

INCIDENCE OF PAIN ON PROPOFOL INJECTION AND EFFICACY OF ADDITION OF LIGNOCAINE OR SELECTING BIG VEIN OR BOTH COMBINED IN REDUCING IT: A RANDOMIZED CONTROL TRIAL

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ABSTRACT

Objectives: To find out the frequency of pain due to propofol injection and to assess the efficacy of addition of lignocaine to propofol, selecting big vein in antecubital fossa or both combined in reducing pain.

Material and Methods: Incidence of injection pain with propofol was noted in 200 unpremedicated patients undergoing tonsillectomy. They were divided into 4 groups of 50 patients each. The patients were randomly allocated by card method to one of the four groups. Group A received plain propofol in a small vein on the dorsum of hand. Group B received 10 mg lignocaine added to propofol before administration into a vein on the dorsum of hand. Group C received propofol in a vein in the antecubital fossa and group D received lignocaine 10 mg added to propofol prior to administration in vein in the antecubital fossa.

Results: Incidence of pain was 58% with plain propofol injected in small vein, 10% when lignocaine was added prior to injection, 8% when injected in large vein and 6% when lignocaine was added before injecting propofol in large vein.

Conclusion: Addition of lignocaine to propofol before injection into a small vein and administration of plain propofol into a large vein were equally and significantly effective (P value <0.001) in reducing the incidence of pain. Addition of lignocaine to propofol into a large vein further reduced the incidence as compared to plain propofol but this was not statistically significant (P value >0.05).

Keywords: Propofol, Pain on injection, Lignocaine.

INTRODUCTION

Propofol, a specific hypnotic agent is formulated as sterile, oil in water emulsion for intravenous administration. Its clinical uses have greatly expanded over the past years. Propofol has rapidly become the drug of choice for induction of anaesthesia in outpatients undergoing short procedures. Propofol is suitable both for induction and maintenance of general anaesthesia. For maintenance propofol is usually given by infusion.

Propofol is very rapidly and extensively distributed and rapidly metabolized to inactive metabolites. These features form the basis of a pharmacokinetic profile, which makes propofol suitable for administration by continuous infusion.

Propofol may cause pain or discomfort on injection especially when administered into a vein on the dorsum of hand. Incidence may be as high

as 84%.¹ Incidence of pain is less after injection in large vein in antecubital fossa.² The incidence of pain on injection can be reduced if local anaesthetic lignocaine is mixed with it prior to administration.³

The purpose of this study was to establish how efficient lignocaine is in lowering the incidence of pain when propofol is injected in to a small vein on the dorsum of hand. The study also aimed to know the efficacy of selecting a large antecubital vein in lowering the incidence of pain. Further more this study was designed to know the incidence of pain when propofol is injected into a large antecubital vein after addition of lignocaine.

MATERIAL AND METHODS

Two hundred patients were selected for this study. All of them were un-premedicated and

ASSESSMENT OF PAIN

Pain Score	Degree of Pain	Response
0	None	Negative response to Questioning
1	Mild	Pain reported in response to questioning only without any behavioral sign
2	Moderate	Pain reported in response to questioning and accompanied by a behavioral sign
3	Severe	Strong vocal response or response accompanied by facial grimacing, arm withdrawal or tears.

Table 1

were ASA-I patients undergoing routine tonsillectomy. These patients were randomly divided into four groups of fifty each. A 20-gauge cannula was inserted into either the largest apparent vein on the dorsum of hand or into the largest vein in antecubital fossa. The patients were randomly allocated by card method to one of the four groups.

Group A- Induction dose of propofol 2.5 mg /kg was administered in a small vein on dorsum of hand.

Group B- 10 mg of lignocaine (1 ml of 1% solution) was added to propofol and administered in a small vein.

Group C- Induction dose of propofol was administered in a large vein in the antecubital fossa.

Group D- Lignocaine 10 mg was added to propofol and administered in a large vein in antecubital fossa.

The speed of injection was controlled carefully. One quarter of the total calculated dose was given over the first 5 seconds, after this period injection was stopped for 5 seconds to allow assessment of pain by the method outlined. Induction was then continued and second quarter of the total induction dose was administered over a further 5 seconds period. The patient was questioned again and assessment of pain done. Finally the remainder of the dose was administered.

The pain score was obtained by asking the patient about any pain felt on injection and verbal response, together with behavioral signs such as

facial grimacing, arm withdrawal or tears. A score of 0-3 which corresponded to no pain, mild pain, moderate and severe pain respectively was recorded (Table 1).

Suxamethonium 1.5 mg /kg was given after loss of verbal contact to facilitate tracheal intubation. Anaesthesia was maintained with oxygen, nitrous oxide and halothane.

The statistical significance of different groups was estimated by chi square test and Fisher's exact test and the results were considered significant at $P < 0.5$.

RESULTS

Out of 200 cases, each group comprised of 50 patients of either sex. There were no differences among the groups regarding age, weight or sex (Table no. 2).

No adverse effect attributable to lignocaine was observed during the study. Results and pain scores of different groups were as follows.

Group A: Plain propofol was injected into a small vein on the dorsum of hand. 21 patients did not experience any pain (score of 0), 20 patients complained of mild pain (score of 1), 6 patients had moderate pain (score of 2) and only 3 patients felt severe pain (score of 3).

