



## COMPARISON OF SUPERFICIAL CERVICAL PLEXUS BLOCK VERSUS LOCAL INFILTRATION FOR PAIN RELIEF DURING INTERNAL JUGULAR VEIN CANNULATION FOR DIALYSIS IN CHRONIC RENAL FAILURE PATIENTS

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### ABSTRACT

**Introduction:** To compare whether superficial cervical plexus block (SCPB) provides good analgesia when compared with local infiltration during cannulation of Internal Jugular Venous Catheter (IJV) for Hemodialysis in Chronic Renal Failure Patients (CRF) measured by Verbal Pain Rating Scale

**Methods:** In this prospective, randomised controlled study, patients aged 20 to 70 years with CRF planned for dialysis was included. Patients was assigned into Group I: 72 patients in this group had received 2% Lignocaine 8-10ml for SCPB. Group II: 72 patients in this group had received 2% Lignocaine 6-8ml for local skin infiltration. Pain was assessed with the Verbal Pain Rating Scale. Patient satisfaction was assessed after 2 hours using a Likert scale.

**Results:** There was statistically no difference in both the groups with respect to demographic profile like age and BMI. The pain scores were lower and patient satisfaction score were higher in Group I than in Group II. Hemodynamics parameters were well maintained in Group I compared to Group II. The difference was statistically significant. No complications were noted in any groups.

**Conclusion:** To conclude, SCPB is superior to local infiltration in terms of pain relief during internal jugular vein cannulation. Patients in SCPB group showed more stable haemodynamics throughout the procedure.

**KEYWORDS :** Internal Jugular Vein, Superficial Cervical Plexus Block, Local Infiltration, Chronic Renal Failure

### INTRODUCTION:

Central venous catheter (CVCs) is a type of access used for hemodialysis. In these patients, it is necessary to have central venous access before induction of anaesthesia. Internal jugular vein (IJV) cannulation is the most preferred route for this purpose. CVCs are meant to be used for short period of time until a more permanent type of dialysis access has been established. Hence, in Chronic Renal Failure patients it is necessary to secure CVC for start of dialysis. Two commonly used methods to reduce pain experienced by the patient while undergoing placement of the internal jugular vein access are local anesthetic (LA) infiltration and superficial cervical plexus block. With local infiltration, the major disadvantages are patient discomfort during insertion of dilator for tunneling and dilating the tract, and pain during suture placement.

Superficial cervical plexus block produces a field of anaesthesia with the superior border running diagonally from the occiput through the lower ear to the tip of the chin. The inferior border of this area runs from the sternoclavicular joint along the inferior border of the clavicle and then down the lateral side of the shoulder, and also anesthetizes muscle in the subcutaneous plane. This allows the operator a large area of anaesthesia to locate the internal jugular vein using a high or low approach and then secure the cannula in place. Therefore, the whole procedure including tunneling, dilating and suturing is pain-free.

If need of more than one puncture at different site arises, no additional infiltration is required. This is especially beneficial in a teaching institute where practical training may give rise to requirement of more than one puncture, and add to the discomfort of the patient. Effective control of pain remains one of the most important and pressing issue in the field of anaesthesia and surgery, with significant impact on health care systems as hundreds to millions of people worldwide who undergo operations each year experience pain of varying intensity. Adverse effects caused by pain during IJV cannulation include but are not limited to Cardiovascular system effects. Pain causes stimulation of sympathetic system

leading to tachycardia, increased stroke volume, cardiac work and myocardial oxygen consumption. Thus, the risk of myocardial ischemia increases.

### OBJECTIVES

#### Primary Objective:

To compare whether superficial cervical plexus block provides good analgesia when compared with local infiltration during cannulation of Internal Jugular Venous Catheter for Hemodialysis in Chronic Renal Failure Patients measured by Verbal Pain Rating Scale.

#### Secondary Objectives:

To compare between the groups

1. Patient satisfaction after procedure using Likert Scale
2. Hemodynamics changes during the procedure

### MATERIAL AND METHODS:

#### Source Of Data:

Patients scheduled for Dialysis at RL Jalappa Hospital & Research centre, Tamaka, Kolar.

**Study Design :** Prospective, randomised controlled study

**Study Period :** June 2021 to August 2020

**Sample Size :** 72 in each group

**Sampling Method :** Simple Random sampling

### METHOD OF COLLECTION OF DATA:

#### Inclusion Criteria:

Patients of either gender aged 20-70yrs with CRF planned for Dialysis

#### Exclusion Criteria:

- Patient's refusal for participation in the study
- Patients allergic to Local anesthetic Lignocaine
- Patients having infection at needle insertion site for block
- Patients with pre-existing coagulation disorders

**Methodology:**

Institutional ethics committee (IEC) approval and Departmental dissertation committee approval was obtained prior to the start of the study. Patients with Chronic Renal Failure Planned for Internal Jugular Vein Catheter Cannulation for Dialysis and satisfying the inclusion and exclusion criteria were enrolled for the study. Written informed consent was obtained from the patients. Randomization of patients done using Computer generated random number table.

