

Effectiveness and Complication of Local Anesthesia in Non-Vascular Interventional Radiology

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ABSTRACT

Background: In the past few years, there has been extraordinary growth in interventional radiology owing to the benefit of image guidance and minimally invasive procedures. Appropriate utilization of local anesthetics reduces discomfort for patients and improves their satisfaction thus decreasing the requirement of sedation, complications, and prolonged hospitalization. **Objective:** To determine the patient's satisfaction with local anesthetics used in non-vascular interventional radiology procedures, onset of action, and record the frequency of complications experienced by the patient. **Study Design:** Cross-sectional study. **Settings:** Interventional Radiology department, Dow University Hospital, Karachi Pakistan. **Duration:** 2 months, from October 2022 to November 2022. **Methods:** After informed consent, 246 patients who underwent FNAC procedure, Lidocaine 2% was administered subcutaneously in each patient. Onset of action, pain score on visual analog scale (VAS), patient satisfaction with anesthesia and immediate post procedural complications were recorded on the questionnaire. **Results:** There were 88 males and 158 females with the mean age of 44.07 ± 16.94 years. The mean onset of action of anesthesia was 10.80 ± 3.61 seconds. None of the patients required reinjection of local anesthesia. 97.6% of patients were satisfied with local anesthesia. Complete loss of sensation was recorded in 96.3% patients, post-procedure complications were observed in 19.9%, of which most common was pain (16.7%), followed by blurring of vision in 3.3% of the cases. **Conclusion:** Overall patients' satisfaction with pre-procedural anesthesia used in non-vascular interventional radiology is high. Further improvement can be achieved by appropriate patient counseling

Keywords: Anesthesia, Interventional radiology, Non-vascular interventional radiology.

INTRODUCTION

In the past few years, there has been extraordinary growth in radiology, and in particular interventional radiology owing to the benefit of image guidance and minimally invasive procedures. These procedures can be diagnostic or therapeutic.¹ The main asset of these procedures is that they are associated with minimal pain and complications.² Inadequate pain management during and after the intervention can lead to poor outcomes such as patient dissatisfaction, increased time to completion a radiologic procedures, morbidity and mortality.³ It is

imperative to take into consideration patient's experience in IR department during the course of a disease, in order to prevent and reduce pain and anxiety.⁴ Anesthesia is described as the pharmacological blocking of pain signal through the nervous system and can be classified as general, regional and local. Local anesthetics are not new to the field of medicine and have been used for at least 100 years to supply analgesia by reducing the potential of both peripheral and central nervous system to transmit pain signal.⁵ In medicine, as well as specifically in interventional radiology, local anesthetics are extensively used to manage procedural and post-procedural pain.

These anesthetic agents are generally considered safe and effective; however, radiologists should have sound knowledge regarding the appropriate usage, route, and dose of administration of these agents as well as be aware of potential complications.⁶ Mode of action of local anesthetics is reversible binding with the sodium channels thus stabilizing nerve membranes, reduction in action potentials, and ultimately leading to sensory and motor blockade.⁷ Topical anesthesia acts by numbing the surface of the body part, whereas, infiltrative anesthetics are the one that injected subcutaneously. Local anesthetics are generally categorized into amides and esters.⁸ Local anesthetics are generally considered safe and effective; however, it has its own share of complications. These complications include acute neurotoxicity and cardiac toxicity, as well as allergic reactions especially with the usage of drugs structured as ester.⁹ Symptoms related to local anesthetic toxicity include early neurologic symptoms like disorientation, metallic taste, dizziness, lightheadedness, circumoral numbness. Respiratory and cardiovascular symptoms include bradycardia, arrhythmia, hypotension, and cardiac arrest. Local symptoms are redness, swelling and pain.¹⁰ The effectiveness of a local anesthetic can be determined subjectively by the patient's perception of pain during the procedure, and by its onset of action.¹¹ This study aimed to assess patient's satisfaction with local anesthetics used in non-vascular interventional radiology procedures, determine the efficacy of anesthesia in terms of onset of action, and record the frequency of complications experienced by the patient. This study may provide insight from the patient's point of view regarding the effectiveness of anesthesia in relieving their pain during the procedure. Although anesthesiologists are best trained for this purpose, they are not available for non-vascular interventional radiology procedures. Pain free procedure improves patient satisfaction, and leads to patient centered care. This has a positive impact not only on the patient but also on the community, build trust on health personnel and health care facilities.

METHODS

This cross-sectional study was conducted at Interventional Radiology, Dow University Hospital Karachi Pakistan. Duration of the study was 2 months, from October 2022 to November 2022.

