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Original Research Article

COMPARISON OF ULTRASOUND-GUIDED ERECTOR SPINAE PLANE BLOCK AND ANTERIOR QUADRATUS LUMBORUM BLOCK FOR POSTOPERATIVE ANALGESIA IN TOTAL HIP REPLACEMENT SURGERY – A PROSPECTIVE, RANDOMIZED, DOUBLE-BLINDED STUDY

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Abstract

Background: Postoperative pain is a prevalent issue following surgeries, particularly Total Hip Replacement (THR), which is critical in elderly patients with multiple health conditions. As life expectancy rises globally, managing pain and ensuring stability during surgeries like THR becomes increasingly challenging for anaesthesiologists. Recent advancements in medical care have highlighted ultrasound-guided regional nerve blocks as promising options for pain relief post-THR. Traditional blocks like femoral nerve and fascia iliaca blocks have been effective but may cause quadriceps weakness, hindering early mobilization and compliance with Enhanced Recovery After Surgery (ERAS) protocols. In response, newer techniques such as Erector Spinae Plane Block (ESPB) and Quadratus Lumborum Block (QLB) have gained attention for their ability to provide effective analgesia with stable hemodynamics and minimal motor side effects. This study compares the effectiveness of ultrasound-guided ESPB and anterior QLB (AQLB) for postoperative pain management in THR surgery. **Materials and Methods:** The study was prospective, randomized, and double-blinded, involving patients undergoing primary, unilateral THR under spinal anesthesia. Seventy patients met inclusion criteria and were randomly assigned to ESPB or AQLB groups. Both blocks were administered post-surgery using ultrasound guidance with 30mls of 0.25% ropivacaine with intravenous dexamethasone. **Result:** No significant difference in NRS scores noted between ESPB and AQLB groups at 6, 12, and 24 hours postoperatively ($p > 0.05$). The first rescue analgesia request was at 17.5 ± 6.6 hours for ESPB and 18.5 ± 6.1 hours for AQLB ($p = 0.537$). Neither block resulted in hemodynamic instability or prolonged hospital stay. **Conclusion:** In conclusion, both ESPB and AQLB were found effective for postoperative pain relief following THR, reducing the need for additional analgesia and opioid consumption, without causing motor weakness or delaying ambulation. These findings support the integration of ESPB and AQLB into analgesia protocols for THR to enhance patient comfort and perioperative outcomes.

INTRODUCTION

Total Hip Replacement (THR) is a commonly performed surgery with majority of patient population falling in geriatric age group. Hip being a weight bearing joint, THR patients experience significant postoperative pain, limiting their physiotherapy and early ambulation. Conventionally, Non-steroidal anti-inflammatory drugs (NSAIDs) and opioids (single shots or via patient controlled analgesia pumps) make up most of the peri-operative analgesia regimen for THR. Well-known as it is, high opioid use results in concerning side effects and delayed recovery. It is all the more crucial in resource-limited clinical setups, in developing countries, where immediate access to advanced healthcare can be arduous in a crisis situation. Multimodal approach towards pain is thus paramount in ensuring patient satisfaction, early rehabilitation and overall improved outcomes. Analgesia regime for THR has come a long way from sole use of opioids, continuous epidurals, landmark guided nerve blocks, continuous lumbar plexus blocks to

precise ultrasound-guided nerve blocks sparing motor functions and fending off most systemic side effects. With detailed cadaveric studies and randomized trials extensively studying hip joint innervation and dynamic effects in live volunteers, various regional techniques like lumbar plexus block, femoral nerve block, suprainguinal fascia iliaca block (SIFIB) and pericapsular nerve group (PENG) block have been introduced in recent decades to cater perioperative analgesia requirements in THR. However, every technique has its limitations and performer bias, and US-guided nerve blocks are not exempted as well. Past literature has raised issues of motor blockade with lumbar plexus block,[1,2] and SIFIB.[3] Studies have shown non-superiority of PENG block over periarticular local infiltration,[4] and it is not totally devoid of impairing hip adduction and decreasing knee extension.[3] PENG block also fails to address the posterior capsule innervation of the hip which may contribute to the residual pain post-opERATIVELY.[5] Enhanced recovery after surgery (ERAS) protocol recommends same-day mobilization after THR, so the ideal analgesic block should provide effective pain relief without affecting motor power of the lower limb.

