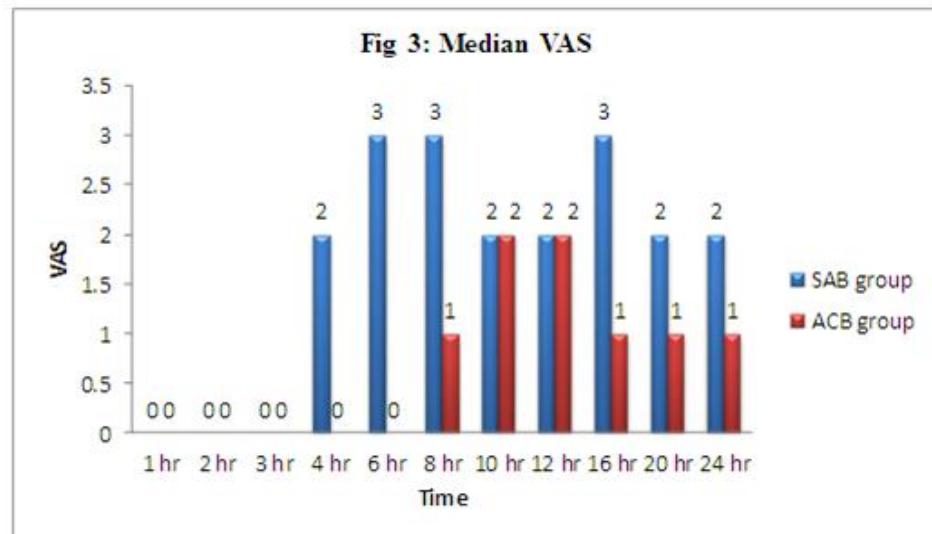
Mann-Whitney U test was used to assess mean pain scores as noted at various time intervals in postoperative period (Fig 4). Mean pain scores were persistently low in group ACB ($P<0.001$). Also the number of rescue analgesia requirements were significantly low in group ACB. 40 percent patients in group ACB did not require a rescue analgesia even at 24 hrs. All patients in SAB group needed at least one rescue dose of pethidine and 23 patients (46 %) needed another dose at 12-16 hrs postoperatively. All the patients were mobilized successfully with full weight bearing after 24 hrs. No adverse effects including sensory or motor weakness and falls were recorded.

Table 1; Demographic Variables.

DEMOGRAPHIC VARIABLES				
S No	Characteristic	SAB Group	ACB group	P Value
1	Age (yr \pm SD)	34.71 \pm 9.02	31.13 \pm 7.73	0.11
2	Sex (Female/male)	2/30	3/30	0.99
3	ASA Physical Status I/II	2/30	3/30	0.99
4	Duration of Surgery(min)	49.05 \pm 20.57	53.48 \pm 21.03	0.412

Table 2: Block Duration And Rescue Analgesia.

Block duration and rescue analgesia				
S No	Characteristic	SAB Group	ACB group	P Value
1	Sensory block duration	193.10 \pm 12.66	194.56 \pm 11.84	0.643
2	Motor block duration	165.86 \pm 14.46	158.30 \pm 16.26	0.05
3	Time to rescue analgesia	423.33 \pm 52.34	958.73 \pm 421.20	<0.001

**Figure 3: Mean time to Rescue Analgesia.****Figure 4: Median VAS.**

DISCUSSION

Anterior cruciate ligament injury is a common athletic injury of the knee. The ACLR is currently accepted as best treatment modality for individuals with functional instability due to anterior cruciate deficiency and is one

of the most commonly performed elective orthopaedic procedure. Every year more than one lakh ACL reconstructions are performed in USA.^[11]

Anaesthesiologists have tried various modalities including systemic NSAID, opioids, central neuraxial methods. Often surgeons use intra-articular analgesics to have additive effect. Excellent pain relief leads to early ambulation and improved functional outcome.^[12,13] Traditionally, femoral nerve block has been used for pain relief in lower limb surgeries. However, it leads to quadriceps weakness leading to delayed ambulation and even risk of fall.^[11] Recently interest is rising to make use of adductor canal block which is exclusively a sensory block for pain relief in knee surgeries including ACL reconstruction and arthroplasties.^[3,4,7,11,14]

Abdallah FW et al compared analgesia and adverse effects of ACB and FNB for ACL reconstruction under general anaesthesia as a day care procedure. They concluded that ACB preserved quadriceps strength and provided non inferior analgesia compared to FNB.^[2] Our study reaffirmed their findings.

Xerogean JW et al recently compared ACB and FNB for ACLR. They recommended ACB as a viable alternative to FNB with lesser chances of quadriceps weakness. Our study confirmed the advantages of ACB but we didn't compare it with FNB.^[3]

Espelund M et al compared ACB with oral paracetamol, ibuprofen and intravenous ketobemidone sos regime analgesic efficacy amongst ACLR under general anaesthesia. They reported no additional benefit with ACB and recommended that oral paracetamol, ibuprofen regime was equally efficacious. They intended to measure a major reduction of 50% in pain scores at 2hr interval in standing and non-weight bearing position.^[15] We conducted all our study under SAB which ruled out the possibility to measure their primary outcome at 2hr postoperatively and 2hr is too short a duration after GA when effects of narcotics and anaesthetic agents has still not worn off to check the effects of post-op pain relief measures.

Jin Shu-Qing et al in their review of efficacy of saphenous nerve block on post-operative pain on various knee surgeries including arthroscopic ACLR and arthroplasty. They concluded that the pain scores were persistently less amongst the patients with ACB not only at rest but also during ambulation.^[16] Our study also produced similar results in ACB.

Sehmbi H et al in their systematic review and meta-analysis to assess analgesic role of adductor canal block in ambulatory arthroscopic knee surgery concluded that ACB provides modest analgesic benefits, including improved pain relief and reduced opioid consumption for up to 8h and 24h respectively following minor arthroscopic surgeries.^[17] However, they didn't recommend routine performance of ACB in ACLR if multimodal analgesic regimen is used because they observed similar findings on comparison with FNB or placebo which seems contradictory where FNB with

proven benefit was also found to be comparable to placebo. Based on our observations we recommend a definitive benefit of routine performance of the ACB for ACLR.

CONCLUSION

From our study we conclude that Adductor canal block is a very good technique for post-op analgesia after Arthroscopic anterior cruciate ligament repair surgery under spinal anaesthesia. It is likely to be comparable to femoral nerve block sans the quadriceps weakness and is likely to help in early mobilization of the patient and hence better rehabilitation, early discharge and better outcome.

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