

## ORIGINAL RESEARCH

# The efficacy of analgesia between ultrasound guided cervical plexus block versus local infiltration during internal jugular vein cannulation

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### ABSTRACT

Ropivacaine is an amino amide local anaesthetic, belongs to piperidylidides and has a propyl group on the piperidine nitrogen atom compared to bupivacaine, which has a butyl group. It is less lipophilic than bupivacaine and together with its stereo- selective properties, contributes to ropivacaine having higher threshold for cardiovascular and CNS toxicity than bupivacaine in animals and healthy volunteers. After obtaining the approval from the Ethical committee and the Institutional review board and obtaining a well-informed written consent, 100 ASA Grade I, II, III patients who were undergoing various elective and emergency surgeries requiring central venous cannulation were chosen. The patients were randomized into two groups using computer generated random number tables. It shows significant difference in numerical rating scale (NRS) score between two study groups at all time points except time 0 (baseline). NRS score being much lower in ultrasound guided intermediate cervical plexus block group during various procedural steps of Internal Jugular Vein (IJV) cannulation.

**Key words:** Analgesia, ultrasound guided cervical plexus block versus, local infiltration

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### INTRODUCTION

Ultrasound guidance for regional anaesthesia became popular owing to detection of anatomical variants, painless performance and more accurate needle placement. The needle tip can be guided toward the neuro-vascular plane to avoid injury to arteries, veins and other adjacent structures.<sup>1</sup> It also helps to monitor the spread of local anaesthetic solution in the appropriate tissue planes and thereby reduce the incidence of neurovascular and other complications.<sup>2</sup> Ropivacaine is an amino amide local anaesthetic, belongs to piperidylidides and has a propyl group on the piperidine nitrogen atom compared to bupivacaine, which has a butyl group. It is less lipophilic than bupivacaine and together with its stereo- selective properties, contributes to ropivacaine having higher threshold for cardiovascular and CNS

toxicity than bupivacaine in animals and healthy volunteers. Ropivacaine penetrates large myelinated motor fibres (A $\beta$  fibres) to a lesser extent and therefore blocks pain-transmitting A $\beta$  and C nerves more selectively.<sup>3</sup>

However there are limited number of studies reported in the literature comparing ultrasound guided intermediate cervical plexus block and local infiltration in terms of efficacy of analgesia and patient satisfaction during internal jugular vein cannulation. This prompted us to compare the efficacy of analgesia and the patient satisfaction between ultrasound guided intermediate cervical plexus block versus local infiltration during IJV cannulation in patients who are undergoing both emergency and elective surgeries.<sup>4</sup>

The scope of this study within the institution is that, this is a centre for various elective and emergency surgeries and tertiary care hospital catering to a wide range of surgeries requiring central venous cannulation. The use of Ropivacaine as drug of choice in ultrasound guided intermediate cervical plexus block for IJV cannulation have reduced the morbidity.

## METHODOLOGY

**STUDY DESIGN:** A prospective comparative study.

**STUDY POPULATION:** After obtaining the approval from the Ethical committee and the Institutional review board and obtaining a well-informed written consent, 100 ASA Grade I, II, III patients who were undergoing various elective and emergency surgeries requiring central venous cannulation were chosen. The patients were randomized into two groups using computer generated random number tables. Assessment of pain using NRS score 0-10 during various steps in IJV cannulation.

NRS for pain assessment

NRS Score assessed at following procedural steps during IJV cannulation:

Time 0: At baseline 5 minutes prior to start of procedure.

Time 1: During administration of block/local infiltration.

Time 2: During needle puncture.

Time 3: During subcutaneous tunneling.

Time 4: At insertion of catheter.

Time 5: During securing and suturing.

Time 6: 5 minutes after procedure.

**BLINDING:** Single blind study.

**SAMPLE SIZE:** Considering dropouts, and to have better power we studied 50 patients in each group. Total 100.

**RANDOMIZATION:** Patients were randomized based on computer generated randomization into two groups.

**GROUP 1:** (n=50) Patients who were given ultrasound guided intermediate cervical plexus block with 5-7ml of 0.75% Ropivacaine.

**GROUP 2:** (n=50) Patients who were given local infiltration with 5-7ml of 0.75% Ropivacaine.

## INCLUSION CRITERIA

- Age group 18-75 years.
- ASA grade I, II, III patients of either sex.
- Patients undergoing various elective surgeries requiring Internal jugular vein cannulation.
- Patients undergoing various emergency surgeries requiring Internal jugular vein cannulation.