Erector Spinae Plane block (ESPB) was first described in 2016 by Forero et al as an innovative alternative for treating thoracic neuropathic pain secondary to bony injury.[6] Since then ESPB has been used extensively for treating chronic neuropathic and acute pain related to breast, thoracic and abdominal surgeries.[6-8] To our knowledge, the only published evidence of ESPB application for hip and femur surgery is a single-centre study conducted by Tulgar et al.[9-12] They further conducted a study comparing effectiveness of ESPB and transmuscular quadratus lumborum block (QLB) in surgeries related to hip and proximal femur with promising results.[13]

QLB has recently enticed anaesthesiologists worldwide to address post-op pain in hip surgeries. Evidence shows utility and substantial safety of Anterior (or transmuscular or type 3) QLB (AQLB) in hip surgeries for patients of all age groups.[14-16]

Our study was driven by a lack of evidence extrapolating the benefits of these novel blocks, ESPB and AQLB, for managing postoperative pain exclusively associated with THR. We aimed to compare the analgesic efficacy of US guided ESPB with AQLB in providing post operative analgesia to patients undergoing THR. We hypothesized that both ESPB and AQLB are equivocal in meeting analgesic requirements post THR.

MATERIALS AND METHODS

Study design: Our study was prospective, randomized and double-blinded comparing US guided ESPB and AQLB for postoperative analgesia in THR. Written and well-informed consent was taken from all the enrolled patients. Prior to the trial, approval was obtained by the Institutional Review Board and Institutional Scientific Board and is registered at clinical trials registry, India (CTRI) (Registration No: CTRI/2022/05/042394).

Criterion for patient selection: Patients were recruited over a 7 month period, between July 2021 to January 2022. Patients listed for primary THR under neuraxial blockade, aged 18-90 years with ASA grade I, II or III and who willingly consented to be a part of the study were included after they met thE inclusion criteria. Exclusion criteria incorporated unwillingness to participate, allergy to LA, bleeding diathesis, patients on anti-platelets, previous knee surgery on the same side, localized infection, pre-existing peripheral neuropathy, neurological disorders, surgical time of <60 min or >180 min and patients who received general anaesthesia. CONSORT diagram below shows the inclusion and exclusion criteria of the trial.

Figure 1: CONSORT diagram showing inclusion and exclusion criteria

Blinding and Study groups: Anaesthetists who performed the block were not included in data collection and analysis. Patients as well as the observers in the postoperative period were blinded to the type of block administered.

Required sample size was calculated using the formula as proposed by Kirkwood, BR and Sterne, JA.[17] Initial sample population included 75 patients, out of which two dropped out prior to the intervention, one was excluded due to Alzheimer'S DEMENTIA and other two were excluded from the study due to requirement of epidural top-up for prolonged operative time (>180 mins). Remaining 70 patients were randomly allocated into ESPB group and AQLB group, each consisting of 35 patients by CONSORT checklist. This comparison study was done between the two block groups, without any control group.

Conduct of Anaesthesia and Block Performance: After shifting the patients to the operative room (OR), ASA standard monitors were attached and WHO checklist was observed. All patients, in both groups, who met the inclusion criteria received spinal anaesthesia (in sitting position) at lumbar 4-lumbar 5 or lumbar 3-lumbar 4 level using a standard combined spinal and epidural kit (CSEA) with 2.0-2.2 ml of 0.5% hyperbaric bupivacaine and 20mcg fentanyl. Epidural catheter was inserted, flushed with normal saline and secured. Epidural was reserved to be used only in case of prolonged operative time, i.e. more than 180 mins, requiring additional top-up for surgery and to be used as a rescue analgesia for 24hours post-operatively. All patients received pre-op antibiotic inj. cefuroxime 1.5gm and inj. fentanyl 50mcg intravenously at the start of surgery. After confirmation of successful spinal block in supine position, patient was turned into lateral position for the surgery, with the operative site being non-dependant. All patients received 1gram of intravenous paracetamol as a standard. Surgery was completed under spinal blockade.

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At the end of the procedure, both ESPB and AQLB were administered in the same lateral decubitus position, as also preferred for posterior approach to THR. Both the blocks were administered with sterile technique using US guidance (SONOSITE Edge-II) and a curvilinear low frequency (2-5MHz) probe using an in-plane approach.