Patients were assigned into one of the 2 groups:

**Group I :** Patients in this group received 2% Lignocaine 8-10ml for superficial cervical plexus block.

**Group II :** Patients in this group received 2% Lignocaine 6-8ml for Local skin infiltration.

Patients were randomized and allotted to either of two groups by computer generated tables. Principal investigator performed the procedure and recorded Age, sex and weight of patients. Before start of procedure ECG, pulse oximeter, non-invasive blood pressure monitor were attached. Patient placed in the supine position with the head turned away from the side of cannulation. A Healthcare worker recorded the vital parameters required for the study while performing the procedure and were not be aware of which group the patient belongs.

In group I: Sternocleidomastoid muscle identified and superficial cervical plexus block was performed with a 22 gauge needle inserted at the midpoint of the posterior border of the Sternocleidomastoid muscle. After negative aspiration, 4-6 ml of 2% lignocaine injected in both cranial and caudal directions along the posterior border of the muscle in the subcutaneous plane and 2-4 ml of 2% lignocaine injected horizontally above the muscle. During injection, negative aspiration performed every 2.5 to 3.0 ml to avoid inadvertent intravascular injection.

In group II: 6-8ml of 2% lignocaine infiltrated locally at the apex of the triangle formed by two heads of sternocleidomastoid muscle.

Emergency crash cart will be kept ready. Pain will be assessed with the Verbal Pain Rating Scale.

Verbal Pain Rating Scale : Score Intensity of Pain

- 0 - No pain
- 1 - Mild pain
- 2 - Moderate pain
- 3 - Severe pain
- 4 - Very severe pain
- 5 - Worst possible pain

Verbal contact with patient maintained throughout the procedure. After placement of the internal jugular venous cannula and determination of the Verbal Pain Rating Scale patient's satisfaction assessed using likets scale after 2 hours.

**Parameters Observed**

Heart rate, blood pressure, arterial oxygen saturation by pulse oximetry, ECG, and the Verbal Pain Rating Scale

1. At baseline
2. During administration of block
3. During needle puncture of internal jugular vein cannula
4. During subcutaneous tunneling
5. During insertion of internal jugular vein cannula
6. Suturing of the cannula in place
7. Five minutes after completion of procedure

**Possible Complications:**

Accidental puncture of carotid artery, hematoma,

intravascular injection of local anaesthetic drug and local anaesthetic toxicity.5

**Patient satisfaction** will be assessed after 2hours using a Likert scale from 1 to 5 :



**Statistical Methods :**

Qualitative data entered in MS excel sheet and analysed using SPSS statistical software(version 20.0)( IBM corporation,NY,USA). It was presented in the form of proportions and pie chart, bar diagram and used to represent graphically. Qualitative variables compared using Chi-square test .Quantitative data presented as mean standard deviation. Quantitative variable analysed using Student t test. The P value <0.05 considered as statistically significant.

Assuming a pooled standard deviation of 15.312439 units , the study requires a sample size of 72 for each group i.e a total sample size 144 to achieve a power of 80% and a level of significance of 5%(two sided), for detecting a true difference in means between the test and the reference group of 7.17000000000002(i.e 88.16 – 80.99)units.

In other words , If we select a random sample of 72 from each population and determine that the means of the test and reference groups are 88.16 and 80.99 units respectively and the standard deviation is 15.312439 units, we would have 80% power to declare that the two groups have significantly different means i.e a two sided p-value of less than 0.05.

**RESULTS**

**Table 1: General Characteristics Of The Participants And Patient Satisfaction Score**

Group	N	Mean	Std. Deviation	P value	
Age	1	72	62.58	11.195	0.861
	2	72	62.92		
Wt(Kg)	1	72	60.46	6.524	0.915
	2	72	60.58		
Ht(cm)	1	72	161.61	5.982	0.77
	2	72	161.89		
BMI	1	72	23.13	2.047	0.91
	2	72	23.09		
Patient Satisfaction Score	1	72	4.64	0.484	<0.0001
	2	72	3.74		

This is simple randomised clinical study done on 144 patients randomised into two groups of superficial cervical plexus block versus local infiltration for pain relief during internal jugular vein cannulation for dialysis in chronic renal failure patients. There was no statistical difference noted in the demographics of the study groups.