## EXCLUSION CRITERIA

- Patient refusal for the study.
- Age <18 or >75 years.
- Patients receiving anticoagulants.
- Patients with infection/local pathology at the site of administration of block.
- Patients allergic to local anaesthetic agents.
- Patients with coagulation disorder.
- ASA grade  $\geq$  IV.
- Patients with distorted local anatomy.

## RESULTS

**Table 1: Age wise distribution of patients**

Group	N	Mean	SD	Median	Min.	Max.	t value	p value*
Group 1	50	57.5	15.865	61.0	20	74	0.384	0.697
Group 2	50	56.3	15.371	60.5	18	74		

\*Student t test

Independent t test does not show statistically significant difference in the mean of age between two groups (t value of 0.384, p value of 0.697).

**Table 2: Gender Wise Distribution of Patients**

	Gender		Total	$\chi^2$	p value*
	Male	Female			
Group 1	31	19	50	0.372	0.542
	62.0%	38.0%	100%		
Group 2	28	22	50		
	56.0%	44.0%	100%		
Total	59	41	100		
	59.0%	41.0%	100%		

\*Chi Square test

In this study among group 1 i.e., intermediate cervical plexus block method, 62% patients were males and 38% were females.

Among group 2 i.e., local infiltration method, 56%

were males and 44% were females. Groups were comparable in gender distribution and there was no statistically significant difference.

**Table 3: Distribution according to ASA grading**

	ASA Grade			Total	$\chi^2$	p value*
	Grade 1	Grade 2	Grade 3			
Group 1	2	25	23	50	3.448	0.178
	4.0%	50.0%	46.0%	100%		
Group 2	2	16	32	50		
	4.0%	32.0%	64.0%	100%		
Total	4	41	55	100		
	4.0%	41.0%	55.0%	100%		

\*Chi Square test

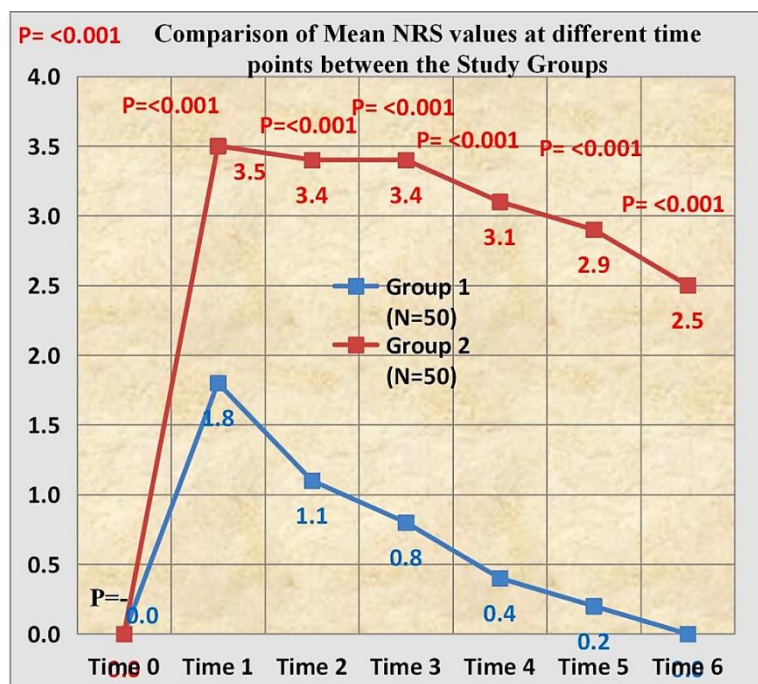
Among group 1, 2 members belonged to ASA 1, 25 belonged to ASA 2 and 23 belonged to ASA 3. Among group 2, 2 members belonged to ASA 1, 16 belonged to ASA 2 and 32 belonged to ASA 3. P value is 0.178, hence not significant.

**Table 4: Comparison of NRS score between the study groups at different time points.**

Time	Group	N	Mean	SD	Min	Max.	p value
Time 0	Group 1	50	0.0	0.000	0	0	-*
	Group 2	50	0.0	0.000	0	0	
Time 1	Group 1	50	1.8	0.737	1	4	<0.001
	Group 2	50	3.5	0.813	1	4	
Time 2	Group 1	50	1.1	0.647	0	2	<0.001
	Group 2	50	3.4	0.785	1	4	
Time 3	Group 1	50	0.8	0.687	0	2	<0.001
	Group 2	50	3.4	0.802	1	4	
Time 4	Group 1	50	0.4	0.485	0	1	<0.001
	Group 2	50	3.1	0.881	1	4	
Time 5	Group 1	50	0.2	0.404	0	1	<0.001
	Group 2	50	2.9	0.895	1	4	
Time 6	Group 1	50	0.0	0.000	0	0	<0.001
	Group 2	50	2.5	0.974	0	4	

\*Not applicable as time 0 is preprocedural.