Performance of Erector Spinae Plane Block: Tuffier's Line (imaginary line connecting both iliac crests) was used as a landmark for probe positioning at the start to identify L4-L5 spinous processes in a sagittal plane. The probe was then moved laterally on the operated side to trace the transverse processes (TP) of L4 and L5 vertebrae and ESM (TP of L3/4/5 form the 'trident'). We then introduced a 100mm 22G echogenic needle (Stimuplex A, Braun) using an in-plane technique and after reaching tip of the TP, followed it up with a hydro-dissection using 1-2mls of 0.25% Ropivacaine to confirm the correct plane between the TP and ESM. ESPB was administered with 30 mls of 0.25% Ropivacaine.

Figure 2: (A) Probe positioning for ESPB, (B) Sonoanatomy of ESPB, (C&D) ESP Block performance and LA spread.

TP = transverse process, LD = latissimus dorsi, ESM = erector spinae muscle, LA= local anaesthetic

Performance of Anterior Quadratus Lumborum Block: For AQLB, curvilinear US transducer was placed in the transverse axis just lateral to the umbilicus and was moved towards the operated side while tracing the abdominal muscles till the probe was resting just cephalic to the iliac crest on US screen. The lumbar vertebral TP, ESM, psoas muscle, transversus abdominis muscle, internal and external obliques, and the quadratus lumborum muscle were identified (Shamrock sign). We then introduced a 22G, 100mm echogenic needle in the plane between QL and psoas muscle under US guidance using the 'in-plane' technique. After hydro-dissection with 1-2mls of LA, a total of 30 mls of 0.25% Ropivacaine was injected in this plane, in aliquots of 5 mls.

For both groups intravenous inj. dexamethasone 4 mg was administered simultaneously during block performance. Patient was then turned supine and transferred to high dependency unit (HDU) for post-operative monitoring and care.

Figure 3: (A) Probe positioning for AQLB, (B) Sonoanatomy of AQLB, (C&D) AQL Block performance and LA spread.

TP = transverse process, QL = quadratus lumborum muscle, LA= local anaesthetic deposition

Analgesia Management: Apart from the 1gm paracetamol and 50mcg fentanyl given intra-op, all patients received a standard multimodal analgesia regimen in the HIGH DEPENDENCY UNIT (HDU) POST-OPERATIVELY, which included inj. paracetamol 1gm 6hrly, inj. ketorolac 30mg 12hrly and a buprenorphine transdermal patch 10mg which was placed upon arrival to HDU so as to start its effect in-time with the wearing of the two blocks.[18] Epidural top-up with 3cc of 0.5% bupivacaine and 2cc of normal saline was administered as a rescue analgesia ONLY if patient reported an NRS score >4/10.

Outcome measures: Numeric Rating Scale (NRS) scores were used as the primary outcome to assess the analgesic efficacy of the blocks. In the postoperative period, we documented NRS scores at 30th min, 1st, 2nd, 3rd, 4th,5th, 6th, 8th, 10th, 12th, 18th and 24th hr.

As secondary outcomes we measured the time TO first rescue analgesia, time of recovery for straight leg raise (SLR) and dorsiflexion of foot, occurrence of any complication like nausea/ vomiting or instability in vitals requiring treatment and increase in planned LENGTH OF STAY (LOS) at discharge.

We recorded the time at which first rescue analgesia was solicited by the patient and the time was noted as 'duration of analgesia of block' i.e. the total time patient was pain-free due to the effect of the block.

We further checked for the time of recovery for SLR (L2) and time of recovery for foot dorsiflexion (L4) to evaluate any motor weakness causing a delay in ambulation.

We noted any incidence of complications like postoperative nausea/vomiting or vital instability requiring medication and treatment.

Our institute protocol has a provision of 5-day hospital stay after primary THR. We took note of any increase in the LOS for any of the subjects.

Data collection and analysis: Data was collected, properly coded and entered in MS Excel and analysis was done using SPSS 21.0 version Statistical package program (SPSS, Chicago, IL, USA). All analysis was conducted by author (ARS) and statistical team of our institute who were blinded to the study. Data was presented as mean and standard deviation for continuous variables and as percentages for categorical variables. Unpaired t test was done to compare the 'mean value' of the two group. Paired-t test was done to compare the 'mean value' within the group at different time intervals. Chi-square test was done to find out the association between categorical variables and p value of less than 0.05 is considered significant.