There was a significant difference between two groups in patient satisfaction score.

**Table 2: Heart Rate, Mean Arterial Pressure, Pain Score**

	Group	1		2		P value
		Mean	Standard Deviation	Mean	Standard Deviation	
Heart Rate	T0	84.22	6.11	82.75	5.12	0.119

	T1	83.50	6.31	81.92	6.10	0.128
	T2	82.89	6.80	81.53	6.07	0.207
	T3	85.28	7.90	82.89	6.90	0.055
	T4	87.58	6.38	85.64	5.46	0.051
	T5	92.58	7.57	90.06	6.05	0.028
	T6	93.28	7.58	90.86	6.44	0.041
Mean Arterial Pressure	T0	98.17	1.64	98.60	1.33	0.086
	T1	98.17	1.64	98.60	1.33	0.086
	T2	98.17	1.64	98.60	1.33	0.086
	T3	98.17	1.64	98.60	1.33	0.086
	T4	98.17	1.64	98.61	1.33	0.076
	T5	98.17	1.64	98.61	1.33	0.076
Pain Score	T0	89.15	7.10	90.08	5.20	0.371
	T1	89.08	6.51	90.83	5.37	0.081
	T2	89.76	6.62	92.65	5.79	0.006
	T3	91.88	7.02	94.32	6.64	0.034
	T4	93.46	7.02	96.36	6.19	0.009
	T5	95.08	6.51	98.72	6.39	0.001
T6	98.08	6.29	101.40	6.26	0.002	

Heart rate, mean arterial pressure, pain score were comparable between two groups. Heart rate was significant at T5 and T6 interval.

Mean arterial pressure was not significant among two groups. Pain score was significant at from T2 to T6 interval.

**Table 3 T0- At Baseline Recording Between Two Groups**

Crosstab				T0	Total	P value
				.00		
Group	1	Count	72	72	n/a	
		% within Group	100.0%	100.0%		
	2	Count	72	72		
		% within Group	100.0%	100.0%		
Total	Count	144	144			
	% within Group	100.0%	100.0%			

There was no statistical difference between between two groups.

**Table 4: T1- Duting Administration Of Block**

Crosstab				T1		Total	P value
				1.00	2.00		
Group	1	Count	34	38	72	0.317	
		% within Group	47.2%	52.8%	100.0%		
	2	Count	40	32	72		
		% within Group	55.6%	44.4%	100.0%		
Total	Count	74	70	144			
	% within Group	51.4%	48.6%	100.0%			

There was no statistical difference between two groups.

**Table 5: T2- During Needle Puncture Of Internal Jugular Vein Cannula**

Crosstab				T2				Total	P value
				.00	1.00	2.00	3.00		
Group	1	Count	26	40	5	1	72	<0.00	
		% within Group	36.1%	55.6%	6.9%	1.4%	100.0%		
	2	Count	16	15	40	1	72		
		% within Group	22.2%	20.8%	55.6%	1.4%	100.0%		
Total	Count	42	55	45	2	144			
	% within Group	29.2%	38.2%	31.3%	1.4%	100.0%			

There was significant statistical difference between two groups.

**Table 6: T3- During Subcutaneous Tunneling**

Crosstab			T3				Total	P value
			.00	1.00	2.00	3.00		
Group	1	Count	17	43	9	3	72	<0.00
		% within Group	23.6%	59.7%	12.5%	4.2%	100.0%	
	2	Count	2	4	21	45	72	
		% within Group	2.8%	5.6%	29.2%	62.5%	100.0%	
Total	Count	19	47	30	48	144		
	% within Group	13.2%	32.6%	20.8%	33.3%	100.0%		

There was significant statistical difference between two groups.

**Table 7: T4-During Insertion Of Internal Jugular Vein Cannula**

Crosstab			T4		Total	P value
			.00	1.00		
Group	1	Count	52	20	72	<0.0001
		% within Group	72.2%	27.8%	100.0%	
	2	Count	31	41	72	
		% within Group	43.1%	56.9%	100.0%	
Total	Count	83	61	144		
	% within Group	57.6%	42.4%	100.0%		

There was significant statistical difference between two groups.

**Table 8: T5- Suturing Of The Cannula In Place**

Crosstab			T5			Total	P value
			.00	1.00	2.00		
Group	1	Count	29	42	1	72	<0.0001
		% within Group	40.3%	58.3%	1.4%	100.0%	
	2	Count	8	19	45	72	
		% within Group	11.1%	26.4%	62.5%	100.0%	
Total	Count	37	61	46	144		
	% within Group	25.7%	42.4%	31.9%	100.0%		

There was significant statistical difference between two groups.

