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SCIENTIFIC ARTICLE

To study the effect of injection dexmedetomidine for prevention of pain due to propofol injection and to compare it with injection lignocaine

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KEYWORDS
Pain;
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Abstract
Background: Pain due to injection propofol is a common problem. Different methods are used to decrease the pain but with limited success. The objective of this study was to assess the effect of injection dexmedetomidine 0.2 mcg/kg for prevention of pain due to propofol injection and compare it with injection lignocaine 0.2 mg/kg.
Method: After taking permission of the Institutional Ethical Committee, written informed consent was obtained from all patients, in a randomized prospective study. 60 American Society of Anesthesiology I and II patients of age range 20–60 years of either sex posted for elective surgeries under general anaesthesia were randomly allocated into two groups. Group I (dexmedetomidine group): Inj. dexmedetomidine 0.2 mcg/kg diluted in 5 mL normal saline and Group II (lignocaine group): Inj. lignocaine 0.2 mg/kg diluted in 5 mL normal saline. IV line was secured with 20 G cannula and venous occlusion was applied to forearm using a pneumatic tourniquet and inflated to 70 mm Hg for 1 min. Study drug was injected, tourniquet released and then 25% of the calculated dose of propofol was given intravenously over 10 s. After 10 s of injection, severity of pain was evaluated using McCrirrick and Hunter scale and then remaining propofol and neuromuscular blocking agent was given. Endotracheal intubation was done and anaesthesia was maintained on O_2, N_2O and isoflurane on intermittent positive pressure ventilation with Bain's circuit and inj. vecuronium was used as muscle relaxant.
Results: Demographic data showed that there was no statistically significant difference between the 2 groups. There was no statistically significant difference between 2 groups in respect to inj. propofol pain. No adverse effects like oedema, pain, wheal response at the site of injection were observed in the two groups.

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PALAVRAS-CHAVE
Dor;
Fenol;
Propofol;
Dexmedetomidina;
Lidocaína

Avaliação do efeito de dexmedetomidina na prevenção da dor relacionada à injeção de propofol e comparação com o efeito da injeção de lidocaína

Resumo
Justificativa e objetivo: A dor relacionada à injeção de propofol é um problema comum. Métodos diferentes são usados para diminuí-la, mas com sucesso limitado. O objetivo deste estudo foi avaliar o efeito da dexmedetomidina (0,2 mcg kg^{-1}) na prevenção da dor relacionada à injeção de propofol e compará-lo com lidocaína (0,2 mg kg^{-1}).
Método: Depois da permissão do Comitê de Ética Institucional, a assinatura do termo de consentimento informado foi obtida de todos os participantes deste estudo prospectivo e randomizado. Sessenta pacientes com estado físico ASA I-II, idades entre 20-60 anos, de ambos os sexos e programados para cirurgias eletivas sob anestesia geral foram randomicamente alocados em dois grupos: Grupo I (dexmedetomidina) recebeu injeção de dexmedetomidina (0,2 mcg kg^{-1}) diluída em 5 mL de solução salina normal e Grupo II (lidocaína) recebeu injeção de lidocaína (0,2 mg kg^{-1}) diluída em 5 mL de solução salina normal. O acesso IV foi obtido com uma cânula de calibre 20G e a oclusão venosa aplicada no antebraço com o uso de um torniquete pneumático e inflado a 70 mm Hg durante um minuto. Os medicamentos em estudo foram injetados, o torniquete foi liberado e, em seguida, 25% da dose calculada de propofol foi administrada por via intravenosa durante 10 segundos. Após 10 segundos de injeção, a intensidade da dor foi avaliada com o uso da escala de McCrirrick e Hunter e, em seguida, o restante do propofol e um agente bloqueador neuromuscular foram administrados. A intubação endotraqueal foi feita e a anestesia mantida com O_2, N_2O e isoflurano em ventilação com pressão positiva intermitente, com o circuito de Bain e uso de vecurônio como relaxante muscular.
Resultados: Os dados demográficos mostraram que não houve diferença estatisticamente significante entre os dois grupos. Não houve diferença estatisticamente significante entre os dois grupos em relação à dor relacionada à injeção de propofol. Não houve efeitos adversos, como edema, dor e pápula no local da injeção nos dois grupos.

