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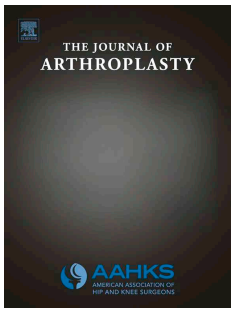

Randomized prospective comparative study of adductor canal block versus periarticular infiltration on early functional outcome after unilateral total knee arthroplasty

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Randomized prospective comparative study of adductor canal block versus periarticular infiltration on early functional outcome after unilateral total knee arthroplasty

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Randomized prospective comparative study of adductor canal block versus periarticular infiltration on early functional outcome after unilateral total knee arthroplasty

ABSTRACT

Background: Total knee arthroplasty (TKA) is associated with significant post-operative pain. Effective pain relief is essential for early post-operative rehabilitation. Periarticular infiltration (PAI) and Adductor canal block (ACB) have become popular modes of pain management after TKA. Our aim is to compare their efficacy and impact on early functional outcome in patients undergoing TKA.

Methods: A single-blind randomised controlled trial, 100 patients undergoing unilateral primary TKA for symptomatic OA were allocated to either of the two groups (50 in each arm). Postoperative ultrasound guided single shot of ACB (Group A) or intra operative PAI (Group B). All patients underwent TKA without patella resurfacing under spinal anaesthesia. Pre-operative work up, surgical technique, post-operative management were standardised for all the patients. Patients were assessed for pain using VAS (Visual analogue scale) at 6, 12, 24 hrs after surgery, haemoglobin level preoperatively and post operatively on day 1 to calculate blood loss, hospital stay, tourniquet time (TT), operative time (OT) and post-operative complications by an independent observer blinded to the group allocation.

Results: Patients were matched for age, gender, ASA grade and Deformity. VAS (scale 0-10) between PAI & ACB at 6, 12 & 24 hours were significantly different ($p<0.05$) with higher score seen in the patients with ACB at all time points. TT and OT were significantly longer in the PAI than ACB. No significant difference in the hospital stay observed. No complications occurred during the study.

Conclusion: PAI achieves better pain control as compared to ACB in patients undergoing unilateral TKA.

Key words: Total knee arthroplasty (TKA), Adductor canal block (ACB), Periarticular infiltration (PAI), Visual analogue score (VAS), Osteoarthritis (OA).

INTRODUCTION:

Patient undergoing Total knee arthroplasty (TKA) suffer from moderate to severe pain postoperatively. Though there have been advances in technologies and instrumentations in TKA, pain management after the operation is still evolving [1, 2]. Early post-operative mobilization is critical for reduction of immobility related complications as well as achieving the optimal functional outcome following surgery. Satisfactory pain relief is essential to ensure early mobilization. Various methods for pain control used in the previous years include epidural analgesia (EA), femoral nerve block (FNB), periarticular infiltration (PAI) and systemic analgesia (SA). The EA provides good pain relief but has side effects like urinary retention, hypotension and risk of epidural haematoma [3]. The FNB has advantage over EA but has shown to affect the strength of quadriceps muscles and may lead to increase incidences of falls [4, 5, 6]. SA is the most prevalent method of reducing pain with use of opiates or opioids. However some of these patients complain about nausea, vomiting, and pruritus related to it [7]. Therefore, an option for pain control with preserved motor function and adequate analgesia for TKA patients still remains a challenge.

Perioperative pain management with PAI is a safe and effective method of controlling pain after TKA and it also eliminates the risk associated with femoral nerve block of quadriceps weakness. Effective use of PAI requires specific knowledge of the relevant neuroanatomy of the knee [8]. PAI contains cocktail of local anaesthetics, NSAIDs, epinephrine (adrenaline) and normal saline which is injected into the peri-articular tissues around the knee joint during the operation. It has gained popularity for its simplicity,

safety and selective sensory blockade unlike the motor blockade associated with FNB and EA[9, 10, 11].