Epi Info sample size is used for the estimation of sample size taking confidence interval 95%, margin of error 5%, reported prevalence of no pain in previous study 20%.¹² The estimated sample size came out to be 246. Non-probability consecutive sampling technique was used.

All patients referred for FNAC procedures to Dow Institute of Radiology were included in the study.

Patients with history of pre-procedure analgesia within 12 hours, pregnant women and patients not willing to participate in the study were excluded.

Patients who have signed the consent form were asked questions in the questionnaire by the Co-Principal Investigators in their native language at the end of the procedure. The questions pertaining to the anesthetic agent were asked from the intervention radiology technologists assisting the procedure. All answers were recorded on the questionnaire. Effectiveness of Local Anesthesia was assessed subjectively by the patient's perception of pain during the procedure, and by its onset of action. The local complications and systemic complications were recorded as nausea, shortness of breath, shock, hypotension, blurring of vision, and others. All the information was collected via self-made study proforma. SPSS version 26 was used for the purpose of statistical analysis. Mean and standard deviation were computed for quantitative variables. Frequencies and percentages were computed for categorical variables. Inferential statistics was explored using chi-square test. P-value < 0.5 was considered as significant.

RESULTS

A total of 246 cases were studied; their mean age was 44.07 ± 16.94 years. Out of all 158 (64.2%) were females and 88 (35.8%) were males.

Out of all study subjects 71 (28.9%) patients had had prior experience of local anesthesia while, 175 (71.1%) of them experienced it for the first time. Complications due to prior local anesthesia exposure were found in only 8 (3.3%) of the patients while, 238 (96.7%) patients show no complication. Out of 8, only 1 (0.4%) had dizziness, 5 (2.0%) had pain at injection site and 2 (0.8%) had blurring of vision. Hypertension was in 50 (20.3%) patients, diabetes mellitus in 31 (12.6%), ischemic heart disease in 8 (3.3%), allergy in 4 (1.6%), 20 (8.1%) patients had other comorbidities, while 133 (54.1%) show no co-morbidity. Out of 246, 233 (94.7%) patients were stable whereas 13 (5.3%) were unstable. Table.1

The mean onset of action was 8.65 ± 3.681 respectively. 245 (99.6%) patients were co-operative and 1 (0.4%) was uncooperative. Loss of sensation in patients was observed under five categorized levels. Majority of the patients i.e., 160 (65.0%) felt a level 4 loss, level 5 loss was noted in 77 (31.3%) patients, only 9 (3.7%) patients sensed level 3 loss, whereas there were no patients with level 1 & 2 loss. Patient's satisfaction during procedure is also categorized into five groups. 143 (58.1%) patients were satisfied on a level 4, 97 (39.4%) were satisfied on level 5, the frequency of level 3 and level 2 scale were 5 (2.0%) and 1 (0.4%) respectively, although level 1 scale was not seen in any of

the patient. Local anesthetic agent was not reinjected in any patient. table.2

The complications due to anesthesia exposure during FNACs were observed such that 49(19.9%) patients had complications due to exposure while 197 (80.1%) patients showed no complications. With respect to side effects, pain at injection site was seen in 39 (15.9%) patients, blurring of vision in 9 (3.7%) patients, redness in only 1 (0.4%) patient whereas no side effects were noted in 197 (80.1%) patients. None of the patients required post procedure analgesia. Table.3

Table 1: Medical history of the study participants n=246

Patient History		Frequency	Percentages
Prior Anesthesia Exposure	Yes	71	28.9%
	No	175	71.1%
Prior Anesthesia Complications	Yes	8	3.3%
	No	238	96.7%
State Problem	Dizziness	1	0.4%
	Pain	5	2.0%
	BOV	2	0.8%
	No symptoms	238	96.7%
Drug history	Yes	53	21.5%
	No	193	78.5%
Co-morbidity	Hypertension	50	20.3%
	Diabetes Mellitus	31	12.6%
	IHD	8	3.3%
	Allergy	4	1.6%
	Any Other	20	8.1%
Physical State of Patient	None	133	54.1%
	Stable	233	94.7%
	Unstable	13	5.3%

BOV=Blurring of Vision, IHD= ischemic heart disease

Table 2: Effectiveness of local anesthetic agent (n=246)

Variables		Frequency	Percentages
Patient Co-operation	Yes	245	99.6%
	No	1	0.4%
Loss Of Sensation	1	0	0%
	2	0	0%
	3	9	3.7%
	4	160	65.0%
	5	0	0%
Patient Satisfaction of Local Anesthesia	1	0	0%
	2	1	0.4%
	3	5	2.0%
	4	143	58.1%
	5	97	39.4%
Agent Reinjected	Yes	0	0%
	No	246	100%
Onset of Action (mean ± SD)		8.65 ± 3.681 seconds	