RESULTS

CONSORT diagram outlays the inclusion and exclusion criteria of the trial [Figure 1]. We observed all patients up to 24 hours post-operatively in HDU.

Both the groups were found to be comparable in demographics and operative side for THR.

Difference between the mean age of subjects in ESPB group was 53.4 and AQLB was 57.0 which was not statistically significant (p value:0.272). Distribution of male subjects in ESPB group (54.30%) and AQLB group (57.10%) and females in ESPB group (45.70%) and AQLB group (42.90%) was also comparable (p value:0.810). No statistically

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significant difference was noted in ASA grades of the subjects in two groups (p value: 0.581). Data on the side THR was being performed in both the groups was also equivocal (p value:1.000). Table below summarizes these findings [Table 1].

The NRS scores between the two groups were noted at subsequent time intervals at 30th min, 1st, 2nd, 3rd, 4th,5th, 6th, 8th, 10th, 12th, 18th and 24th hr. Both ESPB and AQLB were found to have a comparable analgesic effect in THR patients at the 24-hour post-op period (p values >0.005). According to unpaired t-test, there was no significant difference between NRS scores in ESPB group and AQLB group (p value > 0.05). The mean NRS score at 6 hrs, 12 hrs and 24 hrs was 0.9 1.3 hrs, 1.9 2.3 hrs and 1.9 1.1 hrs respectively for patients who received ESPB. For AQLB group the mean NRS scores were 1.4 1.4hrs at 6 hrs, 1.6 1.2 hrs at 12 hrs and 2.2 1.7 at 24 hrs. Mean NRS scores at 6hr, 18 hrs and 24 hrs were marginally high in AQLB group as compared to ESPB, but WAS NOT FOUND TO BE statistically significant (p value >0.005).

We also studied the mean time after which first rescue analgesic was requested by each group, which was 17.5 6.6 hours for ESPB and 18.5 6.1 hours for AQLB [Table 4]. Unpaired t-test showed no statistical significance between the rescue analgesia time of the two blocks (p value being 0.537). 11 out of 35 patients in ESPB group requested rescue analgesia as compared to 5 in AQLB group in between 7th – 12th hours post-op. However, at the 24th hour, a total of 13 patients in ESPB and 11 in AQLB group had requested rescue analgesia [Table 3].

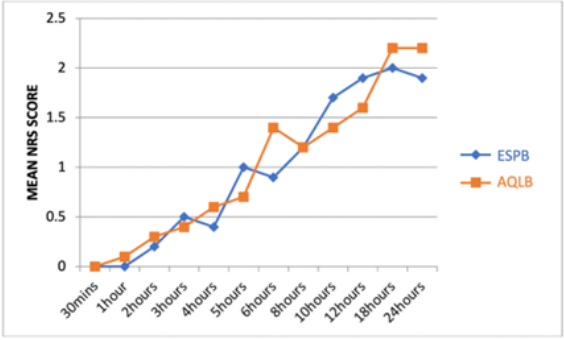

Figure 4: Graphical representation of NRS scores between the ESPB and AQLB group

In our study we also observed THE time TO recovery OF MOTOR FUNCTION AND ABILITY to perform SLR test and dorsiflexion of foot by subjects in ESPB vs AQLB group. We found comparable results between the two groups with no statistical significance (p value >0.05) [Table 4].

Lastly, upon scrutinising the occurrence of any complications like nausea and vomiting or instability of vital signs necessitating intervention, ESPB group had one patient with a single episode of vomiting while AQLB group had nil complications, though this was not statistically significant (p value 0.314). None of the patients enrolled in the study received any intervention for hemodynamic instability [Table 5].

Table 1: Comparison of demographic data and side of THR in ESPB vs AQLB groups.