In the recent years ultrasound guided ACB has gain popularity over FNB, SA, and EA for management of pain in TKA patients. The adductor canal, (also known as the sub-sartorial or the Hunter's canal) is located within the middle third of the anterior-medial thigh and extends from the apex of the femoral triangle to the adductor hiatus. The contents of the adductor canal have traditionally been described as the femoral artery and vein, two fascicular branches of the femoral nerve, the saphenous nerve and the nerve to the vastus medialis, and the articular contribution of the obturator nerve, which enters the distal adductor canal just proximal to the adductor hiatus [12]. The ACB is sensory nerve block with some effect on the motor function of vastus medialis as the motor branch passes through the adductor canal. Isolated and partial effect on motor weakness of vastus medialis decreases tendency of fall while walking [13]. Use of ACB needs ultrasound and does not provide pain relief at the posterior aspect of the knee.

Whether PAI offers better pain control than ACB after TKA remains controversial. The primary aim of this study is to compare the pain relief with PAI Vs ACB in patients undergoing primary TKA. The secondary aim is to assess time to mobilise, related complications and length of stay with either of these techniques.

MATERIALS AND METHODS:

Inclusion criteria:-Adult patients undergoing primary unilateral TKA, ASA Grade1 or 2 with normal cognitive function.

Exclusion criteria:- Patients unwilling to participate, poorly controlled diabetes, history of inflammatory arthritis, non-ambulatory/ bed ridden patients, known allergy to the anaesthetic drugs, history of bleeding disorder, history of arrhythmia or seizures, sepsis, pre-existing lower extremity neurological abnormality.

Study design: - This single blind prospective randomised controlled trial was conducted at Deenanath Mangeshkar Hospital, Pune, India from September 2017 to June 2018. Approval was provided by Institute's human research ethics committee. Patients scheduled for primary unilateral TKA were invited to take part in the study and informed consent was obtained from those willing to participate in the study. 100 opaque sealed envelopes were prepared in advance with random sequence generated by computer and contained a label marked A or B. The envelope was opened by the scrub nurse before start of the surgery. If the sheet showed label marked A, Ultrasound guided Adductor canal block was given on the side of surgery postoperatively and if it showed B then periarticular infiltration was injected intra-operatively before implantation. Surgical team, scrub staff and anaesthesiologist were aware of the allocation. One hundred patients were included in this study with 50 patients in Group A designated to ACB and 50 patients in Group B designated to PAI.

None of the patients were on long-term opioids pre-operatively. At the time of initial outpatient assessment, all patients received same standardized instructions about which medications they should take and which they should try and avoid. We do not routinely prescribe gabapentinoids or opioids to patients as pre-operative medication. All patients undergoing TKA, were KL grade IV.

For the Group A (ACB) an ultrasound transducer was used to identify the adductor canal. The transducer located the adductor canal at mid-thigh, halfway between the inguinal crease and patella. Superficial femoral artery, sartorius, the adductor longus and adductor magnus muscle were identified. The hyper echoic structure located anterolateral to the artery (sephanous nerve and nerve to vastus medialis) was identified as the target injection site. A 22-Guage, 100mm needle (stimuplex; B Braun) was introduced in plane lateral to medial under ultrasound guidance using linear probe of a sonosite (Fujifilm, Japan) machine. Solution containing 30ml of 0.5% of ropivacaine and 100 mcg of clonidine (total volume = 30.7 ml) was injected after ensuring correct placement of the needle.

For group B (PAI) solution contained local anesthetic agent(ropivacaine), NSAID (ketorolac), epinephrine (adrenaline), clonidine and normal saline according to the weight of patient and was injected using a 20G spinal needle with 20cc syringe (table 1).

The PAI was given in eight zones around the knee [8] as shown in table 2.