Group B: 10 mg of lignocaine (1ml of 1% solution) was freshly added to 200 mg of propofol and induction dose injected into small vein on dorsum of the hand. 45 patients did not feel any pain (score of 0), 2 patients complained of mild pain (score of 1), 2 patients had moderate pain (score of 2) and only 1 patient felt severe pain

AGE AND WEIGHT RANGES AND MALE TO FEMALE RATIOS

GROUPS	Age (years) Mean (range)	Weight (kgs) Mean (range)	Sex M : F
Group-A	22(15-36)	52.4 (42-72)	25 : 25
Group-B	23(16-34)	53.2 (45-73)	24 : 26
Group-C	22(16-37)	52.8 (44-76)	26 : 24
Group-D	24(18-35)	53.6 (48-80)	25 : 25

Table 2

(score of 3).

Group C: Plain propofol was injected into a vein in the antecubital fossa. 46 patients did not complain of any pain (score of 0), 2 patients felt mild pain (score of 1), 1 patient had moderate pain (score of 2) and only 1 patient experienced severe pain (score of 3).

Group D: 10 mg of lignocaine was added to propofol and injected into vein in antecubital fossa. 47 patients had no pain (score of 0), 2 patients felt mild pain (score of 1), 1 patient experienced moderate pain (score of 2) and no patient felt severe pain (score of 3).

Pain scores of four groups are summarized in table No.3.

Results of group B, C and D were significant as compared to group A with a P value <0.001 in all the cases. This means that the methods employed in groups B, C and D significantly reduced the incidence of pain. Comparing the results of group D and C, addition of lignocaine reduced the incidence but it was not significant as P value was >0.05.

DISCUSSION

Pain on injection is very distressing to patients and can reduce the acceptability of otherwise useful agent Propofol. Although the exact mechanism responsible for the propofol induced pain is not fully understood but the activation of kinin system has been suggested⁴.

Different clinical strategies have been tried over the years to reduce the incidence and severity of pain on injection with propofol.

A multicentre study was carried out in which 1465 patients received propofol and occurrence of pain on injection was assessed.² They found that lignocaine 10 mg used as pretreatment or mixed with propofol reduced the incidence of pain from 28.5% to 8.8%. However this study did not differentiate between pretreatment with lignocaine and mixing of lignocaine with propofol. They also found out that when propofol was injected into veins in the antecubital fossa the incidence of pain was reduced to 6%.

We have selected these two methods,

addition of lignocaine 10 mg and injection into a vein in antecubital fossa to assess their efficacy in reducing the incidence of pain on propofol injection. Furthermore we wanted to know how much the incidence is reduced when lignocaine is added to propofol before injecting into vein in antecubital fossa.

A study found that addition of lignocaine to propofol was more effective in reducing the incidence as compared to pretreatment with lignocaine.³ This was confirmed by another study that pretreatment with lignocaine does not reduce the incidence of pain significantly.⁵

In another study lignocaine 20 mg mixed with propofol reduced the incidence of pain from 59.1% to 5.6%.⁶ Similarly another study reported significant reduction in pain on injection with propofol when 10 mg of lignocaine was added to propofol.⁷

We found 58% incidence of pain on injection with plain propofol when injected into a small vein on the dorsum of hand. This result is comparable to a study of Valanne and Kortilla⁸ and a study by Van Hemelrijck and his colleagues.⁹

In our study lignocaine 10 mg, when freshly added to propofol before injection on the dorsum of hand reduced the incidence to 10% from 58%. Similar results were reported by Stark et al.² These results can also be compared to the study by Johnson and Colleagues⁶ who reported incidence of 11.1% with lignocaine.

In our study when propofol was injected into a large vein in antecubital fossa the incidence of pain is reduced to 8%. These results coincide with the study by Stark and Colleagues² and a study by Valanne and Kortilla.⁸ We found that when lignocaine is added to propofol before injecting into a vein in antecubital fossa the incidence of pain was reduced from 8% to 6% as compared to plain propofol. Although there was reduction in incidence but this was not significant statistically. Different other techniques employed for the reduction of incidence and severity of propofol is as follows.

Dilution of propofol to 1% with either 5% dextrose¹⁰ or 10% intra lipid¹¹ reduced the

SUMMARY OF RESULTS

Pain Score	Group A No. of pts (%)	Group B No. of pts (%)	Group C No. of pts (%)	Group D No. of pts (%)
0 (None)	21 (42)	45(90)	46 (92)	47 (94)
1 (Mild)	20 (40)	2 (4)	2 (4)	2 (4)
2 (Moderate)	6 (12)	2 (4)	1 (2)	1 (2)
3 (Severe)	3 (6)	1 (2)	1 (2)	0 (0)

Table 3

incidence of pain. Administration of tramadol before propofol also significantly reduced the incidence and severity of pain.¹² Patients receiving propofol that had been taken directly from refrigerator (4-5 degree centigrade) have lower incidence and severity of pain as compared to propofol at room temperature.¹³ Similarly warming propofol to 37°C before administration decreased the incidence and severity of pain on injection.¹⁴ Administration of remifentanyl (0.5µg/kg) 60 seconds before propofol administration decreased the incidence of pain from significantly.¹⁵ Metoclopramide 10mg mixed with lignocaine 20mg, when administered 1 minute before propofol into a dorsal hand vein reduced the incidence of pain.¹⁶ Prior administration of thiopentone (0.5mg/kg) also reduced the incidence of pain on subsequent propofol injection.¹⁷ Pretreatment with butorphanol 2 mg intravenously one minute before administration of propofol also attenuates the pain on injection.¹⁸

We conclude that the addition of 10 mg of lignocaine to propofol before administration is a safe and easy way to decrease the incidence and severity of pain on injection. Other methods that can be used are dilution of propofol by 5% dextrose, keeping propofol in refrigerator at 4-5°C. Remifentanyl if available 0.5µg/kg bolus 60 seconds before injection of propofol. Prior administration of thiopentone 0.5mg/kg or butorphanol 2 mg before administration of propofol can reduce the incidence and severity of pain.

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