Introduction

Pain is an unpleasant subjective sensation which is very distressing to the patient. Pain on injection with propofol is a common problem.[1,2] It is due to phenol group present in propofol. Phenol group is irritating to skin, mucous membrane and venous intima. In the absence of treatment regimens, 28–90% of patients experience moderate to severe pain when propofol is injected into peripheral vein.[1] Various methods have been used to decrease the severity of pain like Nitroglycerine ointment at the injection site, diluting propofol with 5% dextrose or intralipid, inj. ondensetron or opioids such as fentanyl, NSAIDs. Intravenous Lignocaine is the most commonly used pre-treatment to reduce the pain caused by inj. propofol. It is definitely effective but it also has a failure rate of 13–32%.[3,4]

Dexmedetomidine is a highly selective, specific and potent alpha-2 adrenoreceptor agonist. It is a potent analgesic, sedative, along with sympatholytic effect. In addition, it has supraspinal, spinal and peripheral action. Alpha 2-adrenoreceptors located on blood vessels inhibit norepinephrine release, resulting in release of prostaglandins and cause vasodilation that antagonize the venoconstrictor response.[5] Dexmedetomidine has been shown to promote peripheral antinociception.[6] Therefore dexmedetomidine can also be used for relief of propofol pain. Lignocaine is a time tested local anaesthetic belonging to the ester group.

In the present study, we plan to investigate the effect of inj. dexmedetomidine for prevention of propofol injection pain and compare it with inj. Lignocaine.

Methods

The study was conducted after obtaining the approval from institutional ethical committee. A written and informed consent was obtained from all patients. 60 patients were included in our study. All these patients belonged to American Society of Anesthesiology (ASA) grade I or II and were posted for elective surgery under General Anaesthesia. Thorough preoperative evaluation was done. Patients were kept fasting for 6 h. Randomization was done into 2 groups by double blind method. Group I (dexmedetomidine group) in which inj. dexmedetomidine 0.2 mcg/kg diluted in 5 mL normal saline and Group II (lignocaine group) in which inj. Lignocaine 0.2 mg/kg diluted in 5 mL normal saline were given.

Exclusion criteria for this study were patients unwilling for the trial, those requiring rapid sequence induction and those with anticipated difficulty in venous access.

On arrival of patient to the operation theatre, a 20 G intravenous cannula was inserted in a prominent vein on dorsum of non-dominant hand. All monitors like electrocardiogram, non-invasive blood pressure and pulse oximeter were attached. A pneumatic tourniquet was placed on the

Table 1 McCrirrick and Hunter Scale for evaluation of pain.

Degree of pain	Response
None (0)	No response to questioning
Mild (1)	Pain reported in response to questioning only without any behavioural signs
Moderate (2)	Pain reported in response to questioning and accompanied by behavioural signs or pain reported spontaneously without questioning
Severe (3)	Strong vocal response or response accompanied by facial grimacing, arm withdrawal or tears

same upper arm with pressure inflated to 70 mm Hg to produce venous occlusion.

The study drugs were preservative free and kept at room temperature. Each of the study drug was prepared by independent Anaesthesiologists into 5 mL volume. The tourniquet was inflated for 1 min and study drug were given intravenously over 5 s and then tourniquet was released. 25% of the calculated dose of propofol was given intravenously over 10 s. After 10 s severity of pain was evaluated using McCrirrick and Hunter Scale[2] (Table 1) which was already explained to the patient. Then remaining propofol and neuromuscular blocking agent (inj. vecuronium 0.08 mg/kg) were given & endotracheal intubation were done with appropriate size tube. Anaesthesia was maintained with O_2, N_2O and Isoflurane on intermittent positive pressure with Bain's circuit and Inj Vecuronium was used as muscle relaxant.

Statistical analysis

Analysis was performed using the program SPSS (Statistical Package For Social Services) version for windows. The data were reported as a mean ± SD, median and numbers (%) as found suitable. Relationships between categorical variables were tested using the Chi Square Test. Two sample *t*-test was used for comparison of normally distributed continuous variables between the two groups. *p* Value more than 0.05 was considered as statistically significant (Fig. 1, Table 2).

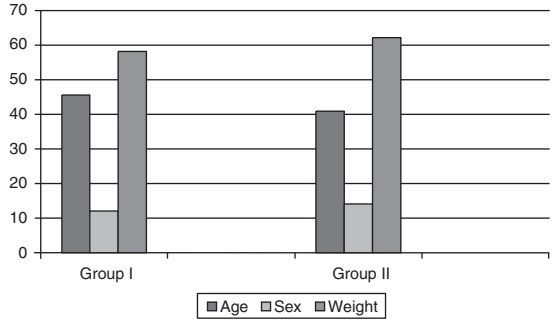

Figure 1 Demographic data. Table 2 shows overall incidence and severity of pain after injection of propofol in the two groups.