Procedure:-

All patients were admitted on the previous night. Premedication included oral paracetamol 650 mg QID, Pregabalin 75 mg at night & in the morning before surgery with sips of water and Alprazolam 0.5 mg previous night. All patients received spinal anaesthesia. Total knee arthroplasty was performed using midline skin incision and medial paraptellar arthrotomy. Tourniquet was used in all the cases and was released before wound closure. Surgical drains were not used in any patient. All patients received a PS knee and patella was not resurfaced in any of the cases. In both the groups after the closure of arthrotomy, tranexamic acid was infiltrated locally to reduce bleeding at surgical site [14,15]. Postoperatively patients were encouraged to stand with support on the same day of surgery and used ice packs to the knee four times a day during their hospital stay. Patients received six hourly intravenous (IV) Paracetamol 1g along with twelve hourly IV Tramadol 50 mg and diclofenace 75 mg post operatively for the first 48 hours post-surgery. Later PRN oral analgesics were prescribed (Paracetamol and Tramadol). All patients received standard DVT chemoprophylaxis for first two weeks post operatively. DVT chemoprophylaxis included 40 mcg of sub cutaneous low molecular weight heparin for five days post operatively followed by oral Rivaroxaban 10 mg for fourteen days. Patients were also provided with below knee anti embolism compression stockings to be used in the post-operative period for six weeks. All pain scores were assessed by an independent observer who was blinded to the allocation of groups. All the patients were followed for a period of 6 months.

Statistical analysis:-Baseline characteristics, difference between pre- and post-operative Hb as well as VAS scores at 6, 12, and 24 hours were compared between both the groups using independent T-test.

RESULTS:

The study included total 100 patients with 50 in each group.The two groups were well matched for age, gender, pre-operative deformity and ASA grade (Table 3)

There was significant difference between the VAS score at 6, 12, & 24 hours (table 4) with significantly higher pain scores in the ACB as compared to the PAI group.

There was significant difference between tourniquet time & operative time with no significant difference between hospital stay in both the groups (ACB & PAI) as shown in Table 5 with higher tourniquet time noted in the patients with PAI.

The difference between levels of haemoglobin preoperatively & postoperatively on day 1 between both the groups (ACB & PAI) were significant with reduction in level of haemoglobin was higher in ACB group (Table 6). The range of drop in haemoglobin difference in the patient with Adductor canal block was 0.3 to 3.1 while mean is 1.8. While in the patients with periarticular infiltration the range of drop in haemoglobin was 0.1 to 3.4 while mean is 1.1.

DISCUSSION: -

Effective analgesic modalities are essential in TKA to facilitate early rehabilitation and optimise post-operative recovery [(16)]. After TKA the analgesic modality should offer adequate pain relief with no effect or very little effect on muscle power, which would allow early and safe post-operative rehabilitation [(17)]. The medication for local anaesthesia with selective effect on sensory nerve with no effect on motor nerve fibres does

not exist [18]. This study confirmed better post-operative pain relief and less drop in haemoglobin with peri-articular infiltration as compared to adductor canal block. No difference was found in length of stay.

A recent study by Kampitak W et al [19] showed better post-operative pain relief with ACB with less requirement of opioids compared to PAI in unilateral TKA patients. In contrast, our study shows better post operative pain relief in the patients with PAI at 6, 12, 24 hours as compared to ACB group. This may be due to the difference in the technique for PAI between both the studies. In their study they infiltrated cocktail around prosthesis, fat & subcutaneous tissue but in our study we have infiltrated cocktail in 8 zones as described in materials & methods. Volume of drug used in their study was 60ml for all the patients but in our study volume of drug has been varied according to the weight of the patient. In their study they have used levo-bupivacaine, morphine, adrenaline & normal saline while in our study we have used ropivacaine, adrenaline, ketorolac, normal saline & clonidine. Clonidine exerts its effect via its α-2 adrenergic actions and results in potentiation of the synergistic action of local anaesthetic and local steroids [20].

Some investigators have assessed combination of ACB and PAI. Andersen et al [21] in a blinded RCT compared the effect of continuous saphenous nerve block (two 15 ml boluses of ropivacaine per day for the first two days post-surgery) in patients undergoing TKA and receiving PAI. In this study, authors reported better pain relief (both at rest as well as on movement) in the nerve block group. In this study we have used single shot of ACB given postoperatively without the use of an indwelling catheter as this can increase the risks of infection, prolong hospital stay and it also increases the cost of procedure to the patient. In a prospective study by Reddy el al [22] patients who received MIA (multisite infiltration analgesia) showed significantly better VAS scores 8, 24, and 48 hours after surgery. Furthermore, they showed a marginally better ROM postoperatively. This study was not blinded, also the ACB was given four hours after the spinal anaesthesia while in our study which was blinded & ACB was given immediately after the closure of wound for better comparison of the effectiveness between both