Characteristics	ESPB group	AQLB group	P-value
Age (in years)	53.4 ± 12.1	57.0 ± 15.0	0.272
Gender (Male/female)	19/16	20/15	0.810
Distribution of ASA grade (I/ II/ III) in %	28.6/ 62.9/ 8.6	40.0/ 54.3/ 5.7	0.581
Side of THR (Right/Left) in %	54.3 ± 45.7	57.1 ± 42.9	0.810

Table 2: Comparison of NRS scores for pain between the two groups

Time interval	ESPB Group		AQLB Group		Unpaired t test P value
	Mean	SD	Mean	SD	
30 mins	.0	.0	.0	.0	NA
1 hour	.0	.0	.1	.2	0.156
2 hours	.2	.6	.3	.7	0.601
3 hours	.5	.7	.4	1.0	0.675
4 hours	.4	.7	.6	.9	0.430
5 hours	1.0	1.1	.7	.9	0.147
6 hours	.9	1.3	1.4	1.4	0.188
8 hours	1.2	1.5	1.2	1.4	0.933
10 hours	1.7	2.1	1.4	1.4	0.480
12 hours	1.9	2.3	1.6	1.2	0.583
18 hours	2.0	2.0	2.2	1.4	0.667
24 hours	1.9	1.1	2.2	1.7	0.679

Table 3: Comparison of number of patients receiving rescue analgesia in both the groups

Time of request of rescue analgesia	ESPB group (No. of patients)	AQLB group (No. of patients)
0- 6 hours	2	2
7-12 hours	11	5
13- 18 hours	3	7
19-24 hours	6	10
>24 hours (no rescue analgesia)	13	11

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Table 4: Comparison of secondary outcomes in ESPB and AQLB group

Variables	Group A		Group B		Unpaired t test
	Mean	SD	Mean	SD	p value
Time after which first rescue analgesia requested	17.5	6.6	18.5	6.1	0.537
Time of recovery of straight leg raise (L2)	1.7	.5	1.8	.5	0.306
Time of recovery of dorsiflexion of foot (L4)	1.4	.5	1.5	.5	0.368

Table 5: Comparison of occurrence of complications between ESPB vs AQLB groups

Complications	Group ESPB		Group AQLB		Chi square test
	N	%	N	%	P value
Nil	34	97.1%	35	100.0%	0.314
Nausea/Vomiting	1	2.9%	0	0.0%	
Vital instability	0	100.0%	0	100.0%	

No patient in either groups had increased LOS in hospital than the usual hospital standard of 5 days.

DISCUSSION

Optimizing pain control in the post operative period after THR significantly impacts functional recovery by aiding early mobilization and improves overall patient satisfaction, leading to better clinical outcomes. Our study juxtaposed the effects of ESPB and AQLB in patients undergoing primary THR. Results revealed that both the blocks have similar analgesic effect in THR and none is inferior than the other. There was no statistical discrepancy noted in between the two groups in terms of motor weakness, time to first analgesia request, side-effects or LOS.

All the blocks were performed by experienced regional anaesthesiologists, supervised by one of the authors. Blocks were performed under US guidance with real time visualization of LA spread. Each surgery was performed by the same surgical team utilising posterior approach technique and in a lateral decubitus position. Moreover, we could perform both ESPB and AQLB conveniently in the same lateral decubitus position, immediately after completion of the surgery and post block administration patients were directly transferred to HDU. No control group was defined in our study because there is already an established superiority of ESPB and AQLB over sham intervention in hip surgery patients as per literature.[13] Moreover, in line with current standard of care, peripheral nerve blocks are mandatory in our hospital setting as part of multi-modal analgesia for THR patients. We did not perform objective sensory assessment of the blocks as our goal was confined to evaluate the efficacy of the two blocks for post-oPERATIVE pain relief in THR patients.

Considering the expertise of our surgeons, extent of surgery and frailty of majority of THR patients, regional anaesthesia is our institutional preference over general anaesthesia. All surgeries were performed under spinal anaesthesia, with the epidural catheter in-situ reserved for rescue analgesia (to prevent patients from undue suffering in the early postoperative period, in case of a block failure) as both blocks are relatively new and epidural analgesia is still considered gold standard for hip analgesia after THR. Epidural catheter was safely removed on post-op day 1 for all the patients. No catheter related complication or site infection was encountered.

