

Research Article

TO EVALUATE THE EFFICACY OF IV FENTANYL WITH FIELD INFILTRATION TO RELIEVE PAIN AND DISCOMFORT DURING INTERNAL JUGULAR VEIN CANNULATION

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ABSTRACT

BACKGROUND: Central venous catheterization (CVC) is a frequently performed clinical procedure associated with pain, anxiety and discomfort. Lignocaine infiltration at the point of insertion being the most commonly used technique to alleviate such pain. However, field block with subcutaneous local anesthetics (LA) induces considerable degree of pain. Various studies suggests the use of fentanyl along with local anaesthetics for adequate analgesia ad sedation. Ensuring adequate analgesia and sedation is essential for patient comfort and satisfaction.

AIM: To evaluate the efficacy of fentanyl along with LA field infiltration in controlling pain and discomfort associated with CVC insertion.

MATERIALS & METHODS:

Following institutional ethics committee clearance and informed consent from all the patients, a prospective observational study was conducted on 35 patients of ASA

physical status I and II, III in the age group of 18-60 years requiring central venous access with planned placement in the Internal jugular vein (IJV) as a part of normal care are consented and taken in the study. Ten minutes before the local anaesthetic (LA) infiltration inj.fentanyl 1microgram/kg given intravenously slowly over 10 minutes. The IJV cannulation done at the end of infusion of study drugs. Each patient received subcutaneous infiltration of 5ml of 2%lignocaine after confirming the anatomical landmark of the internal jugular vein using anterior approach. Each patient received 7 Fr double- lumen catheter via a non-tunneled approach in the IJV.

Blood pressure, pulse rate, SPO₂, sedation, pain and discomfort scores were assessed at 5 time points.T1-at the base line, T2-Initial LA injection,T3-Immidiata after the procedure, T4 10 min after the procedure and T5-60min after completion of procedure.

RESULTS:

The mean VNRPS (Verbal numerical pain rating scale) score at base line was 0.62±

0.492 and during the procedure (T2 and T3), it was 3.69 ± 0.924 with p-value 0.001 and 3.98 ± 0.78 with p-value <0.001 respectively, 60 minutes post procedure (T5) it reduced to 1.88 ± 0.772 with p-value <0.001 .

The mean VNRDS (Verbal numerical rating scale for discomfort) at base line was 0.74 ± 0.445 and during the procedure (T2 and T3) it was 3.26 ± 0.544 and 4.29 ± 0.508 respectively, 60 minutes post procedure (T5) it reduced to 2.98 ± 0.780 .

CONCLUSION: For central venous access procedures, preprocedural fentanyl bolus infusion along with field infiltration of local anaesthetics was associated with less procedural pain.

KEYWORDS: Central venous catheter, Fentanyl, Trendelenburg position, Local anaesthetics, pain score.

INTRODUCTION

Central venous access is an important part of patient management in many clinical settings.^{1,2} Percutaneous central venous cannulation is now common during perioperative care of major surgeries, intensive care monitoring, for infusion of vasoactive drugs and also for rapid restoration of blood volume.³ Central venous access is commonly attempted at internal jugular vein, subclavian vein, femoral vein, anterior cubital vein, external jugular vein.^{4,5}

Anterior cubital approach is difficult in obese individual.

External jugular venous approach is simple due to its superficial location but not widely used for central venous catheterization because of unpredictability of passage of catheter to central compartment.

In subclavian approach, the success rate is 90-95% but incidence of pneumothorax is of about 1-5%.⁶

Femoral approach is useful in neck surgeries. There is high incidence of complications like thrombosis, arterial puncture and infection.^{5,7}

Internal jugular venous approach is the best route because of its reliability and low rate of major complication with insertion. The right IJV has direct path to right atrium, most reliably reflects the CVP and is associated with fewest catheter tip malposition⁸. Many anatomical landmark guided techniques for IJV puncture have been described⁹. In these landmark guided techniques, mechanical complications such as carotid artery puncture and pneumothorax is up to 35% at the insertion attempt^{11,12,13}.

OBJECTIVES:

To evaluate the efficacy of fentanyl along with LA field infiltration in controlling pain and discomfort associated with CVC insertion.

METHODOLOGY

Source of data:

Study was conducted in patients undergoing internal jugular vein cannulation in Dr. B R Ambedkar medical college, Bangalore Karnataka.