Table 3: Complications of Local Anesthesia n=246

Complications		Frequency	Percentages
Complications	Yes	49	19.9
	No	197	80.1
Side Effects	Redness	1	0.4
	Swelling	0	--
	Pain	39	15.9
	SOB	0	0
	BOV	9	3.7
	Any Other	0	0
Post Procedure Analgesic	Yes	0	0
	No	246	100

SOB=Shortness of breath, BOV=Blurring of vision

DISCUSSION

On the basis of analyzed data we were able to conclude that patient satisfaction was recorded much greater in overall patients along with no need of reinjection of local anesthesia while performing FNAC procedure. A huge number of patients felt complete loss of sensation throughout the procedure. A large proportion of patients showed no post procedure adverse effects. There were negligible number of patients who were dissatisfied due to the procedure and who presented with post procedure complications, of which most commonly pain was detected followed by blurring of vision.

In this study effectiveness and complications of local anesthesia were analyzed and were observed on the basis of variety of questions that were key factors for patient satisfaction, effectiveness and complications asked from the patients with 97.6% satisfied patients, and a 96.3% ratio of loss of sensation during their minimally invasive procedures. On contrary another study regarding patient satisfaction with local anesthesia was conducted in Moscow but found to have only 59.7% satisfied patients.¹³ Our study has a higher patient satisfaction level because local anesthesia was used for minimally invasive procedures whereas in the latter discussed study local anesthesia was administered to patients undergoing surgical procedures. Another study was conducted about the effectiveness of local anesthesia in the dental procedures at the University of Mainz, Germany and the complications experienced by the patients here were only transient and did not need any specific treatment and only two patients out of 2731 patients encountered severe complications, just like our study where the patients only encountered pain or blurring of vision which settled down on its own after a short time period with no severe complications noted. A slight difference in the comparison might be present because the local anesthesia used in this study was Articaine unlike our study where lidocaine was used.² However there might be slight variations in the figures because the study population

size has a major noticeable difference from our population size. One more study was conducted at the Catholic University of South Korea where a total of 113 patients were considered a part of the study where patients were divided in three main groups on the basis (a) patients with pre procedural administration of lidocaine, (b) patients with post procedural administration of lidocaine and (c) patients with no administration of lidocaine. So in patients of group (a) where patients were given pre-procedural local anesthesia and here post procedural pain was noted in 16.7% of the patients which is almost same as that of our study analysis whereas in the groups (b) and (c) there was noticeable post procedural pain.¹⁵The study figures may vary slightly because this study has almost half as that of our study population size.

Patient satisfaction and effectiveness were measured along with the level of complications that were encountered by the patient after the procedure and since we were able to conduct the study within the calculated time and the analyzed results depicted a high effectiveness and patient satisfaction rates in both male and female population of the study and were relatively higher than the studies that were primarily based on surgical or invasive procedures. The results suggested profound superiority and authenticity as the post procedural complications were noted to be relatively lesser and insignificant.

This study comprises of several strength factors which are as; there was no requirement of financial resources as our study was based on the procedures that were already taking place at the hospital, sample size was adequate and we were able to complete our data collection as it was not too large to be unachievable as there was a good patient flux or too small to not support our objectives, visual analogue scale was used to make our questionnaire patient friendly as it got easier for patients to interpret the scaling and rate their pain relief and satisfaction. Although as per weaknesses of the study, the participants of our population were not notified about the outcomes of this study and possible long-term complications of the Local anesthetic agent were not assessed.

CONCLUSION

In non-vascular interventional radiology, patients' satisfaction level towards local anesthesia is significantly high in terms of onset of action, remarkable loss of sensation, no requirement of reinjection, no usage of post procedure analgesic. In addition, local anesthesia is safe and reliable pharmacological agent because of its contribution to inappreciable post procedure complications.

LIMITATIONS

This study had few limitations some of them are:

- ✧ Single center study so there was not a quite variation in our targeted population.
- ✧ Due to diverse patient population, few patients may not understand the questions properly.
- ✧ Our questionnaire did not include questionnaire in the local languages like Urdu and Sindhi so we used the healthcare staff who were able to communicate with the patients in their local languages but that can't be accurately interpreted every time.

SUGGESTIONS / RECOMMENDATIONS

As we observed, few patients felt afraid of needles so we recommend that it is better to communicate and educate the patients properly before and during the procedure for additional satisfaction outcomes as it would benefit both patients and healthcare providers in achieving maximum efficacy with least post procedural complications and high patient satisfaction level.

CONFLICT OF INTEREST / DISCLOSURE

None.

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