Results

Fifteen patients (50%) in Group I and eighteen patients (60%) in Group II had no pain on inj. propofol. Nine patients (30%) in dexmedetomidine group and eight patients (27%) in lignocaine group had mild pain. Six patients (20%) in Group I and four patients (13%) in Group II had moderate pain (Table 3, Fig. 2). The study showed that there was no difference in the pain score which was statistically significant. No patient in this study had severe pain. No adverse effects like oedema, pain, wheal response at the site of injection were observed in the study.

Discussion

Propofol induced pain is considered to be one of the most important problems of current clinical practice. It was rated

Table 2 Demographic data. The demographic data were compared among the two groups.

Demographic data	Group I (dexmedetomidine)	Group II (lignocaine)	*p* value[a]
Age (yr)	45.4 ± 16.11	40.72 ± 13.96	>0.05
Male/female	16/14	15/15	<0.05
Weight	57.92 ± 8.41	61.88 ± 5.91	<0.05

There was no significant statistical difference among the 2 groups in relation to the weight and sex except the age parameter which was clinically insignificant (Fig. 1).

[a] *p* value – probability/test of significance.

Table 3 Severity of pain score.

Pain score	Group I (dexmedetomidine)	Group II (lignocaine)	*p* value[a]
None (0)	15 (50%)	18 (60%)	<0.005
Mild (1)	9 (30%)	8 (27%)	<0.005
Moderate (2)	6 (20%)	4 (13%)	<0.005
Severe (3)	0	0	

[a] *p* value < 0.005 i.e. not significant.

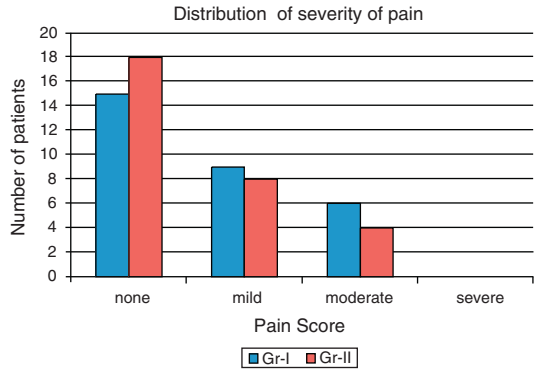

Figure 2 Severity of pain score.

as the seventh most disturbing experience to the patient in anaesthesia practice by a group of experts.[7] Nature of the vascular pain is expressed by the patients as aching, burning and crushing. Inj. propofol has a phenol group which is irritating to skin, mucous membrane and venous intima.[8] Mechanism of immediate pain is due to irritation of afferent nerve endings within the vein. Scott et al.[3] speculated that mechanism of the delayed pain is due to activation of kallikrien–kinin system by propofol, thereby generating kinin, probably bradykinin. It produces local vasodilation and hyperpermeability. It increases contact between propofol and free nerve endings resulting in pain on injection.[9] The use of adjuvant medication before propofol to reduce the pain of injection has become a common practice.

The 0.2 mcg/kg dexmedetomidine dose was chosen according to a study of Memis et al.[10] where they compared 0.1 mcg/kg and 0.2 mcg/kg dexmedetomidine for decreasing rocuronium injection pain and they concluded that the latter dose was more effective.

Ayoglu et al.[11] in their comparative study of dexmedetomidine with lignocaine for their effect on reducing propofol and rocuronium injection pain concluded that dexmedetomidine failed to decrease propofol injection pain but reduced rocuronium withdrawal movement.

Comparison of 0.2 mcg/kg of dexmedetomidine with placebo for propofol pain was studied by Uzun et al.[12] who concluded that injection of dexmedetomidine before propofol was found to be more effective than injection of normal saline in alleviating propofol injection pain.

Alpha 1- and alpha 2-stimulation might be a possible mechanism involved in decreasing propofol injection pain and resulting in release of prostaglandins which cause vasodilation that antagonize venoconstrictor response. This modulates the sympathetic response of venous smooth muscle and may be important in endothelial dysfunction caused by propofol.[13] This might be the basic mechanism of action with dexmedetomidine as it is highly potent alpha2 adrenoreceptor agonist. Another mechanism might be hyper-polarisation activated conductance in peripherally mediated antinociception.

Mechanism of action in lignocaine for propofol pain relief is due to local anaesthetic effect which causes an inhibitory effect on the enzymatic cascade leading to release of kinin.

Conclusion

Inj. Dexmedetomidine is equally effective and can be used as an alternative to time tested drug inj. Lignocaine for relief of pain due to propofol injection without any significant side effects.

Conflict of interest

The authors declare no conflicts of interest.

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