

Title: MYOGLOBINEMIA AFTER SUCCINYLCHOLINE IN CHILDREN UNDERGOING HALOTHANE AND NON-HALOTHANE ANESTHESIA

Authors: Jean F. Harrington, M.D., Douglas J. Ford, Ph.D., and Theodore W. Striker, M.D.

Affiliation: Department of Anesthesia, University of Cincinnati College of Medicine, and Children's Hospital Medical Center, Cincinnati, Ohio 45267-0531

Introduction. The objective of this study was to compare the incidence of myoglobinemia and myoglobinuria following the administration of succinylcholine to infants and children undergoing either halothane or non-halothane anesthesia. Previous investigations by Ryan (1) and by the authors demonstrated a consistent rise in serum myoglobin concentration and occasional myoglobinuria following succinylcholine administration to children undergoing halothane anesthesia. We sought to determine whether or not halothane contributes to the release of myoglobin into the serum following use of succinylcholine.

Methods. Informed consent was obtained for 64 P.S. 1 children, 2 months to 15 years of age, undergoing peripheral, nonmuscle-dissecting operations. Approval for blood and urine collection was granted by the Committee on Human Research. A preoperative urine specimen and a first-voided postoperative urine specimen were obtained from each child. Following induction of anesthesia with either N₂O-O₂-halothane or thiopental-N₂O-O₂, a pre-succinylcholine blood sample was drawn. Each patient served as his own control. All drugs were given intravenously. Two groups of patients receiving either a single 1 mg/kg or 2 mg/kg dose of succinylcholine were studied in both the halothane and non-halothane categories. In the non-halothane group, anesthesia was maintained with N₂O-O₂-narcotic and nondepolarizing muscle relaxant. Fifteen and 60 minutes after succinylcholine administration, blood samples were collected in serum separator Microtainers[®] which were centrifuged and frozen until analysis. Myoglobin RIA Kit from Nuclear Medical Systems, Inc., employing I-125-myoglobin was used for analysis. Children were observed for the occurrence of fasciculations. All data were analyzed by nonparametric analysis of variance followed by Dunn's critical value test for multiple comparisons.

Results and Discussion. Using a radio-immunoassay sensitive to 10 ng/ml, we determined a range of serum myoglobin concentration of 10-80 ng/ml which compares well with the accepted adult range of 6-85 ng/ml. Serum myoglobin concentrations in three age groups -- less than 2 years, 2-12 years, and 12 years or older -- did not differ significantly. Following succinylcholine administration, a rise in serum myoglobin concentration was observed in all but one patient. There was a wide range of elevation of serum myoglobin concentration. Myoglobin concentrations at 60 minutes tended to be higher than those at 15 minutes, but did not differ significantly. Although we saw a trend toward greater myoglobinemia in the group of patients given 2 mg/kg of succinylcholine, data showed no significant dose-related effect of a single dose of succinylcholine on serum myoglobin concentrations in either the halothane or the non-halothane group. Presence or absence of fasciculations had no effect on the degree of myoglobinemia attained.

Serum Myoglobin Concentration (ng/ml)		
60 minutes after succinylcholine		
Succinylcholine 1 mg/kg		
Halothane		Non-Halothane
450+	Median	100+
46-6000	Range	61-680
23	n	5
Succinylcholine 2 mg/kg		
Halothane		Non-Halothane
1820 *	Median	205 *
65-7000	Range	30-585
18	n	15

* + p < .002

Patients receiving halothane and succinylcholine had significantly greater increases in serum myoglobin concentrations than those not receiving halothane. One patient who had received a 2 mg/kg dose of succinylcholine under halothane developed a 7000 ng/ml myoglobin concentration at one hour and myoglobinuria > 300 ng/ml. Urine myoglobin concentrations in all other patients were < 20 ng/ml.

In conclusion, we have compared serum myoglobin concentrations in children undergoing halothane and non-halothane anesthesia and receiving 1 mg/kg or 2 mg/kg doses of succinylcholine. We have determined that children receiving succinylcholine under halothane anesthesia develop significantly greater degrees of myoglobinemia than those receiving succinylcholine without halothane.

References

1. Ryan JF, Kagen L, Hyman A: Myoglobinemia after a single dose of succinylcholine. *NEJM* 285:824-827, 1971.