Our double-blinded, randomised trial revealed that both, ESPB at lumbar level (L4) and QLB via anterior approach, provide effective post-op analgesia in THR patients for about 24 hours post-operatively. We measured NRS scores at regular intervals and there was no statistical difference in NRS scores for the two groups at 30 mins, 3 hours, 6 hours, 12 hours and 24 hours post operatively (p value >0.05). Though ESPB block has a clear advantage of distant anatomical location from vital structures and bony landmark facilitating its smooth administration while mitigating nociception around the hip joint; QLB on the other hand, is safest and easiest when performed using the anterior approach, as compared to other approaches, and provides a reliable option for analgesia in THR patients.

Study conducted by Tulgar et al stated similar findings where 24 h average NRS scores were statistically comparable ($p > 0.05$) in ESPB and QLB groups. NRS scores were reported to be significantly higher in the control (no intervention) group when compared to both the block groups at the 1st, 3rd, and 6th hours.[13] Literature first describing the successful use of lumbar ESPB in a THR patient stated that NRS was <3/10 for the first 18 hours and no analgesic supplementation was required during these hours.[10] Parras and Blanco compared QLB-1 (or transversus abdominis plane (TAP) block by posterior approach) and femoral block for post-operative pain relief for femur fracture patients undergoing hemiarthroplasty and QLB was found to be more effective out of the two.[19]

Abduallah et al observed statistically lower post-operative visual analogue scores (VAS) for pain in the t-QLB group than the control (placebo) group 4, 6 and 8 hours postoperatively ($P < 0.05$).[20]

Among other contemporary regional techniques for hip analgesia, QLB and ESPB are being explored in depth due to more favourable outcomes. Recently, Shuwei Ye et al found in their study that US-guided PENG block was not superior in terms of post-op analgesia and functional recovery than periarticular local infiltration for THR.[4] Study by Chudinov A et al highlighted that though lumbar plexus block provides favourable postoperative analgesia for hip over intravenous opioids, reproducing same results may be difficult due to individual variability in

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defining the psoas compartment and inconsistent spread of injected dye, leading to dissonant surgical anaesthesia and post-oPERATIVE analgesia.[1]

With respect to first request of rescue analgesia for both the blocks (on addition of 4mg intravenous dexamethasone) we found comparable results; 17.5 ± 6.6 hours for ESPB and 18.5 ± 6.1 hours for AQLB (p value 0.537). We concluded that ESPB and AQLB determinately prolong the time of request of rescue analgesia thereby decreasing the total opioid consumption post operatively. Tulgar et al shared similar results for fentanyl requirement as rescue analgesic, tramadol consumption via patient controlled analgesia (PCA) system and total opioid consumption within the first 24 hours between ESPB and QLB groups ($P > 0.05$). As anticipated, they noted statistically significant use in the control group (p value < 0.05),[13] though they did not note the exact time of first rescue analgesic request. A multicentric study by Kukreja et al observed decreased opioid requirements up to 48 hours, decreased VAS scores up to 12 hours, and shorter post-anaesthesia care unit LOS in patients receiving preoperative QLB for primary THR.[21] It was further supported by a randomised study suggesting improved analgesia and decreased opioid requirements up to 48 hours with AQLB after primary THR.[22] Other literature also favours QLB in significantly reducing the total 24hours opioid consumption in hemiarthroplasty patients as compared to femoral block.[19]

In our study, none of the two blocks essentially caused any motor weakness and did not delay ambulation. Time of recovery for straight leg raise (L2) was 1.7 ± 0.5 hours in ESPB group and 1.8 ± 0.5 hours in AQLB group while time of recovery for dorsiflexion of foot (L4) in ESPB and AQLB groups was found to be 1.4 ± 0.5 hours and 1.5 ± 0.5 hours respectively. We were unable to perform a complete motor hip inspection because our surgeons were against its testing for internal rotation and adduction beyond neutral until 24 hours postoperatively due to fear of hip dislocation.

