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EFFECT OF DEPO-MEDROL VS LIGNOCAINE IN REDUCING DIPRIVAN-INDUCED INJECTION PAIN: A RANDOMIZED, DOUBLE-BLIND, PROSPECTIVE STUDY IN ADULT PATIENTS UNDERGOING CARDIAC SURGERY

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Abstract

SYNOPSIS:

Diprivan is frequently used medicine for induction of anesthesia. It often causes discomfort when it is injected. To compare how well depo-medrol and lignocaine work in reducing this pain, we carried out a double-blind study on patients who were having cardiac surgery.

METHOD:

The study involved 180 adult patients who were scheduled for elective cardiac surgery.

Participants were randomly assigned to three groups: one received normal saline (Group S, n = 60), another received lignocaine 20 mg (Group L, n = 60), and the third received depo-Medrol 125 mg diluted in 2 ml of distilled water (Group MP, n = 60). The assigned medication was given after applying a tourniquet, and the tourniquet was released after one minute. Then, one fourth of the total diprivan dose (2 mg/kg) was given at a rate of 0.5 ml per second. Pain from the diprivan injection was measured using a four-point verbal rating scale. Data was analyzed using Student's t-test, along with Chi-square or Fisher's exact test as appropriate.

RESULT:

Pain occurred in 70.9% of patients in the saline group, compared to 30.9% in the lignocaine group and 36.4% in the depo-medrol group.

Both Depo-medrol and lignocaine were linked to significantly lower pain than saline (P value < 0.012).

CONCLUSION:

Administering intravenous depo-medrol before treatment was found to be as effective as lignocaine in reducing the pain from diprivan injection.

INTRODUCTION

Diprivan is an intravenous medicine commonly used to induce and maintain anesthesia.

Pain upon injection is experienced by 28% to 90% of adult patients and is usually described as intense, with sensations ranging from sharp to aching or burning. This pain may lead to increased cardiac rate and blood pressure, which could be harmful in certain patients, especially those with previous cardiac problems or irregular heartbeats. Several factors can affect the likelihood of experiencing injection pain, including the injection site, the size of the vein, rate of injection, the blood's ability to buffer, the temperature of the Diprivan solution, and the use of other medications such as local anesthetics or opioids.

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Corticosteroids act as systemic anti-inflammatory and pain-relieving agents and are known for their capacity to block pain signals from C fibers when given locally.

Dexamethasone has been shown to help reduce pain from diprivan injection. Depo-medrol is often used during cardiac-lung bypass procedures to reduce inflammation, typically in doses ranging from 10 to 30 mg/kg. Injectable depo-medrol sodium succinate is available in various strengths, including 40 mg, 125 mg, 500 mg, and 1000 mg. We proposed that giving depo-medrol before treatment could help decrease the pain caused by diprivan injection.

METHOD

The study was approved by the hospital's ethics committee, and all participants gave written consent.

The study included 180 patients aged 21 to 60, regardless of gender, classified as American Society of Anesthesiologists (ASA) physical status I or II, who were scheduled for elective cardiac surgery. Patients with known allergies to diprivan or lignocaine, those with difficulty accessing veins, cardiac conduction issues, congenital cardiac disease, reduced cardiac function, unstable blood pressure, diabetes, chronic pain conditions, seizures, head injuries, or systemic fungal infections were excluded.

This was a prospective, randomized, double-blind, interventional study with a parallel-group design.

Standard monitoring included five-lead electrocardiography and pulse oximetry. A 20-gauge intravenous catheter was inserted into the most prominent vein on the back of the left hand. After applying lignocaine for local anesthesia, radial artery cannulation was done on the right side. Patients were randomly divided into three groups of 60 each using a computer-generated sequence. Group S received 2 ml of normal saline as a placebo; Group L received 20 mg of lignocaine (from a 2% solution, diluted to 2 ml with distilled water); and Group MP received 125 mg of depo-medrol sodium succinate diluted to 2 ml with distilled water.

The limb was raised for 15 seconds, followed by venous occlusion using a tourniquet inflated to 40 mmHg.

The assigned solution was then given, with the investigator unaware of the treatment. After one minute, the tourniquet was released, and diprivan (0.5 mg/kg, formulated in long-chain triglycerides) was injected at a rate of 0.5 ml per second. All study medications were stored at room temperature. A second anesthesiologist, who was unaware of the patient's group, assessed the pain level. This assessment involved asking standardized questions about injection comfort, analyzing verbal feedback, and observing behavioral responses such as facial expressions, arm movements, or crying.

Pain intensity was scored on a four-point scale:

0 = no pain

1 = mild pain (only reported when asked, no observable reaction)

2 = moderate pain (pain mentioned during questioning and linked to a behavioral sign, or pain expressed without prompts)

3 = severe pain (strong vocalization or pain response with facial expressions, arm movement, or crying)

Anesthesia was deepened using intravenous fentanyl at 3–5 μg/kg and midazolam at 0.03 mg/kg.

Rocuronium was given to assist with tracheal intubation, and isoflurane was used for maintaining anesthesia.

Hemodynamic variables were continuously monitored.

After surgery, the trachea was removed, and a blinded anesthesiologist evaluated the injection site for pain, swelling, or signs of an allergic reaction.

Based on previous findings, the expected rate of pain due to diprivan was set at 80%, with a 50% reduction considered clinically meaningful.

