TITLE: CELIAC PLEXUS BLOCK DOES NOT ALTER HEPATIC INJURY IN RATS

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Introduction. Abdominal surgery under halothane anesthesia in rats produces hepatic injury when enzyme induction preceeds surgery. Injury may result from liver hypoxia per se or from metabolism of haothane via reductive pathways. Liver hypoxia may be a consequence of hepatic vasoconstriction or a low cardiac output which reduces hepatic blood flow relative to hepatic metabolic requirements. Since hepatic vasoconstriction may be mediated by the sympathetic nervous system, we hypothesized that we might ameliorate such hepatic injury by celiac plexus blockade.

Methods. Male Sprague-Dawley rats (Charles River) weighing about 250 grams were fed rat chow and given phenobarbital 1 mg/ml in their drinking water for four days. Pure drinking water and food were given for the next 24 hours. The animals were divided into 2 control and 4 experimental groups of 8-10 rats each. Experimental animals were anesthetized with 1% halothane, 2% enflurane, 1.4% isoflurane or 0.1 mg/kg fentanyl, each with oxygen, 98 to 100%. Through a 3 cm upper abdominal incision, a periaortic injection of 3 mg/kg bupivacaine was made just below the diaphragm. Then the hepatic artery was exposed and dissected free. A Zeiss OPMI-1 operating microscope facilitated identification and dissection of structures. Anesthesia was continued for 2 hours after surgery. One control group received 1% halothane and an equal volume of normal saline substituted for bupivacaine. Another control had no surgery or anesthesia (enzyme induction only). After 24 hours the rats were killed with 100% carbon dioxide and sections of the right superior hepatic lobe were taken for microscopic examination. Slides were arranged in a random sequence and were scored "blindly" by a pathologist for hepatic injury. Each liver was given a score of 0 to 5 using the criteria of Jee et al (2) (0=normal; 5=extensive cell disruption with multiple centrilobular necrosis, greater than 25% of field area). Significant differences between groups were tested using the Kruskal-Wallis test.

Results. Liver injury was most severe in rats anesthetized with halothane and injected with either bupivacaine or saline and in rats anesthetized with fentanyl and injected with bupivacaine. These three groups had greater histologic damage than the phenobarbital control, enflurane, and isoflurane groups (p=less than 0.001) (Table).

Discussion. Hypoxic hypoxia, hepatic artery ligation or sham abdominal surgery lead to liver necrosis in enzyme induced rats anesthetized with halothane.[1,2] If sympathetic mediated vasoconstriction in response to surgical trauma causes injury by decreasing hepatic blood flow, celiac plexus block should prevent or diminish injury. We could not demonstrate such an effect for either halothane or fentanyl anesthetized rats. Consistent with the previous report by Harper et al, we also found no injury with enflurane or isoflurane anesthesia. It would appear that if hepatic hypoxia is the cause of liver injury during halothane or fentanyl anesthesia in these rats, that it may result from a locally mediated vasoconstriction or a decrease in cardiac output and liver blood flow relative to liver metabolic requirements. The same thought would suggest that enflurane and isoflurane may block local vasoconstriction and/or not decrease output. The finding that fentanyl is associated with injury would suggest that some factor other than metabolism of halothane to reactive intermediates also is important to injury or that fentanyl similarly is metabolized to reactive intermediates.

References.

1. Harper MH, Collins P, Johnson BH: Postanesthetic hepatic injury in rats: Influence of alterations in hepatic blood flow, surgery, and anesthesia time. Anesth Analg 61:79, 1982

2. Jee RC, Sipes IG, Gandolfi AJ, et al: Factors influencing halothane hepatotoxicity in the rat hypoxic model. Toxicol Appl Pharmacol 52:267, 1980

	Histologic Score*	N
Halothane/bupivacaine	4.9 ± 0.1	8
Halothane/saline	3.5 ± 0.5	9
Fentanyl/bupivacaine	3.4 ± 0.5	9
Enflurane/bupivacaine	1.8 ± 0.6	8
Isoflurane/bupivacaine	1.0 ± 0.4	10
Phenobarbital only (no anesthesia or surgery)	1.0 ± 0.2	9

*Mean ± SE: 0=normal; 5=extensive cell disruption with multiple centrilobular necrosis greater than 25% of field area.