Study by Tulgar et al does not comment on motor weakness caused by the two blocks. But in comparison, Aliste et al stated that PENG block resulted in a lower incidence of quadriceps motor block as compared to SIFIB at 3 hours ($p<0.001$) and 6 hours ($p<0.001$) as evidenced by improved knee extension and PENG block also resulted in decreased paresis of hip adduction at 3 hours (50% vs 90%; $p=0.023$).[3] Parras et al stated that both femoral and AQLB (type1) have comparable motor and sensory blockade.[19] Study by Chudinov A et al highlighted that lumbar plexus block is most likely to result in excessive motor blockade and as a result of motor blockade after lumbar plexus block, patients cannot progress with postoperative physical therapy and ambulation, and are more likely to suffer a fall in the hospital.[1,2]

In our study, one subject in ESPB group had nausea and an episode of vomiting requiring anti-emetic (inj. ondansetron 4mg) while AQLB group had none. Subjects in either groups were fairly stable from the point of enrolment to discharge and no in-hospital fall was recorded. As per the hospital standards of our orthopaedic department, unilateral primary THR patients are discharged after 5 days, (unless prolonged because of any complication) and none of our enrolled patients had an increased or decreased length of stay (LOS) in the hospital. Green et al had however, observed decreased length of hospital stay after THR with the use of t-QLB.[23] Tulgar et al do not mention data on LOS. We did not assess patient satisfaction in our study as a secondary outcome, although Abduallah et al had stated that t-QLB neither improved satisfaction nor increased adverse events when compared to sham QLB.[20]

As far as techniques of the two blocks are concerned, Forero et al had concluded that the ideal plane of injection for ESPB is deep to the ESM due to more proximity with the dorsal and ventral rami and closer to the midline at the tip of TP since the costotransverse foramina is located medial to this parasagittal plane. Extension of ESM along the entire thoracolumbar spine favours the spread of injectate in cranio-caudal direction covering multiple dermatomes.[6]

Ever since Blanco first described the technique of US guided QLB in 2007, it has found various applications for post-op pain management in young and adult patients.[24-27] Various types of QLB have been described based on the technique of approach - lateral (QL1), posterior (QL2), anterior (QL 3 or transmuscular) and intramuscular (QL4) (28). Literature recommends the use of t-QLB for analgesia of the trunk and lower limb (T10–L4), as the LA mixture is injected between the psoas and QL muscle, plane where the branches of lumbar plexus run.[29] It is also supported by evidence published in cadaveric studies of Carline et al and Dam et al and radiological study by Adhikary et al.[30-32] Elsharkawy et al demonstrated that LA mixture in AQLB spreads to the lumbar paravertebral space and likely the lower thoracic as well, blocking most of the nerve roots innervating the hip joint (L1–L4), sparing the sacral roots. It can thus be used as an effective post-operative analgesic technique though not as an anaesthetic technique in hip surgeries.[33]

Limitations: Inevitably, there are certain limitations to our study. Though both ESPB and AQLB are proven to be excellent analgesia options, our limited sample size may question their efficacy and reproducibility as compared to a gold standard modality like epidural analgesia. Multicentric trials with larger sample size are needed to validate our results and provide universal acceptance on these interventions for post-op analgesia in THR patients.

Analgesia due to neuraxial blockade can act as a confounding factor in our study in determining the onset, duration and sensory assessment of the block. However, as both the groups received the exact same intervention, comparison can be validated.

We did not observe NRS scores on mobilisation, but only at rest. This may confound consistent coverage

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of all the innervating branches of lumbar and sacral plexuses supplying the most nociceptor-rich regions of the hip capsule.

We compared NRS scores between the two groups at different time intervals as our primary outcome but we realised that observing outcomes like 24-hour opioid consumption in the two groups would have been a better way of assessing pain as it would be more accurate considering that sometimes patients cannot clearly distinguish between successive pain values, like how much more is NRS 6 from NRS value of 5, which is bound to deviate the results. We also did not measure patient satisfaction in the two groups.

We did not encounter motor weakness of the lower limb which was likely due to low concentration and low volume of LA used in our study, however since both the blocks in study can potentially cause such complications, more studies are required to determine an accurate concentration and volume of LA which provide sufficient analgesia while mitigating associated complications.

CONCLUSION

In our study we concluded that both, ESPB (at L4 level) and AQLB provide effective post-op analgesia for THR patients. Time to request of first rescue analgesia (with addition of intravenous dexamethasone) was more than 17 hours for both block groups and was comparable. They also aid in reduction of opioid requirement for rescue analgesia and thus overall opioid consumption. NEITHER of the two blocks caused any motor weakness or delay in ambulation with the used concentration and volume of LA. Both the blocks demonstrate fair hemodynamic stability and can be safely incorporated into multi-modal analgesic regimes for THR in patients of diverse age groups.

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