Study design: Prospective observational study

Study period: 18 months (Jan 2022 to June 2023)

Sample size: 35

Inclusion criteria

- a) Patients aged between 18 to 60 years
- b) ASA grade I, II or III status patients.
- c) Ability to communicate.

Exclusion criteria

verbal stimulation, head tilt-chin lift, Guedel airway and bag and mask assisted ventilation.

Cardiovascular events was defined as a single episode of variation in heart rate (HR) and systolic blood pressure (SBP) by >20% from patients baseline. Persistent (two readings 3 min apart) or recurrent SBP <90 mmhg, was treated with bolus of IV mephentermine 6mg and /or persistent (30s) or recurrent HR<50 beats/min was treated with IV atropine 0.6mg.

Statistical analysis:

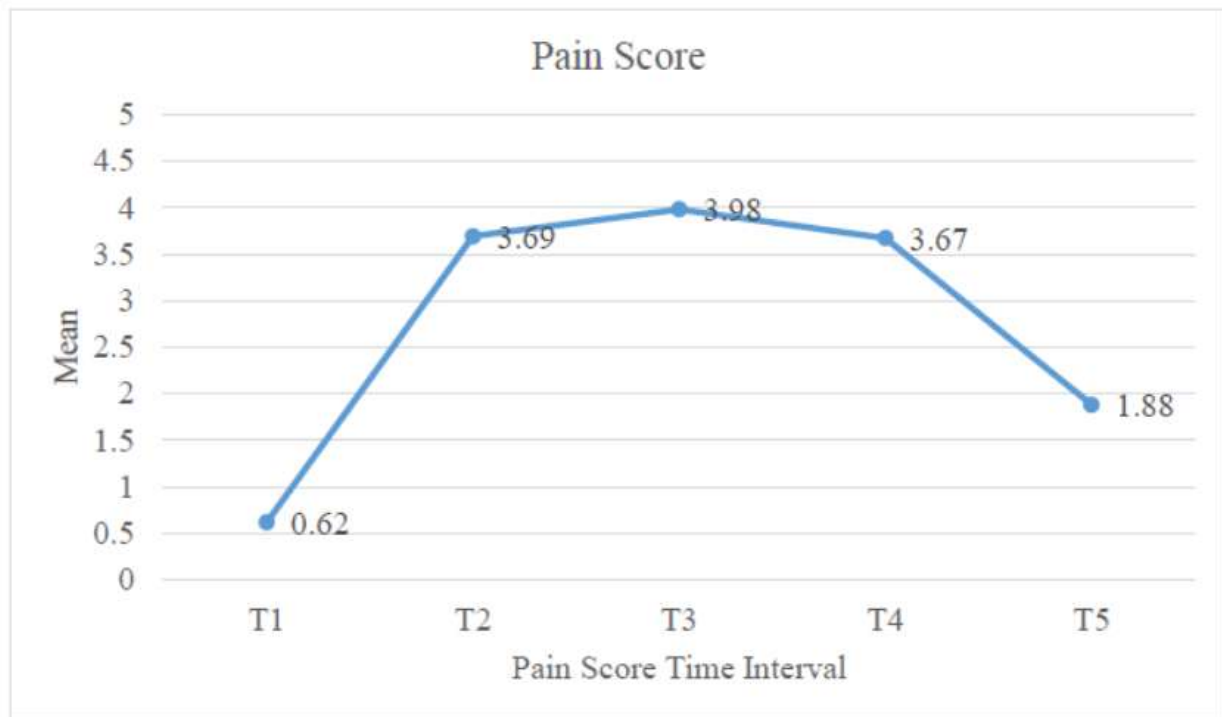
Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Continuous data was represented as mean and standard deviation. Normality of the continuous data, was tested by Kolmogorov–Smirnov test and the Shapiro–Wilk test. Paired t test was used as test of significance for paired data such as before and after surgery for quantitative data. Wilcoxon Signed rank test was used as the test of significance for paired data such as before and after surgery for quantitative data with skewed distribution. A p-value of <0.05 was considered as statistically significant

RESULTS:

Table 1: Pain Score at different periods of follow-up

Pain Score	N	Mean	SD	Median	IQR		p value
					Lower Bound	Upper Bound	
T1	42	0.62	0.492	1.00	.00	1.00	
T2	42	3.69	0.924	4.00	3.00	4.00	<0.001*
T3	42	3.98	0.780	5.00	3.00	5.00	<0.001*
T4	42	3.67	0.526	4.00	3.00	4.00	<0.001*
T5	42	1.88	0.772	2.00	1.00	2.00	<0.001*

In this study, there was significant decrease in pain score from T2 to T5 compared to T1.



