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RESEARCH ARTICLE

A LITERATURE REVIEW TO IDENTIFY PAIN RELIEVING INTERVENTIONS AND EFFECT DURING INTRAVENOUS CANNULATION.

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Abstract

The objectives of this review to explore the research study available relating to identify the pain relieving measures and their effect during intravenous cannulation. The data were collected from the Pub Med, Google Scholar, Pro Quest, CINHALL (Cumulative index To Nursing & Allied Health Literature), MEDLINE (Medical Literature Analysis & Retrieval System Online), Science Direct by Review of literature search. The literature review concluded that Numerical rating scale is more effective pain scale. In Intra venous cannulation pain reduction many techniques were found effective like, flash light, valsava maneuver, laser assisted anesthesia, vapocoolant spray, EMLA cream and cannula site selection etc. It was found that there is no relationship between cannula material on pain reduction in Intra venous cannulation.

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What is already known about topic?:-

Insertion of peripheral intravenous catheters is one of the most common invasive procedures performed in hospitals. The previous studies suggest that there are various measures play vital role in pain reduction of IV cannulation which includes valsava maneuver technique, laser assisted anesthesia, vapocoolant spray, EMLA cream etc.

What new this paper will add?:-

This paper will add new thing about best effective techniques in reduction of pain during intravenous cannulation and the best suitable pain scale for assessment of pain.

Introduction:-

"Pain is such an uncomfortable feeling that even a tiny amount of it is enough to ruin every enjoyment".
 Will Rogers

The word pain is derived from the latin word 'poena' which means punishment, which in turn derived from the Sanskrit root 'pu' meaning purification. The international association for the study of pain defines, "pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, are described in terms of such damage". It further states that, "pain is subjective. ¹ Pain is a complex, multidimensional experience. ²

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Peripheral veins are the most common intravenous access method in both hospitals and paramedic services for a peripheral intravenous cannulation for intravenous therapy.³

Evidence has demonstrated that pain from IV cannulation is a significant source of adult pain and distress with effects far more reaching than the presenting event. When describing worse pain experiences in hospitalized adult, IV cannulation pain was found second reason in hospitalized patient. It is important to mitigate or decrease adult IV cannulation pain and distress in hospitalized patients.⁴

Methods:-

1. **Search Strategy :-** Review of literature search done from Pub Med, Google Scholar, Pro Quest, CINHALL (Cumulative index To Nursing & Allied Health Literature), MEDLINE (Medical Literature Analysis & Retrieval System Online), Science Direct.
2. **Inclusion and exclusion criteria for article selection**
3. **Inclusion criteria :-** Study's which are indicates the pain assessment during intravenous cannulation, various methods used to relive intravenous cannulation pain, study's which indicate different pain relieving methods prior and during procedure and study which are included pain scales.
4. **Exclusion criteria :-** Study's which are not including peripheral intra venous cannulation, study's which are showing complications of intravenous cannulation.

Result:-

Total 14 searched review found to meet the inclusive criteria of the study. Among this 3 studies given evidence about effective use of numerical rating scale, 2 studies indicate that local skin analgesic EMLA is more effective in reduction of pain full procedure, 2 studies suggested that Valsava Maneuver and Vapocoolant spray also helped in pain reduction. One meta analysis study related to use of 2% lidocain indicate that 44% study suggested that lidocain is useful in IV cannulation pain reduction. While 1 study suggest that antecubital fossa is best site for cannulation with less pain. 1 study related to use of various colour different light indicates that blue light is helpful in pain reduction.

