Effects of Ethylene Glycol on Renal Function and General Circulation in Anesthetized Dog

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Abstract

The objective of this investigation was to study the effects of ethylene glycol (EG) on renal function and general circulation in anesthetized dogs. The animals were divided into 3 groups. Animals in group 1 were used as a control group. Group 2 animals were given ethylene glycol at a dose of 1.5 ml/kg.bw. Group 3 animals were given ethylene glycol at a dose of 3.0 ml/kg.bw. By 24 hours after ingestion, all dogs were anesthetized, and the studies for the renal function and the general circulation were performed. At the end of the experiments, kidneys were isolated for the measurements of lipid peroxide concentration and xanthine oxidase activity. The results from the EG ingested dogs (group 2 and 3) when compared to those of the control dogs showed significant decreases in blood pH, blood bicarbonate, and blood total carbon dioxide (P<0.01). Effective renal blood flow and glomerular filtration rate of EG ingested animals significantly decreased (P<0.01). Filtration fraction of EG ingested dogs increased in group 3 animals (P<0.05). Urine pH, and urinary excretions of potassium and bicarbonate decreased (P<0.01) while measured plasma osmolality significantly increased in group 2 (P<0.05) and group 3 animals (P<0.01). Meanwhile the osmolal gap was significantly increased in group 3 (P<0.01). The concentration of urine urea nitrogen and potassium decreased whereas the concentration of urinary glucose in EG ingested dogs increased significantly (P<0.01). The level of urine osmolality significantly decreased in group 2 animals (P<0.05). The renal lipid peroxide concentration increased in both groups of EG ingested animals (P<0.05). While the xanthine oxidase activity of EG ingested animals significantly decreased (P<0.01). From these results, it may be concluded that EG affected the acid-base status of the ingested animals. The glycolic acid, an EG metabolite, may be responsible for the metabolic acidosis. In addition, changes in renal function as shown by the decrease in effective renal blood flow, glomerular filtration rate, and renal tubular function were apparent in EG ingested animals. The loss of renal tubular function may be due to the damage of renal tubular cell related to the effect of the free radicals

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