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KEY WORDS: Interscalene Brachial Plexus Block, Ropivacaine, Laevobupivacaine,fentanyl.

COMPARATIVE STUDY OF ROPIVACAINE AND LAEVOBUPIVACAINE WITH FENTANYL AS AN ADJUVANT IN INTERSCALENE BRACHIAL PLEXUS BLOCK FOR UPPER ARM SURGERIES

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ABSTRACT

INTRODUCTION: Interscalene brachial plexus block is a useful peripheral nerve bock for upper arm surgeries. Ropivacaine and laevobupivacaine has better safety profile than bupivacaine and Fentanyl may enhance the quality of block.
AIMS AND OBJECTIVES: To compare the block characteristics of ropivacaine and laevobupivacaine with fentanyl as an adjuvant in interscalene brachial plexus block.
MATERIAL AND METHODS: For this prospective study ,60 patients were randomized into two groups ,Group A-0.5% ropivacaine 30 cc and 50ug fentanyl and Group B- 0.5% laevobupivacaine 30cc and 50ug fentanyl and interscalene block was given.The onset of sensory block, motor block, the duration of sensory block and motor block, the quality of surgical anaesthesia, the duration of postopsertive analgesia, haemodynamic parameters and side effects were observed.
RESULTS: Onset time of sensory block and motor block was earlier with laevobupivacaine.(P<.0.001).The duration of sensory block and motor block was longer in laevobupivacaine group(P<0.001)The duration of analgesia was longer in laevobupivacaine group (P<0.0001).Quality of surgical anaesthesia was excellent to good in all patients in both groups. Haemodynamics were stable and there were no side effects in both groups.
CONCLUSION; Laevobupivacaine with fentanyl provides efficient brachial plexus block by interscalene route compared to ropivacaine with fentanyl

INTRODUCTION:

Upper arm surgeries form a major bulk of orthopedic trauma. Advantages of the use of peripheral nerve block consists of prolonged analgesia, selective area of action, fewer collateral effects compared to general anaesthesia.[1] Upper extremity block provides effective intraoperative and early post operative analgesia, reducing opiod consumption in first 24 hrs.[2],opioid sparing effects and decrease in side effects related to opioids.[3] In patients with upper limb trauma,avoidance of general anaesthesia in non fasted patient,for out of hours surgeries is beneficial. Also peripheral nerve block reduces post operative nausea vomiting, improves tissue perfusion during re-implantation and provides ability for a continouos technique for repeated procedures. Interscalene block appears to be the most appropriate for shoulder surgery.[4]

Ropivacaine, the S isomer of racemic bupivacaine has efficacy similar to levobupivacaine and bupivacaine for peripheral nerve block. In addition it has lower propensity for motor block and reduced potential for central nervous system and cardiovascular toxicity.[5] Levobupivacaine, the S isomer of racemic bupivacaine has a clinical profile similar to bupivacaine with additional advantage of a better safety profile regarding central nervous system and cardiovascular toxicity than the racemic parent bupivacaine.[6]

Review of RCTs support the use of these drugs in clinical situation where risk of systemic toxicity related to either overdosing or unwanted intravascular injection is high such as peripheral nerve block. [7] A review has shown similar clinical profile of ropivacaine and levobupivacaine to that of bupivacaine [7] while another metaanalysis of RCT has shown longer duration of sensory block and long term anaesthesia and less need of rescue analgesics with levobupivacaine compared to ropivacaine.

Fentanyl an opioid has been given perineurally with local anaesthetics agents in peripheral nerve block. [9] It improves the quality of block but some studies found no significant difference in quality with addition of fentanyl [11,12]

The rationale of the study was to find out the efficacy and safety of ropivacaine and laevobupivacaine with fentanyl as an adjuvant in interscalene block for upper arm surgery.

MATERIAL AND METHODS

After approval by institutional ethical committee , patients posted for upper arm surgeries were enolled by convenient sampling method. A sample size of 60 was taken. The inclusion criteria was age 18-60 yrs of both gender, weight 50-70kg, height 150-170cm,ASA grade I and II and exclusion criteria was refusal to participate in study, history of cardiovascular disease, respiratory disease, central nervous system disease, ASA grade III and IV, allergy to local anaesthetics. Informed consent was taken. Patients were randomized into two groups by computer generated random number table. Group A- Inj. Ropivacaine (0.5% 30 mL) + Inj fentanyl 50 mcg and Group B, Inj. Levobupivacaine (0.5% 30 mL) + inj fentanyl 50 mcg. Allocation consealed by opaque sealed envelope technique.