GRAPH 1: Line diagram showing Pain Score at different periods of follow-up.

Table 2: Discomfort Score at different periods of follow-up.

Discomfort Score	N	Mean	SD	Median	IQR		p value
					Lower Bound	Upper Bound	
T1	42	.74	.445	1.00	.00	1.00	
T2	42	3.26	.544	3.00	3.00	4.00	<0.001*
T3	42	4.29	.508	4.00	4.00	5.00	<0.001*
T4	42	4.83	.537	5.00	4.75	5.00	<0.001*
T5	42	2.98	.780	3.00	2.00	4.00	<0.001*

In this study, there was significant decrease in Discomfort Score from T2 to T5 compared to T1.



GRAPH 2: Line diagram showing Discomfort Score at different periods of follow-up.

DISCUSSION

Central venous catheterization is one of the most commonly performed invasive procedures in intensive care unit (ICU) and is a source of pain and anxiety to the conscious patient and this pain is often reduced with the use of local anesthetic agents^{1,2}. For our study, we have defined pain as an unpleasant sensory and emotional experience that arises from actual or potential tissue damage associated with CVC. The sensory and emotional component of pain was assessed with VNRPS and VNRDS respectively.

In our study, field infiltration with LA for CVC induces considerable degree of pain in conscious patients. Thus, IV fentanyl infusion can attenuate this and subsequent pain response significantly when given 10 min before such invasive procedure. In our study all patients had a distinctly lesser pain for all procedural steps compared to baseline (T1). The mean VNRPS score at T1 was 0.62 ± 0.492 . During the procedure at T2 and T3, it was 3.69 ± 0.924 and 3.98 ± 0.78

respectively, 60 minutes post procedure (T5) it reduced to 1.88 ± 0.772 . Patients trended towards less discomfort at T5. The mean VNRDS at T5 was 2.98 ± 0.780 . Morrison et al⁸ in their five-point numeric rating scale described CVC as a moderately painful and severely uncomfortable procedure. Puntillo et al⁹ demonstrated a positive surge in mean pain intensity score at the time of CVC than the base line preprocedural pain. In their analysis, they found that, only 20% of patients received opioids either alone or in combination with sedation before or during a CVC depending on the pain intensity at the beginning of the procedure. In comparison to their study, we have administered opioid IV fentanyl infusion 10 min prior to the procedure and hence attained lesser pain scores. In our study we provided base line analgesia with preprocedural infusion of fentanyl and found that fentanyl provides better analgesia for all procedural steps (T2 through T5). Burlacu et al¹⁰ used three different rates of IV Remifentanyl infusion at 0.5 mcg/kg for patients undergoing insertion

or removal of long-term tunneled central venous access devices during sedation with propofol and field infiltration with LA and found all were equally analgesic-efficient. However, most of the patients in their study group required a bolus of rescue analgesic indicating that a simple infusion regimen may not be sufficient to meet the analgesic demand for different procedural step. In contrast to their study, our procedure was of shorter duration and probably the magnitude of pain also would have been less compared to tunneled catheterization where not only LA infiltration, but also subcutaneous tunneling induces greater pain.^{3,4,5,6,7} Hence, we choose to use short single bolus IV fentanyl infusion over a continuous infusion throughout the procedure and yet we achieved the targeted decrease in pain score.

Fentanyl, which acts as a pure opioid analgesic, mainly affected the sensory-discriminative component of the pain and an inappreciable magnitude of effect in attenuating the motivational-affective and cognitive component of pain. Fentanyl as an intraoperative analgesic agent has good track record owing to the cardiovascular stability it provides, even in critically ill patients. However, the major obstacle of using fentanyl in the ICU for procedural sedation is its potential for respiratory depression.^{5,6} We have used a single preprocedural IV fentanyl infusion 1 mcg/kg over 10 min and did not encounter any clinically significant respiratory depression (requirement for intervention with naloxone administration, resuscitation with bag-mask ventilation) which are common after continuous background IV fentanyl infusion.

CONCLUSION

For central venous access procedures using non-tunneled CVC in ICU patients,

preprocedural IV fentanyl infusion (1mcg/kg) 10 min before the procedure along with field infiltration of LA was associated with less procedural pain and fentanyl trended towards lesser discomfort score.

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