Discussion:-

On the whole, the findings of the searched review showed that IV cannulation pain is the painful procedure in hospitals which also leads to fear and distress in patients. Based on the findings of the searched review it can be concluded that there are various methods are effective in reducing pain of IV cannulation. More study suggests that skin analgesic like EMLA cream and Ametop are more effective than lidocaine application, Valsava Maneuver, Vapocoolant spray reduce the cannulation pain. In addition blue flash light reduce the pain and female has more pain during cannulation. There is no reduction in pain seen with cannula material but antecubital fossa site has less pain during cannulation than other sites. Also pain rating scales have a fundamental place in clinical practice. The study suggests that Numerical rating scale is more appropriate for use compare to Verbal rating scale and Visual Analog scale. VAS is the least favourite and hardest tool to use.

Limitation :- Review literature related to pain assessment of intravenous cannulation, review literature related to comparison of simple IV cannulation and Pro safety IV cannulation

Implication :- This research can be useful in hospital settings during intra venous cannulation for pain reduction.

Conclusion:-

This study suggests that various methods like local skin analgesic, lidocain, Valsava maneuver, Vapocoolant spray, cannulation site, blue flash light, gender are more effective in reduction of pain of IV cannulation and Numerical rating scale is easy to use to assess the pain level.

Conflict of Interest:-None

Source of Funding:-No separate funding was received for this study.

Ethical Clearance:-The ethical clearance obtained from our Institute(CHARUSAT University, Changa).

Table of Literature search;-

SI. NO	Study	Country	Samples	Research type & Methods	Main Finding
1	The minimum clinically significant difference in visual analogue scale pain score does not differ with severity of pain	Melbourne, Australia	156 patients	Prospective descriptive study	The MCSD in VAS pain score does not differ with the severity of pain being experienced. ⁵
2	An Experimental Study to Assess the Effectiveness of Valsalva Maneuver Prior to Intravenous Cannulation on Pain Perception among Patients Undergoing Venous Cannulation at HAH Hospital in Delhi	New Delhi, India	60 patients	Quantitative experimental study	There was a significant decrease in the level of pain after performing valsalva maneuver ($p < 0.05$) ⁶
3	The effect of vapocoolant spray on pain due to intravenous cannulation in children	Eastern, Ottawa, Ontario	68 patients	Double-blind randomized controlled trial	A modest but significant reduction in pain with the use of vapocoolant spray (mean difference 19 mm, 95% confidence interval [CI] 6–32 mm; $p < 0.01$). ⁷
4	First do no harm: pain relief for the peripheral venous cannulation of adults, a systematic review and network meta analysis		37 studies met the inclusion criteria for this review and 27 had data suitable for the NMA and 2 suitable for the meta-analysis	Systematic review, network meta-analysis and random-effects meta-analysis.	The results of the network meta-analysis indicate that none of the 17 anaesthetic considered had a very high probability of being the most effective when compared to each other; 2 % lidocaine had the highest probability (44 %). When the anaesthetics were compared to no treatment, the network meta-analysis showed that

					again 2 % lidocaine was estimated to be the most effective (mean difference -25.42 (95 % CI -32.25, -18.57). Other members of the 'caine' family were also estimated to be more effective than no treatment as were Ametop, EMLA and Rapydan patch. The meta-analysis compared the pain of anaesthetic application with the un attenuated pain of cannulation. This found that all applications of local anaesthetic were less painful than cannulation without local anaesthetic. In particular a 1 % lidocaine injection was estimated to be -12.97 (95 % CI -15.71, -10.24) points (100 mm VAS) less painful than un attenuated cannulation. ⁸
5	The Effect of Cannula Material on The Pain of Peripheral Intravenous Cannulation in the Emergency Department :A Prospective, Randomized Controlled Study	Bicakcilar, Turkey	89 patients	Prospective, randomized, single-blinded, controlled trial	The two treatment groups did not differ in age, gender or cannulation indication