**Table 9: T6- Five Minutes After Completion Of Procedure**

Crosstab			T6		Total	P value
			.00	1.00		
Group	1	Count	45	27	72	0.005
		% within Group	62.5%	37.5%	100.0%	
	2	Count	28	44	72	
		% within Group	38.9%	61.1%	100.0%	
Total	Count	73	71	144		
	% within Group	50.7%	49.3%	100.0%		

There was significant statistical difference between two groups

**DISCUSSION**

In our study 144, patients were randomized equally (seventy - two in each group) to compare SCPB i.e. "Superficial Cervical Plexus Block" (Group 1) and "Local Infiltration"(LI- Group 2) for relief of pain during dialysis in chronic renal failure patients. It was acknowledged the Group 1 and 2 were alike in terms of height, weight, age, and BMI.

Both the groups were evaluated based on the Verbal Pain Rating Scale ranging from "no pain to worst possible pain" and

the groups were then evaluated after two hours of the procedure for patient satisfaction scores measured on a Likert scale. The patient satisfaction score was higher and pain was lower among those in Group 1 as compared to group 2.

Literature dictates that despite a colossal amount of studies on "*superficial cervical plexus block*" and local infiltration, but similar evidenced-based studies specific to this title were few and far beyond so the discussion is also based on information taken from paediatric studies; carotid endarterectomy, various pain scores included in different studies, etc. have also been included to improve the patients' quality of life.

Our study is in agreement with the one done on children in Turkey (1) undergoing hemodialysis using *SCPB* by a skilled anaesthesiologist showed- good analgesic (2, 3); fewer complications (2, 3), and decreased anxiety due to a single injection for *SCPB* as compared to local anaesthesia which may require multiple injections (4), on the placement of the catheter or even during the post-surgical phase (2,3). Patients receiving *SCPB* have fewer requirements for strong opiates like morphine postoperatively as likened to the ones who receive only local anaesthesia (5, 6).

A study (7) conducted in the emergency department with no controls also elicited a decrease of sixty- two percent in the pain levels similar to our study which reports a 62.5% decrease in pain after 5 minutes of the "*internal jugular vein*" cannulation with *SCPB*.

The concern with cannulation for catheters is that during dialysis the patients undergo cannulation regularly and local infiltration of anaesthesia involves a lot of repeated injection to the site distorting the confined site along with pain, and discomfort that is generally taken care of by preference for *SCPB* which is a consistent method and improves patient satisfaction (8). This knowledge is consistent with our results as pain reduction during our study were significant for a reduction in pain during the following phases of Group 1: needle puncture of "*internal jugular vein*" (36.1%); during subcutaneous tunnelling 23.6% as equated to 2.8% in Group 2); during insertion of "*internal jugular vein*" cannula 72.2% vs. 43.1%); suturing of the cannula in place (40.3% vs. 11.1%), and five minutes after completion of the procedure (62.5%).

Patients with terminal renal disease need "*hemodialysis*", "*peritoneal dialysis*" or "*kidney transplant*", and, the right side "*internal jugular vein*" catheterization is a favoured method for temporary hemodialysis cannulation as related to "*subclavian vein catheterization*" to avoid complications of stenosis of "*subclavian vein*" or thrombosis or occlusion. But then again the most conjoint complications for "*internal jugular vein*" cannulation are 0.1 to 4.2 percent and they are as follows: improperly placed catheter, hematoma, "*carotid artery*" puncture, confined bleeding and pain, etc. (9, 10)

Nevertheless, the "*superficial cervical plexus*" nerve block has lesser complication as compared to even the deeper cervical blocks as it avoids causing injury to the "*sympathetic chain*", "*glossopharyngeal*", "*vagus*", or "*phrenic nerve*"; "*external jugular vein*", etc.(8). Even local infiltration gone wrong can land into "*brachial plexus*" paralysis i.e. paralysis and loss of sensation in the main arm (11) It can also result in temporary reversible features of "*laryngeal palsy*", hoarse voice, breathlessness, ipsilateral vocal cord paralysis, but this resolves hours after the effect of the local infiltration is gone (12). Therefore after going through the above given evidence *SCPB* i.e. *superficial nerve plexus block* has emerged as a better technique for pain relief during "*internal jugular vein cannulation*" for patients undergoing dialysis in chronic renal failure.

#### CONCLUSION:

To conclude, *SCPB* is superior to local infiltration in terms of

pain relief during internal jugular vein cannulation. Patients in *SCPB* group showed more stable haemodynamics throughout the procedure.

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