ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645

INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY
January 2020, Vol 13(02), 213 – 217
DOI: 10.17485/ijst/2020/v13i02/149259,

Pain on Injection: Propofol MCT Vs Propofol LCT

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Article Type: Article

Article Citation: Dr. Sanjot S. Ninave and Dr. Bhavitha Venigalla. Pain on injection: propofol MCT vs propofol LCT. *Indian Journal of Science and Technology*. 2020; 13(02), 213-217. DOI: 10.17485/ijst/2020/v013i02/149259

Received date: November 28, 2019

Accepted date: December 10, 2019

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Abstract

Background: Propofol is one of the safest drugs in the induction of general anesthesia. The routinely available preparation in market being Propofol LCT (long chain triglycerides), which do have a disadvantage of pain on injection. This pain is very discomforting for the patient and also anesthesiologist. So, they are coming up with new preparation Propofol MCT (medium chain triglycerides) which do have a property of reduction of pain on injection. In view of which we compare the occurrence of pain on injection of Propofol MCT with Propofol LCT and rise in serum triglyceride levels after single induction dose. **Materials and methods:** After obtaining institutional ethical committee approval, 150 patients of ASA I & II were enrolled in the study undergoing various elective surgeries under general anesthesia, where propofol is used as an induction agent. The study patients were divided into two groups who received Propofol MCT (Group M) and Propofol LCT (Group L) as an induction drug. The intensity of pain is evaluated by using visual analogue score (VAS). Similarly, side effects of Propofol MCT were observed. **Results:** Group M showed reduced pain score (4.15 ± 1.90) after Propofol MCT injection along with less incidence of pain compared to Group L (6.37± 2.49). Serum triglyceride levels had no significant difference in preoperative and postoperative values. **Conclusion**: In conclusion, pain on injection with Propofol MCT (4.15 ± 1.90) is less compared to Propofol LCT (6.37± 2.49); there is no evidence of elevation of triglyceride levels after single induction dose in the study.

Keywords: Propofol, Pain on Injection, Propofol MCT, Propofol LCT, Serum Triglycerides

1. Introduction

Propofol is a substituted Isopropylphenol that is administered intravenously as 1% solution in an aqueous solution of 10% soyabean oil, 2.25% glycerol, and 1.2% purified egg phosphatide [1].

Propofol is currently the preferred intravenous general anesthetic drug with a smooth induction, pleasant sleep, rapid recovery, and low incidence of nausea and vomiting.

Despite these positive properties, it also has adverse effects such as injection pain, which may discomfort in the induction of anesthesia [2].

The mechanism of pain on injection of propofol is thought to be multifactorial but its exact causation is not clear. The most commonly identified mechanism is the release of bradykinin as a result of the activation of the plasma kinin–kallikrein system by propofol.

Lignocaine though being effective in reducing pain caused by propofol, there is a need for inflating tourniquet giving the drug intravenously, and then giving compression and deflating the tourniquet to overcome this disadvantage, there is a need of propofol solution which by itself is painless, so we want to compare the efficacy of Propofol MCT with that of routinely used Propofol LCT for the incidence of pain during injection.

Regarding potential risks related to propofol, however, an increase in serum triglyceride levels has been described repeatedly, particularly after long-lasting infusions. In critically ill patients presenting with deranged metabolic or enzymatic systems, prolonged propofol administration might result in an excessive fat load with ensuing pancreatitis, which is a well-known complication of hyper triglyceridemia [3]. The incidence of serum triglygeridemia is also compared between both the groups checking preoperative and postoperative triglycerides.

2. Aim

To study the efficacy of Propofol MCT over routinely use Propopfol LCT in attenuating the pain caused by propofol injection and comparing serum triglyceride levels preoperatively and postoperatively.

3. Materials and Methods

The study was carried out in the Department of Anaesthesiology, JNMC, Sawangi (Meghe), Wardha. After Approval from the Institutional Ethics Committee,150 patients aged between 18–65 years willing to give written informed consent fitting into the inclusion criteria were included in this double blinded prospective observational study scheduled for various elective surgeries under general anesthesia. Patients are divided into groups into 75 each. Group MCT received 25% of propofol MCT induction dose. Group LCT received 25% of propofol LCT. Preanesthetic evaluation was done a day before the surgery. Patients were asked to be nil by mouth by 8 hours. All the necessary routine investigations were noted along with preoperative triglycerides. Patients with chronic pain disorder, known allergy to the study drug, pregnancy, abnormal renal and liver function were excluded from the study. On arrival of patient to operation theater, all routine monitors are attached to the patient, and baseline parameters such as HR, SBP, DBP, MAP, SPO2 were recorded. Intra-venous cannulation was done using wide bore cannula (18 G or 20 G) on the dorsum of the hand or fore arm. Premedications were delebirately avoided to avoid influence on study results. With a tourniquet in place distal to venous cannulation, 2.5 ml of total 10 ml propofol, i.e., 25% of the induction dose, is given according to the

groups divided. Patients are asked to indicate the severity of pain on injection using VAS Score at 25 seconds. This is the end point of the study and further procedure was carried out in conventional manner depending on the type of surgery. Awareness of the pain due to propofol after general anaesthesia is not considered. Postoperative serum triglyceride levels were measured.

