

Evaluation of Impact of Procaine and Propofol on Coagulation Parameters of Male Wistar Rats

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Abstract

Original Research Article

Evaluation of impacts of propofol and procaine on coagulation parameters in male Wistar rats was studied. 20 male Wistar rats were acquired for the purpose of the study and were divided into 4 groups. Group 1, the control group received 10ml/kg of distilled water, Group 2 received 5mg/kg of procaine, Group 3 received 10mg/kg of propofol while Group 4 received both combination of 5mg/kg of procaine and 10mg/kg of propofol combined together. At the end of drug administration, blood samples were collected for evaluation of hemostatic parameters such as clotting time, prothrombin time, activated partial thromboplastin and international normalized ratio using coagulation analyser. ANOVA was used as data analysis method. Results revealed no effect on prothrombin time, thrombin time, bleeding time, activated partial thromboplastin time, INR and platelet count. It is concluded that both procaine and propofol does not have the capacity to derange hemostatic parameters of male Wistar rats.

Keywords: Propofol, procaine, coagulation factors, coagulation parameters.

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Introduction

Propofol is a general anesthesia with intravenous, sedative and hypnotic properties (Ihua, 2025). Procaine is a local anaesthetics with local effects, fibrinolytic, has ability to reduce clot strength and delay blood clot formation. It is in ester-type of local anaesthesia. Both propofol and procaine have demonstrated inhibitory effects on blood coagulation parameters. Effects of propofol on coagulation are driven by both the active drug itself and its lipid vehicle. Propofol caused dose-dependent cardiovascular depression, resulting to significant hypotension, variable effects on the

heart rate and cardiac output (Fraser, Dor Worby and Deulin, 2013). Propofol most notable hemodynamic effects is the incidence of hypotension reported in up to 42% of ICU patients in clinical settings. However, clinical data regarding propofol's haemodynamic consequences remain inconsistent and are mostly from retrospective studies (Frazer, et al., 2013).

Procaine impairs blood coagulation and enhances fibrinolysis in dose-dependent manner. It is primarily utilized as a local anaesthetic (Kara, K.H.J., 1989). HIS systemic absorption or high concentrations may directly alter several clotting parameters by disrupting platelet

function, lengthening clot formation timelines and accelerating blood breakdown (Karaki, 1989).

Procaine reduces collagen-induced platelet aggregation making blood clotting difficult at the site of injury. Procaine also suppresses the release of critical clotting factors from platelets such as beta thromboglobulin and platelet factor 4 necessary for acceleration of clotting (Bhavani and Kodali, 2014). Procaine anaesthesia has the potential of inhibiting calcium ion channel and the release of calcium from cellular stores (Bhavani, et al., 2014).

Methodology

Twenty male Wistar rats were acquired for the purpose of this study. The animals were allowed free access to water and rat feeds for the duration of the experimentation.

Experimental Design

Group 1 (Control Group): 10ml of distilled water was administered to them everyday for one (1) week.

Group 2: 5mg/kg of procaine was administered to them everyday for one (1) week.

Group 3: 10mg/kg of propofol was administered to them everyday for one (1) week.

Group 4: 5mg/kg of procaine and 10mg/kg of

propofol combined together was administered to the experimental rats everyday for one (1) week.

Collection of Blood Samples from the Experimental Animals

Blood samples were collected from the experimental rats after sacrifice and cervical disarticulation for hemostatic evaluation.

Evaluation of Hemostatic Parameters

Clotting time, prothrombin time, thrombin time, activated partial thromboplastin time and international normalized ratio (INR) were evaluated using auto coagulation analyser.

Evaluation of Bleeding Time

A lancet was used to make a tail end incision on the rats. The time of making the incision and the time when the bleeding stops was measured and recorded.

Statistical Analysis

Values for the results were presented as mean $\pm$ SEM. The statistical analysis was done using Analysis of Variance (ANOVA). Differences between mean values were considered significant at $P < 0.05$.

Results

Table 1: Evaluation of platelet count for the control and anaesthetic groups

Groups	Platelet Count
Control	481.01 $\pm$ 25
Procaine only	480.43 $\pm$ 24.0
Propofol only	481.08 $\pm$ 25
Procaine combined with propofol	399.60 $\pm$ 26

No significant change recorded.

Table 2: Evaluation of bleeding time for the control and anaesthetic groups

Groups	Platelet Count
Control	7.80 ± 13
Procaine only	7.81 ± 11
Propofol only	7.84 ± 15
Procaine combined with propofol	7.78 ± 13

No significant change recorded.

Table 3: Estimation of clotting time, prothrombin time, thrombin time, activated partial thromboplastin time and international normalized ratio for control and anaesthetic groups

Control	6.03±18	7.01±19	8.01±12	4.09±13	0.3±11
Procaine only	5.99±20	7.0±20	8.02±13	4.08±11	0.3±14
Propofol only	6.01±18	7.18±10	8.0±14	4.09±15	0.28±9.2
Procaine + propofol	5.99±18	7.01±11	3.01±13	399.80±15	0.29±11

No significant change recorded.

Discussion of Findings

It is evident in this study that procaine and propofol anaesthetic agents as used as their combination does not have the capacity to alter the platelet count of the experimental animals. If platelet count is too high, it signifies formation of blood clot in the blood vessels leading to blood flow obstruction and possibly thrombocytopenia. It is revealed in this study that both procaine and propofol improves haemodynamics, blood flow through the blood vessels and this is beneficial in terms of blood flow.

In this study, prothrombin time, clotting time, thrombin time, bleeding time, activated partial thromboplastin time and international normalized ratio were not significantly altered and this is in consonance with reports of Gacto et al. (2008) who reported no change in hemostatic parameters in goat treated with different

anaesthetic drugs. This indicates that both procaine and propofol have the tendency to maintain haemodynamic stability.

Conclusion

Both procaine and propofol as well as their combinations does not have the capacity to alter platelet count, bleeding time, clotting time, prothrombin time, thrombin time, activated partial thromboplastin time and INR.

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