On day of surgery, brachial plexus blockade was performed through interscalene approach using classical technique. Brachial plexus was located using nerve locater (NSML 100 INMED EUIPMENTS). A short beveled Teflon coated stimulating needle (3.5 cm long, 22 gauge) was used for locating the plexus. A stimulating frequency was set at 2 Hz while the stimulating current was initially set at 1 mA and was gradually decreased to 0.5 mA. According to method of Winnie, needle was inserted at apex in between the anterior scalene and medial scalene muscles, perpendicular to skin with a 45 degree caudad and slightly posterior angle. The muscular twitches in arm distal to needle insertion were sought to confirm the needle location. Onset of sensory block was assessed every 2 min by atraumatic pinprick test and compared with the same stimulation on contralateral hand. Sensory blockade was graded as: grade 0 (no block), normal sensitivity; grade 1 (onset); grade 2 (partial), analgesia or loss of sharp sensation of pinprick; and grade 3 (complete), anesthesia or loss of sensation to touch. Motor block was evaluated by four-point scale: grade 0, no block; grade 1 (onset), decreased movement with loss of strength; grade 2, (partial): decreased movement with inability to perform movement against resistance; and grade 3 (com

plete), paralysis. Patient were evaluated for surgical anesthesia as 1)excellent 2)good 3)moderate 4)poor/ failure.Need of intraoperative supplementation noted.

The intensity of postoperative pain was evaluated using visual analogue scale (VAS) with grade 0mm(no pain) to 100mm (worst pain imaginable). Both the groups were compared for duration of analgesia. .Heart rate, blood pressure, and oxygen saturation monitoring done. Patients were observed for any systemic side effects such as bradycardia, hypotension and complications of ISB.

STATISTICAL ANALYSIS

The collected data was compiled in EXCEL sheet and Master sheet was prepared. For analysis of this data SPSS (Statistical Software for social Sciences) software version 20th was used. Statistical significance was indicated by conventional symbols:

P <0.05: Statistically significant and P >0.05: Statistically non-significant

RESULTS:

No differences in demographic variables as well as duration of surgical procedure were reported between the two groups.(table 1)

Table 1: Demography

Parameters	Group A n=30	Group B n=30	t-value	P-value
Age	37.07±8.59	39.93±10.20	1.17	P=0.244 NS
Gender Male Female	 18 (60%) 12 (40%)	 15 (50%) 15 (50%)	-	-
Weight (kg)	64.27±5.63	62.83±6.26	2.43	P=0.058 NS
Height (cm)	163.77 ±5.82	160.46 ±5.09	1.76	P=0.127 NS
ASA grade I grade II	 18 (60.0%) 12 (40.0%)	 16 (53.3%) 14 (46.7%)	-	-
Duration of surgery	129.50±33.56	121.33±32.77	0.95	P=0.344 NS

Table 2: Block characteristics

Parameters	Group A Mean ± SD	Group B Mean ± SD	t-value	P-value
Onset Sensory Block	3.58±0.63	1.07±0.173	21.43	P<0.0001S
Onset Motor Block	7.33 ±0.54	2.17 ±0.379	43.12	P<0.0001 S
Total duration of Sensory Block	426.00±24.01	506.67±19.18	14.37	P<0.0001S
Total duration of Motor Block	396.67 ±23.09	490.00 ±21.33	16.26	P<0.0001 S
Total Duration of analgesia	471.33±14.07	554.0±20.44	18.24	P<0.001 S
VAS score at 10th hr	4.00±0.00	3.65±0.48	1.21	P=0.223 NS

The mean onset time for sensory and motor block was late in group A and earlier for group B.The mean time of onset of sensory and motor block achieved were highly significant between group A and B (p<0.0001)(Table 2)

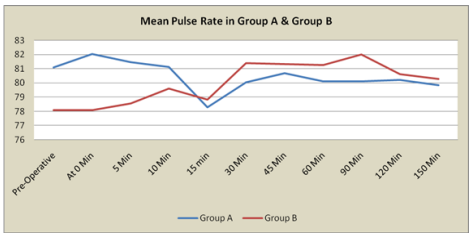
The mean duration of sensory block and motor block was longer in group B than group A. The duration of sensory and motor block was highly statistically significant in group A and group B (p<0.0001)(Table 2)

The mean duration of analgesia was more in group B compared to that in group A . A statistically significant difference was observed amongst the groups. (p<0.001)(Table 2). Till 9th hr VAS score was statistically significant but at 10th hr, it was not statistically significant in group A and B (p = 0.223).