modalities. Very few studies compared blood loss in patients undergoing TKA either with ACB or with PAI. In our study we have noted that the patients who have received ACB had significant blood loss with drop in haemoglobin postoperatively in comparison to the patients who have received PAI. In addition, we noted significant reduction in pain levels at 6, 12 and 24 hours post-surgery. It is possible that with PAI we have targeted delivery of the medication with particular reference to the posterior structures (which are not fully covered by an Adductor Canal Block) and therefore the pre-emptive analgesia achieved is superior. Although the action is unlikely to last for more than 24 hours, this will help in controlling the pain with oral medication better than in those with the regional block. Another reason is the addition of epinephrine (adrenaline) & ketrorolac (NSAID) in the PAI cocktail. Epinephrine causes vasoconstriction locally which helps reduces blood loss [23] also it prolongs the analgesic action of local anaesthetic. NSAID via its alpha-adrenergic effect which reduces the absorption of these drugs [24, 25]. Though the drop in haemoglobin is statistically significant, clinically does not seem significant as none of our patient require blood transfusion or any sort of intervention for drop in haemoglobin. This is a limitation of our study and to rectify this, a study with larger sample size will be required.

In our study tourniquet time & operative time were higher in the PAI group. This is probably due to the time taken to administer PAI before implantation. Our PAI (as described in the methods section) involves multiple small dose deliveries rather than using a spinal needle and delivering a large amount in one place, it takes more time in our hands. We assessed the time taken to inject in the past 20 cases, and on an average it takes around 5 minutes to do so. A meticulous technique helps us achieve good pain relief and it is possible that variation in the injection technique can explain different results reported by other researchers when comparing PAI with ACB. In addition, ACB was administered postoperatively after the tourniquet was deflated and therefore did not impact the tourniquet time as well as operative time. It is an unfair comparison and we should have checked total time spent in theatres from arrival into theatres to entry into recovery room to get a better

idea of additional time needed to administer PAI or ACB. There were a few other limitations to the study. In our study the injection site was in to the adductor canal not proximal to adductor canal or at the apex of femoral triangle. Therefore further studies would be needed to define the optimal injection site of ACB for TKA. In our study we have used ketorolac for pain relief while in other studies ketorolac along with morphine has been used which may be a better combination for pain relief.

One may argue that the reduction achieved in pain levels is similar for both the groups and the differences are not clinically significant. The difference in pain scores was statistically significant at 6hours, 12 hours and 24 hours post-surgery. The difference between the means at each of these time points was 1.06, 1.24 and 1.82. Previous studies have used a difference of 0.9 as minimally clinically important difference (MCID) for pain studies [(26)].

The protocol at our centre is to give either ACB or PAI. We do not routinely practice the combination of both modalities. This study confirms that both techniques work well on their own although PAI provides superior pain relief. We have not found the need for using both ACB and PAI in the same patient although it is likely to further reduce the pain levels.

CONCLUSIONS:-

Periarticular infiltration is safe and effective as it provides better pain relief in early postoperative period than adductor canal block in patients undergoing unilateral total knee arthroplasty. This helps in early postoperative rehabilitation & adds to patient satisfaction. Periarticular infiltration also reduces blood loss.

References

1. Lamplot JD[1], Wagner ER[1], Manning DW[2].Multimodal pain management in total knee arthroplasty. J Arthroplasty. 2014; 29(2):329-34.

2. Dong CC, Dong SL, He FC. Comparison of adductor canal block and femoral nerve block for postoperative pain in total knee arthroplasty: a systematic review and meta-analysis. Medicine (Baltimore). 2016; 95(12):e2983.

3. Choi PT, Bhandari M, Scott J. Epidural analgesia for pain relief following hip or knee replacement. Cochrane Database Syst Rev 2003;3:CD003071.

4. Paul JE, Arya A, Hurlburt L, et al. Femoral nerve block improves analgesia outcomes after total knee arthroplasty: a meta-analysis of randomized controlled trials. Anesthesiology 2010;113:1144-62.

5. Sharma S, Iorio R, Specht LM, et al. Complications of femoral nerve block for total knee arthroplasty. ClinOrthopRelat Res 2010;468: 135-40.