4. Statistical Analysis

Assuming VAS score of Propofol MCT 2.089 and SD of 0.896, keeping power at 80% and confidence interval at 95% (alpha error at 0.05), a sample of 60 patients would be required to detect a minimum of 25% of pain on IV Propofol MCT and LCT. We include 75 patients in each group to compensate for possible drop out.

5. Discussion

Propofol is the most commonly used inducing agent in the practice of anesthesia providing smooth induction, rapid recovery, and low incidence of nausea and vomiting. Despite its positive effects, pain on propofol injection is ranked 17th among the most important 33 low morbidity clinical anesthesia problems by a panel of expert anesthesiologists [4]. Table 1 shows patient characteristics pertaining to demographic details and ASA grade did not differ between both the groups. Table 2 shows the VAS score in Propofol LCT (6.37 ± 2.49) is more compared to Propofol MCT (4.15 ± 1.90). Similarly, there is less injection pain with Propofol MCT/LCT ($p=0.000$) [5]. Table 2 shows that incidence of pain is more in Propofol LCT (86.7 %) compared to Propofol MCT (72.0%). Propofol MCT/LCT had significantly lower incidence of pain on injection in comparison with standard propofol group (37% vs 65%) [6]. Table 2 compared the induction time in Group L (34.07 ±2.68) and Group M (33.81 ± 2.72) and it was found to be similar. Table 3 Compared the preoperative and postoperative triglycrides which showed no significant difference between both the groups failed to increase triglyceride levels to a significant level; despite the difference in the lipid content, single dose of MCT/LCT or LCT propofol did not increase serum triglyceride levels significantly to cause any adverse effects [7] which demonstrated that both LCT and MCT-LCT propofols cause significant rise in triglyceride levels in children when used for induction and maintenance of anesthesia. However, children in MCT-LCT

TABLE 1. Demographic data of the two groups – Propofol LCT and Propofol MCT

MAP	N	Group L	Group M
Age (mean ± SD)	75	44.31 ± 11.29	41.85 ± 10.19
Gender			
Male [n(%)]	75	40 (53.3)	41 (54.7)
Female [n(%)]		35 (46.7)	34 (45.3)
Weight (mean ± SD)	75	59.67 ± 9.53	61.92 ± 12.51
ASA Grade			
ASA I [n(%)]	75	57 (76.0)	59 (78.7)
ASA II [n(%)]	75	18 (24.0)	16 (22.3)

TABLE 2. Comparison of mean VAS pain score, induction time, and presence of pain between the two groups – Propofol LCT and Propofol MCT

MAP	N	Group L	Group M	P-value	Sig.
VAS pain score (mean ± SD)	75	6.37 ± 2.49	4.15 ± 1.90	<0.001	S
Induction time in seconds (mean ± SD)	75	34.07 ± 2.68	33.61 ± 2.72	0.306	NS
Pain present [n(%)]	75	65 (86.7)	54 (72.0)	0.027	S

P-value derived from independent sample t-test; P-value derived from chi-square test; significant at $p < 0.05$.

TABLE 3. Comparison of pre- and posttriglycerides values of group Propofol LCT and Propofol MCT

Triglycerides	N	Group L	Group M
		Mean ± S.D.	Mean ± S.D.
Pre-op triglycerides	75	128.94 ± 21.63	128.62 ± 21.59
Post-op triglycerides	75	134.41 ± 20.41	132.44 ± 12.76
P-value		0.099	0.174
Significance		NS	NS

P-value derived from paired t-test.

group had lower triglyceride levels than children in LCT group at the end of propofol infusion and 4 hours after termination [8] which stated that increased serum triglyceride level after propofol infusion is associated with increased risk of pancreatitis, coronary artery disease. It occurs in ICU patients who receive long-term propofol infusion (>24 hrs) [9–10]. But this propofol infusions are not now routinely used as newer and better drugs like dexmedetomidine and others have taken over propofol. No studies have cited that there was increase in serum triglycerides after single bolus dose of propofol except a case of 21 year old patient operated for Bartholin duct excision developing pancreatitis after single dose of propofol [11]. It is hypothesized that concentration of free propofol in the aqueous phase of emulsion is responsible for the pain of injection. Various options were tried for the prevention of injection pain caused by propofol with varying degree of success, one among is the use of lidocaine. There is a sole need of propofol solution which by itself is painless or less painful. The drawback of propfol being pain on injection may be distressing to patient, interfere with smooth induction, which can be attenuated by a formulation in medium-chain triglycerides rather than long-chain triglycerides. Our study compared Propofol MCT and LCT for pain on injection instead of emulsions and found that Propofol MCT is better as compared to Propofol LCT.

6. Conclusion

Propofol MCT is associated with less incidence of pain on injection compared to Propofol LCT, as it also offers advantage without the addition of any other drugs. Also, the formulations did not increase serum triglyceride levels after single induction dose.

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