With a significance level (α) of 0.05 and 80% power, a minimum of 41 participants per group was required. To account for possible dropouts, the sample size was increased to 60 per group. Continuous variables are presented as mean ± standard deviation. Differences in age, sex, weight, and ASA classification across the three groups

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were analyzed using Student's t-test. Categorical variables are expressed as counts and percentages and were assessed using either the Chi-square test or Fisher's exact test, as appropriate. A p-value less than 0.05 was considered statistically significant.

RESULT

Demographic details were similar across all three groups, with no significant differences observed (Table 1). No pain or discomfort during the injection of the pre-treatment solution was reported in any group. The overall incidence of pain was 70.9% (64.2%–77.6%) in the saline group. 30.9% (21.2%–40.6%) in the lignocaine group, and 36.4% (31.5%–41.3%) in the depo-medrol group (Table 2). Patients who received pre-treatment medications experienced significantly lower pain rates compared to those given saline (P < 0.012). Moderate to severe pain occurred in 3 (5.4%) and 4 (7.3%) patients in the lignocaine and depo-medrol groups, respectively, compared to 34 (62%) in the saline group. However, the difference in moderate to severe pain between the two intervention groups (lignocaine and depo-medrol) was not statistically significant.

TABLE =1 Demographic data

Patient characteristics	Group S (n=60)	Group L (n=60)	Group MP (n=60)
Age (in years)	42.84 +/- 9.62	43.67+/- 10.0	43.5+/-9.4
Weight (in kg)	61.42 +/- 9.43	61.64 +/- 9.3	61.5+/-9.5
Sex (male/ female)	43/17	42/18	41/19
ASA (I/ II)	20/40	19/41	42/18

TABLE = 2 INCIDENCE AND SEVERITY OF PAIN FOLLOWING PROPFOL INJECTION AMONG GROUPS

GROUPS	NO PAIN (%)	PAIN (%)	MILD PAIN (%)	MODERATRE PAIN (%)	SEVERE PAIN (%)
GROUP S	17	40	5	14	20
GROUP L	39	19	15	2	1
GROUP MP	35	21	17	3	1

DISCUSSION

In this study, the occurrence of pain during Diprivan injection was 30.9% in the lignocaine group and 36.4% in the depo-medrol group. Moderate to severe pain was observed in 5.4% of patients receiving lignocaine and 7.3% in the depo-medrol group. Research on using steroid medications as a pretreatment to reduce Diprivan injection pain remains limited.

The exact cause of pain from Diprivan injection is not fully understood, but it may result from endothelial irritation, differences in osmolality, non-physiological pH levels, or the triggering of pain-related mediators. Immediate pain is believed to stem from direct stimulation of venous nociceptive receptors or free nerve endings, particularly involving myelinated Aδ fibers. Delayed pain, appearing after 10–20 seconds, is thought to be linked to activation of the kallikrein–kinin system.

Various methods have been explored to minimize injection pain, such as intravenous lignocaine pretreatment, mixing lignocaine with Diprivan, adjusting the temperature of the Diprivan (cooling or warming), injecting into larger veins, or using agents like 5-HT3 receptor antagonists, dexamethasone, or hydrocortisone—sometimes with a tourniquet. Among these, pretreatment with intravenous lignocaine prior to Diprivan administration is the most widely accepted approach.

Corticosteroids are commonly administered in cardiac surgery to reduce the release of pro-inflammatory cytokines. Dexamethasone, for instance, is often given in 2 ml of normal saline Significantly alleviates pain during Diprivan

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injection. Depo-medrol is routinely administered as a steroid during cardiopulmonary bypass at our institution, which led us to select it for evaluating its effectiveness in minimizing injection-related pain. Prior research indicated that dexamethasone pre-treatment resulted in pain in 31% of patients ($P < 0.01$), with moderate to severe pain reported by 17.14%. Another study comparing lignocaine, pethidine, and dexamethasone as preventive agents showed 48% of patients receiving dexamethasone experienced no pain. The combination of 20 mg lignocaine and 6 mg dexamethasone with one minute of venous occlusion proved more effective than either agent alone—lignocaine (34.3%) or dexamethasone (37.1%)—in managing Diprivan-induced pain. Higher analgesic doses of dexamethasone have been shown to lessen the discomfort of Diprivan injection, demonstrating its efficacy in reducing both the frequency and intensity of pain when used beforehand.

In contrast, pre-treatment with 10 mg or 25 mg of hydrocortisone did not significantly reduce pain incidence (66.66% and 94.44%, respectively) compared to placebo (94.44%). Administered only 30 seconds before Diprivan, the short interval may have limited hydrocortisone's effect, suggesting it may not act quickly enough to influence immediate pain.

In our study, pain occurred in 70.9% of patients in the control group (Group S), while those pre-treated with lignocaine and depo-medrol reported pain in 30.9% and 36.4% of cases, respectively. This indicates a marked reduction in pain with both agents, which were similarly effective. Notably, moderate to severe pain dropped to 5.4% and 7.3% in the lignocaine and depo-medrol groups, respectively, compared to 62% in the control group.

These findings may not extend to emergency settings due to the need for pre-treatment. The approach is best suited for elective procedures and adult patients who are already indicated for perioperative depo-medrol. Clinical use should be tailored to individual patients, weighing potential benefits against cost and overall advantage.

CONCLUSION:

Depo-medrol, when used as a pretreatment before Diprivan, is equally effective as lignocaine in reducing pain caused by Diprivan. Hence, it can be given prior to Diprivan administration in patients who already need depo-medrol for other medical reasons.

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