Title : INTRAVENOUS CALCIUM CHLORIDE AND THE COAGULATION-FIBRINOLYTIC SYSTEM

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INTRODUCTION

Intravenous $CaCl_2$ is often employed to increase blood pressure at the termination of pentolinium-induced hypotension and to treat hypotensive episodes during anesthesia and postoperatively. We have often observed increased oozing from the wound whenever $CaCl_2$ is administered intravenously. The present study was designed to examine the effect of intravenous $CaCl_2$ on the coagulation-fibrinolytic system.

METHODS

Studies were conducted on ten patients undergoing hip surgery under pentolinium-induced hypotension and N_2O-O_2-halothane anesthesia. Intravenous $CaCl_2$ (1 g) was given over one minute to elevate arterial blood pressure in an attempt to secure hemostasis prior to wound closure. Measurements were made before, and 5, 15 and 30 minutes after $CaCl_2$ administration. The following variables were measured: cardiac output (dye dilution), blood pressure, central venous pressure, heart rate, ionized calcium levels (potentiometric technique), concentrations of fibrinogen, factors V and VIII, fibrin degradation products (FDP's), platelet count, and fibrinolytic activity. The latter was assessed by the euglobulin lysis time (ELT), which measures chiefly activators of plasminogen rather than plasmin itself, and the areas of lysis on the fibrin plate (unheated and heated) method; the difference between the areas lysed on the unheated and heated plates gives the amount of activator.

RESULTS

The pertinent findings are as follows:

(1) A significant ($P<0.01$) increase in Ca^{2+} was observed 5, 15, and 30 minutes after intravenous $CaCl_2$.

(2) A significant increase in mean arterial pressure ($P<0.05$), stroke volume ($P<0.05$), and cardiac output ($P<0.05$) was observed after 5 and 15 minutes from $CaCl_2$ administration.

(3) Fibrinolytic activity was increased significantly ($P<0.01$), reached its maximum after 15 minutes and was still elevated after 30 minutes. There was no change in areas of lysis on the heated fibrin plate.

(4) Fibrinogen concentration was decreased and FDP's increased.

(5) Platelet count showed a small significant increase.

(6) Factors V and VIII were not significantly changed.

DISCUSSION

The most important finding in this study is the increase in fibrinolytic activity associated with $CaCl_2$ administration, an observation not previously reported. This can account for the increased oozing we often observe following use of intravenous $CaCl_2$. This finding does not negate, however, the essential role of Ca^{2+} in initiating the coagulation process.

Our study suggests that the enhanced fibrinolytic activity was due to an excess of a plasminogen activator. This is evident from the significant decrease in ELT and an increase in areas of lysis on the unheated fibrin plate. An increase in a plasminogen activator has also been implicated in fibrinolysis associated with peptone injections, emotion, exercise, and adrenalin injection. The precise mechanism by which $CaCl_2$ activates the fibrinolytic system is currently unknown. Further studies are required to elucidate this important observation.