Table 3: Surgical anaesthesia

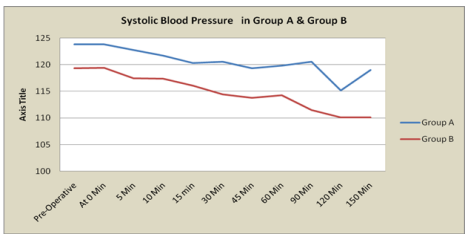
Evaluation	Group A	Group B
Excellent	24 (80%)	22 (73.34%)
Good	06 (20%)	08 (26.67%)
Moderate	00	00
Poor/Failure	00	00

Figure 1: Mean pulse rate at different time interval



The intraoperative conditions in group A was excellent in 80% of patients and good in remaining 20%, while in group B 73.34% patients had excellent intraoperative conditions and remaining patients had good conditions.(Table 3)

Figure 2: Systolic BP at different time interval



Haemodynamically the groups were comparable and clinically non-significant.(Fig 1 & 2) One patient in each group complained of nausea and vomiting.

DISCUSSION:

In our study, both groups were comparable demographically. Similar to our study, onset of sensory block was earlier with levobupivacaine [13] but in few studies it was earlier with ropivacaine [14,15] and equal in both groups in rest of the studies [16-19].Onset of motor block was early with levobupivacaine [13] similar to our study but early with ropivacaine [14,20] and equal in both groups in other studies. [15,17-19] Onset is related to the intrinsic physicochemical property of individual local anaesthetic agent and physicochemical properties include the pKa and hydrophobicity of local anaesthetic agent. Ropivacaine is about 10 times less lipophilic than levobupivacaine and hence the difference seen.[21].When the onset time of sensory block and motor block was compared ,sensory onset was earlier as small myelinated axons ,A gamma and A delta sensory fibres are most susceptible to block followed by large myelinated A alpha fibre and A beta fibres. [21] Comlete sensory block and complete motor block was achieved earlier with levobupivacaine group in our study.

In congruence to our study sensory block duration was longer with levobupivacaine [17-20] and equal in both groups in other studies [22,23] Agreeing with our study, duration of motor block was longer with levobupivacaine [17,19,22] but other studies had equal duration in both groups [18, 23,] Similar to our study duration of analgesia was longer with levobupivacaine [16,17] and equal in duration in both groups [14,15,18,23,24] In congruence to our study rescue analgesics needed later in levobupivacaine groups [16,17] while in few studies it was needed at same time in both groups [15,23,24].Agreeing with our study VAS equal in both groups [13,17,18,23, 24] Duration of block is influenced by the peripheral vascular effects of local anaesthetic drugs. They have a biphasic action on vascular smooth muscle.They cause vasoconstriction at lower concentration and vasodilatation at higher concentration. Effect of local anaesthetics on vasculature and regional blood flow are complex and vary

according to concentration,time,particular vascular bed among other factors.[21]

Similar to our study quality of surgical anaesthesia was excellent and good and comparable in both groups [15,17,18,20,23].while one study showed high success with ropivacaine [14] Our aim of adding fentanyl was to improve the quality of surgical anaesthesia. In our study there was no need of intraoperative supplementation which suggests excellent to good quality of surgical anaesthesia. One study showed improved quality [10] while in other study quality comparable in both groups even after adding fentanyl. [11,12] Duration of analgesia prolonged after adding fentanyl in few studies [25,26] while one study showed prolonged analgesia with levobupivacaine -fentanyl[12] compared to ropivacaine-fentanyl. The existence of peripheral opiod receptors and its effectivity in peripheral nerve block remains controversial.[24]

Similar stable haemodynamics like ours seen in other study.[17] In our study side effects like nausea and vomiting seen only in one patient in each group while in other study no side effect seen.[17]

CONCLUSIONS:

Levobupivacaine and fenanyl provides efficient blockade of brachial plexus block by interscalene route compared to ropivacaine except for the disadvantage of prolonged motor block with levobupivacaine.

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