Title : COMMON BILE DUCT RESPONSES TO ANESTHETIC AGENTS IN DOGS

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Introduction. Narcotic and nitrous oxide anesthesia may be inappropriate for biliary surgery because of spasms induced in the sphincter of Oddi.[1,2] The effect of anesthetic agents and fentanyl on common bile duct (C.D.) pressure was studied in dogs. Pentobarbital, halothane, and enflurane anesthesia were examined with and without fentanyl.

Methods. Dogs were induced with pentothal (20 mg/kg), intubated and ventilated (pO_2>150 torr, pCO_2 30-40 torr). Anesthesia was maintained with one test agent: pentobarbital or halothane or enflurane. The C.D. was cannulated with a double lumen catheter and ligated to preclude bile flow, as described in previous studies.[3] One lumen (1cm from the tip) was continuously perfused with warmed (T 37° C) saline 1cc/minute. C.D. pressure was measured via the second lumen at the tip of the catheter located adjacent to the sphincter of Oddi. Each dog was anesthetized with each anesthetic: pentobarbital (30 mg/kg), halothane, and enflurane in random order. End-tidal concentrations were measured with an infrared analyzer to attain 1 MAC. Time between agents was allowed to wash out gaseous anesthetics below 0.2% end-tidal concentration. Fentanyl was given IV in two doses (2 and 8μg/kg) administered randomly 30-40 minutes apart.

Results. Control C.D. pressure was highest under pentobarbital and lowest under halothane ($p<.05$). (See table). In all cases fentanyl increased contractions of the sphincter of Oddi and C.D. pressure. This occurred within 2 minutes after administration, peaked by 5 minutes, and was gone after 30 minutes. Due to wide individual variations in C.D. pressure plus the effects of different anesthetics, the fentanyl responses were normalized for each animal then averaged. In general, fentanyl produced a dose related increase in C.D. pressure (See chart). The high dose fentanyl responses were significant under pentobarbital ($p<.001$), enflurane, ($p<.01$), and halothane ($p<.01$), while low dose fentanyl responses were significant under enflurane ($p<.05$), and halothane ($p<.05$). The effects of fentanyl on the C.D. could be reduced with atropine and naloxone. When both drugs were given, C.D. activity ceased. Atropine alone eliminated C.D. activity in 3 out of 5 instances. Naloxone alone decreased but did not eliminate C.D. activity.

Discussion. C.D. pressure in dogs is reduced with enflurane and halothane compared to pentobarbital anesthesia. Rises in C.D. pressure in response to fentanyl were attenuated by enflurane and to a greater extent by halothane. C.D. activity can be eliminated by naloxone and atropine, suggesting both a direct smooth muscle and a parasympathetic mechanism of action. The clinical implication is that increased smooth muscle activity induced by fentanyl in biliary surgery can be reduced without necessarily reversing the narcotic analgesia.

References.

1. Chessick, K.C., Black, S., and Hoye, S.J. Spasm and operative cholangiography. Arch Surg 110:53-57, 1975.
2. McCammon, R.L., et al: Naloxone reversal of choldeochoduodenal sphincter spasm associated with narcotic administration. Anesthesiology 48:437, 1978.
3. Greenstein, A.J., Kaynan, A., Singer, A., et al: A comparative study of pentazocine and meperidine on the biliary passage pressure. Am J Gastroent 58:417-427, 1972.

Table of comparative control C.D. pressures under anesthetic agents. Numbers refer to individual studies at given levels of significance.

Anesthetic	N	p<.01	p>.05
Pentobarbital>Halothane	8	6	2
Pentobarbital>Enflurane	6	6	0
Enflurane>Halothane	7	6	1

C.D. Pressure Responses to Fentanyl