6. Lareau JM, Robbins CE, Talmo CT, et al. Complications of femoral nerve blockade in total knee arthroplasty and strategies to reduce patient risk. J Arthroplasty 2012;27:564 8.

7. Parvizi J, Miller AG, Gandhi K. Multimodal pain management after total joint arthroplasty. J Bone Joint Surg Am 2011;93:1075-84

8. Guild GN III, Galindo RP, Marino J, Cushner FD, Scuderi GR (2014) Peri-Art0icular Regional Analgesia in Total Knee Arthroplasty. A Review of The Neuroanatomy And Injection Technique. An Orthop Rheumatol 2(3): 1025

9. Gardner, E. The innervation of the knee joint. (1948) Anat Rec 101(1): 109-130.

ACCEPTED MANUSCRIPT

10. Shah NA, Jain NP. Is continuous adductor canal block better than continuous femoral nerve block after total knee arthroplasty? Effect on ambulation ability, early functional recovery and pain control: a randomized controlled trial. J Arthroplasty 2014;29:2224-9.

11. Kerr DR, Kohan L. Local infiltration analgesia: a technique for the control of acute postoperative pain following knee and hip surgery: a case study of 325 patients. ActaOrthop 2008;79:174-83.

12. Kehlet H, Andersen LØ. Local infiltration analgesia in joint replacement: the evidence and recommendations for clinical practice. ActaAnaesthesiolScand 2011;55:778-84.

13. Reeves M, Skinner MW. Continuous intra-articular infusion of ropivacaine after unilateral total knee arthroplasty. Anaesth Intensive Care 2009;37:918-22.

14. Pispati A, Garg P, Patil N, Savedekar A, Jaiswal N, Kumar A. Is intraarticular administration of tranexamic acid better than its intravenous administration in reducing blood loss after total knee arthroplasty?. J Orthop Allied Sci 2013;1:28-32

15. Ishida K, Tsumura N, Kitagawa A, Hamamura S, Fukuda K, Dogaki Y, et al. Intra-articular injection of tranexamic acid reduces not only blood loss but also knee joint swelling after total knee arthroplasty. Int Orthop 2011;35:1639-45.

16. Wang H, Boctor B, Verner J. The effect of single-injection femoral nerve block on rehabilitation and length of hospital stay after total knee replacement. RegAnesth Pain Med 2002; 27:139-144.

ACCEPTED MANUSCRIPT

17. Perlas A, Kirkham KR, Billing R, et al. The impact of analgesic modality on early ambulation following total knee arthroplasty. RegAnesth Pain Med 2013;38:334-9.

18. Ilfeld BM, Yaksh TL. The end of postoperative pain — a fast-approaching possibility? And, if so, will we be ready? RegAnesth Pain Med 2009; 34:85-87

19. Kampitak W, Tanavalee A, Ngarmukos S, Amarase C, Songthamwat B, Boonshua A. Comparison of Adductor Canal Block Versus Local Infiltration Analgesia on Postoperative Pain and Functional Outcome after Total Knee Arthroplasty: A Randomized Controlled Trial. Malaysian Orthopaedic Journal. 2018;12(1):7-14. doi:10.5704/MOJ.1803.002.

20. Joshi GP. Multimodal analgesia techniques for ambulatory surgery. Int Anesthesiol Clin. 2005; 43:197–204

21. Andersen HL, Gyrn J, M⊘ller L, et al. Continuous saphenous nerve block as supplement to single-dose local infiltration analgesia for postoperative pain management after total knee arthroplasty. Reg Anesth Pain Med 2013; 38:106-11.

22. Gurava Reddy AV[1], Shafeekh M[1], Sankineani SR[1], Jhakotia K[2], Sagi M[1], Daultani D[1], Khanna V[1], Eachempati KK[3]. Comparison between Multisite Infiltration Analgesia versus Adductor Canal Block for Pain Management in Total Knee Arthroplasty: A Prospective Study AnesthEssaysRes.2018Oct-Dec12(4):774-777.doi:10.4103/aer.AER_124_18.