It shows significant difference in NRS score between two study groups at all time points except time 0 (baseline). NRS score being much lower in Group 1 during various procedural steps of IJV cannulation.



**Graph 1: Comparison of mean NRS Scores between study groups**

## DISCUSSION

**Table 5: Comparison of the NRS scores for pain**

STUDY	NRS Scores
Arun Nagdev, MD and Andrew Herring, MD 5	Significantly diminished in severity at all time points of procedure
TanerCiftci, Hayrettin Daskaya, Mehmet B Yıldırım, HalukSöylemez 6	Significantly diminished at time of skin puncture ( $1.4 \pm 0.5$ ), dilatation ( $2.3 \pm 0.6$ ) and skin suturing ( $1.3 \pm 0.4$ ) in SCPB
Harshwardhan A. Tikle, BhaskarMurlidharPatil 7	The pain scores in SCPB group were lower as compared with those in local infiltration group at all time points of procedure
Dr. VenkataKarthik Reddy Kovvuri Dr. VishnumaheshBabuBatchu 8	Significantly lower during subcutaneous tunnelling and suturing in SCPB group as compared to local infiltration group
Present Study	NRS score is statistically significant low in Intermediate CPB as compared to local infiltration group at all time points in various procedural steps of IJV cannulation

NRS Scores significantly diminished in severity at all time points of procedure in study conducted by Arun Nagdev, MD, and Andrew Herring, MD. The study by TanerCiftci, Hayrettin Daskaya, Mehmet B Yıldırım, HalukSöylemez shows NRS scores significantly diminished at time of skin puncture ( $1.4 \pm 0.5$ ), dilatation ( $2.3 \pm 0.6$ ) and skin suturing ( $1.3 \pm 0.4$ ) in SCPB. Harshwardhan A. Tikle, BhaskarMurlidharPatil documented that the pain scores in SCPB group were lower as compared with those in local infiltration group at all time points of procedure. Dr. VenkataKarthik Reddy Kovvuri Dr. VishnumaheshBabuBatchu documented that the pain scores significantly lower during subcutaneous tunneling and suturing in SCPB group as compared with local infiltration group. In the present study NRS score is significantly low in intermediate CPB as compared to local infiltration group at all time points in various procedural steps of IJV cannulation.

- Çiftci T, Daskaya H, Yıldırım MB, Söylemez H. A minimally painful, comfortable, and safe technique for hemodialysis catheter placement in children: superficial cervical plexus block. *Hemodialysis International*. 2014;18:700-4.
- Harshwardhan A. Tikle, BhaskarMuralidharPatil. Comparison of superficial cervical plexus block versus local infiltration for pain relief during internal jugular vein cannulation. *International Journal of Contemporary Medical Research* 2018;5(9):I6-I12.
- Dr. VenkataKarthik Reddy Kovvuri, Dr. VishnumaheshBabuBatchu, "A Comparative Evaluation of Superficial Cervical Plexus Block Versus Local Infiltration for Pain Relief during Internal Jugular Vein Cannulation in Awake Patients-A prospective Randomised Study, *IJSR*, Volume 9 Issue 2, February 2020, 118-120.

## CONCLUSION

Chi Square test shows significant difference in the NRS Scores between two study groups at time of needle puncture, subcutaneous tunneling, at insertion of catheter and securing and suturing and 5 minutes after procedure. Based on these observations from the study it is concluded that Ultrasound guided Intermediate Cervical Plexus Block is superior to local infiltration in terms of pain relief and patient satisfaction during internal jugular vein cannulation.

## REFERENCES

- Kappis H: ÜberLeitunganaesthesie am Bauch, Brust, Arm und Hals durch injection aus Foramen intervertebrale. *Munchen Med Wschr* 1912;59:794-796.
- Heidenhein L: Operations on the neck. In Braun H (ed): *Local Anesthesia, Its Scientific Basis and Practical Use*. Philadelphia, PA: Lea &Febiger, 1914, pp 268-269.
- Lewis (1918) *Gray's Anatomy* 20<sup>th</sup> edition Sherwood-Dunn B: *Regional Anesthesia* (Victor Pauchet's Technique). Philadelphia, PA: FA Davis, 1920.
- Herring AA, Stone MB, Frenkel O, Chipman A, Nagdev AD. The ultrasound-guided superficial cervical plexus block for anaesthesia and analgesia in emergency care setting. *AM J Emerg Med*. 2012;30:1263-7.