					($p > 0.05$). Mean VAS was 2.80 for PEU and 3.56 for FEP ($p = 0.061$). Mean provider safety scores were 4.84 (4 to 5) in the PEU group and 4.00 (2 to 5) in the FEP group ($p = 0.0001$). Mean provider satisfaction of application scores were 4.65 in the PEU group and 4.56 in the FEP group ($p > 0.05$). ⁹
6	Effect of site selection on pain of intravenous cannula insertion: A prospective randomised study.	Philadelphia, USA.	50 patients	Prospective randomised study	The result showed that ACF approach was significantly less painful in comparison to the DOH when using a 20-gauge cannula for venous cannulation ($P < 0.05$). ¹⁰
7	A randomised, double-blind, placebo controlled, comparative study of topical skin analgesics and the anxiety and discomfort associated with venous cannulation	Yorkshire England	20 patients	Randomised, double-blind, placebo-controlled	The mean visual analogue scores (VAS) for discomfort were found to be significantly lower ($p < 0.001$) with Ametop (VAS = 18mm) and EMLA (VAS = 29mm) compared with the control (VAS = 38mm). There was a positive correlation ($R^2 = 72\%$, $p < 0.001$) between discomfort and

					the predicted anxiety if cannulation was to be repeated with the same cream. With the placebo a positive correlation ($R^2 = 19.8\%$, $p = 0.05$) was found between the level of anxiety before cannulation and the level of discomfort recorded. ¹¹
8	Laser-assisted anaesthesia Reduces the Pain of Venous Cannulation in Children and Adults:	suburban, university-based ED	61 patients	A prospective, double-blind, randomized, controlled, clinical trial design	The mean pain of IV cannulation was significantly less (mean difference, 28.3 mm; 95% confidence interval = 17.9 to 38.7) in patients pretreated with the laser (10.0 mm; 95% confidence interval = 4.4 to 15.6) than with sham laser (38.3 mm; 95% confidence interval = 29.3 to 42.2). ¹²
9	Pain during venous cannulation: Double-blind, randomized clinical trial of analgesic effect between topical amethocaine and eutectic mixture of local anesthetic	Malaysia	80 patients	Prospective randomized double-blind study	Topical EMLA and amethocaine were comparable in terms of analgesic efficacy and ease of venous cannulation in adult patients. ¹³
10	Studies Comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for Assessment of Pain Intensity in Adults: A Systematic Literature Review	Europ	239 papers	A systematic search	When compared with the VAS and VRS, NRSs had better

					<p>compliance in 15 of 19 studies reporting this, and were the recommended tool in 11 studies on the basis of higher compliance rates, better responsiveness and ease of use, and good applicability relative to VAS/VRS. Twenty-nine studies gave no preference. Many studies showed wide distributions of NRS scores within each category of the VRSs. Overall, NRS and VAS scores corresponded, with a few exceptions of systematically higher VAS scores.¹⁴</p>
11	Pain:areviewofthreecommonlyusedpainratingscales			Review	<p>All three pain-rating scales are valid, reliable and appropriate for use in clinical practice, although the Visual Analogue Scale has more practical difficulties than the Verbal Rating Scale or the Numerical Rating Scale. For general purposes the Numerical Rating Scale has good</p>

					sensitivity and generates data that can be statistically analysed for audit purposes. Patients who seek a sensitive pain rating scale would probably choose this one. For simplicity patients prefer the Verbal Rating Scale, but it lacks sensitivity and the data it produces can be misunderstood. ¹⁵
12	Effects of a flash of light in different colors on venous cannulation pain	Tehran, Iran	120 patients	Double-blinded, randomized controlled study	Application of a blue light flash before venous cannulation decreased the frequency and severity of pain associated with venipuncture. ¹⁶
13	Assessment and Evaluation of Effectiveness of Valsalva Maneuver on Pain Reduction during IV Cannulation Among Adults	New Delhi, India	60 patients	True experimental pre test post test design	Valsalva maneuver was effective technique in reducing pain associated with IV cannulation. ¹⁷
14	Gender Variation In Pain Perception After Intravenous Cannulation In Adults		100 patients		Pain perception was moderate to severe (5-10) in 64% of females as compared to 12% in males and was statistically significant. ¹⁸

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