23. Teng Y, Ma J, Ma X, Wang Y, Lu B, Guo C. The efficacy and safety of epinephrine for postoperative bleeding in total joint arthroplasty: A PRISMA-compliant meta-analysis. Medicine (Baltimore). 2017;96(17):e6763. doi:10.1097/MD.0000000000006763

24. Parvataneni HK, Ranawat AS, Ranawat CS. The use of local periarticular injections in the management of postoperative pain after total hip and knee replacement: a multimodal approach.InstrCourseLect.2007;56:125–131.

25. Parvataneni HK, Shah VP, Howard H, Cole N, Ranawat AS, Ranawat CS. Controlling pain after total hip and knee arthroplasty using a multimodal protocol with local periarticular injections: a prospective randomized study. J Arthroplasty. 2007;22(6 Suppl 2):33–38.

26. Machado GC, Maher CG, Ferreira PH, Pinheiro MB, Lin C-WC, Day RO, et al. Efficacy and safety of paracetamol for spinal pain and osteoarthritis: systematic review and meta-analysis of randomised placebo controlled trials. BMJ 2015;350:h1225. Wandel S, Juni P, Tendal B, et al . Effects of glucosamine, chondroitin, or placebo in patients with osteoarthritis of hip or knee : network meta-an alysis. BMJ 2010;341:c4675.)

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TABLES:

Table 1: - Periarticular Infiltration cocktail

For patient weight less than 70 kg	**For patient weight more than 70 kg**
Ropivacaine 0.75 = 40 ml Clonidine = 0.6ml Adrenaline = 0.3ml Ketorolac = 1 ml Normal saline = 19 ml	Ropivacaine 0.75 = 54 ml Clonidine = 0.8ml Adrenaline = 0.3ml Ketorolac = 1ml Normal saline = 25 ml
Total volume = 60cc	Total volume = 80cc

Table 2: - Zones for periarticular infiltration around knee

Zone 1	Suprapatellar Pouch/Quadriceps Tendon
Zone 2	Medial Retinaculum
Zone 3	Patellar Tendon and Fat Pad
Zone 4	Medial Collateral Ligament and Medial Meniscus Capsular Attachment
Zone 5	Posterior Cruciate Ligament Tibial Attachment site
Zone 6	Anterior Cruciate Ligament Femoral Attachment site
Zone 7	Lateral Collateral Ligament and Lateral Meniscus Capsular Attachment
Zone 8	Lateral Retinaculum and also in the periosteum around distal femur and proximal tibia.

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Table 3: Variables including age, sex, deformity, ASA Grade

Variables	ACB group (n=50)	PAI group (n=50)
Age (years)	67.4±11.9	67.7±11.4
Sex (male/female)	17/33	17/33
Deformity	50 (varus)	50 (varus)
ASA grade I/II/III	5/34/11	6/32/12

Table 4:-VAS comparison at 6, 12, 24 hours between ACB & PAI Group

Block		N	Mean	SD	Median	SE	T	P
VAS 6 hr	ACB	50	2.6	.94	2	.13	6.014	<0.05
	PAI	50	1.5	.81	1	.11		
VAS 12hr	ACB	50	3.4	1.21	3	.17	5.368	<0.05
	PAI	50	2.1	1.09	2	.15		
VAS 24hr	ACB	50	5.1	1.02	5	.14	8.571	<0.05
	PAI	50	3.3	1.16	3	.16		

Table 5:- Difference between operative time & tourniquet time in ACB & PAI groups

Block	N	Mean	SD	SE	independent t test	p-value
Op Time ACB	50	70.4	10.04	1.42	-3.364	<0.05
PAI	50	77.1	9.62	1.36		
Tourniquet time						
ACB	50	48.8	7.41	1.04	-3.306	<0.05
PAI	50	54.1	8.62	1.22		
Hospital stay						
ACB	50	4.8	1.43	0.20	-0.744	>0.05
PAI	50	5.1	1.24	0.17		

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Table 6:- Haemoglobin difference pre op & post op day 1 between both ACB & PAI

Hb diff= POD1hb-PReopHb

Block		N	Mean	SD	SE	T	P
Hb diff	ACB	50	-1.8	.92	.13		
	PAI	50	-1.0	.65	.09	-5.014	<0.05

Group Statistics

ACCEPTED MANUSCRIPT