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TITLE : PREVENTION OF RIGIDITY DURING FENTANYL-OXYGEN INDUCTION

AUTHORS : A.B. Hill, F.F.A.R.C.S., M.L. Nahrwold, M.D., A.M. de Rosayro, F.F.A.R.C.S., P.R. Knight, M.D., Ph.D., R.M. Jones, F.F.A.R.C.S., and R.E. Bolles, B.G.S.

AFFILIATION: Department of Anesthesiology, University of Michigan Medical Center, Ann Arbor, Michigan 48109

Introduction. Induction of anesthesia with high-dose fentanyl and oxygen is a useful technique in patients with minimal cardiac reserve[1]. A complication of intravenous (IV) fentanyl is the development of muscle rigidity with decrease in pulmonary compliance resulting in inability to inflate the chest. Corssen reported a 79% incidence of decreased pulmonary compliance, whereas Stanley[1] did not see this complication. In view of these discrepancies and our clinical impression that rigidity frequently occurs, we designed a study to: 1)determine the incidence of rigidity following high dose fentanyl induction; 2) assess the efficacy of a simultaneous infusion of pancuronium in preventing rigidity, and 3) compare the hemodynamic effects of IV fentanyl alone to those of fentanyl with a simultaneous infusion of pancuronium.

Methods. In 20 patients scheduled for open-heart surgery, two peripheral IV lines were placed, a radial artery was cannulated and a Swan-Ganz catheter was floated into the pulmonary artery. Throughout anesthetic induction, the following indices were continuously recorded: mean arterial pressure (MAP); mean pulmonary artery pressure (MPAP); heart rate (HR) and electrocardiogram (EKG). The study was conducted in a double blind fashion; patients were randomized into two groups. The first group received fentanyl at a rate of 3 µgm/kg/min to a total dose of 2.5 mg. The second group received the same infusion of fentanyl plus an infusion of 12 µgm/kg/min pancuronium. If chest wall rigidity occured it was confirmed by a second investigator and treated with IV pancuronium, 10 mg.

Results. Nine of the 10 patients who received fentanyl alone became rigid, while none of the 10 patients who received the fentanyl/pancuronium combination became rigid (Table 1). Patients who became rigid did so at a mean dose of 15 ±4 (SD) µg/kg. In the fentanyl alone group, there was a statistically significant increase in MPAP when patients became rigid (Table 2). Other alterations in hemodynamics during induction in both groups were of minor clinical significance. Similarly, there was little difference in hemodynamic parameters when the 9 patients who became rigid were compared to the 10 patients who received pancuronium plus fentanyl.

Discussion. We have clearly demonstrated a high incidence of chest wall rigidity with a fentanyl infusion of 3 µgms/kg/min. It has been suggested that a slow administration of fentanyl decreases the incidence of this side effect but this is time consuming and if hemodynamic stability can be maintained a more rapid induction is preferable. One must ensure that with simultaneous infusions of narcotic and a muscle relaxant, patients become amnesic before they experience any feeling of paresis. On direct questioning postoperatively, no patient had any feeling of muscle weakness, difficulty with secretions or difficulty breathing. No patient had any recall of tracheal intubation or surgical stimulation. In conclusion, we suggest that by simultaneously infusing pancuronium and fentanyl, chest wall rigidity can be eliminated and induction time may be decreased while maintaining stable hemodynamics.

TABLE 1: INCIDENCE OF RIGIDITY

Number	Fentanyl	Fentanyl and Pancuronium
Patients rigid	9	0
Patients not rigid	1	10

$x^2 = 16.364$, $p < 0.001$

TABLE 2: HEMODYNAMIC PARAMETERS (means ± SD)

	FENTANYL/ PANCURONIUM			FENTANYL ONLY		
	MAP	MPAP	HR	MAP	MPAP	HR
Pre Induction	90 ±15	31 ±18	76 ±23	97 ±16	27 ±17	70 ±22
7.5 µgm/kg Fentanyl	90 ±16	32 ±18	76 ±25	92* ±17	27 ±15	62* ±21
Time of † rigidity	84 ±12	32 ±18	82 ±28	88 ±22	31* ±17	66 ±22
1 min later	81 ±10	31 ±18	81 ±23	90 ±15	28 ±13	82 ±28
2 min later	85 ±13	30 ±17	83 ±22	91 ±17	28 ±13	80 ±24
3 min later	85 ±13	30 ±18	82 ±21	92 ±20	26 ±12	78 ±22
End Induction	89 ±15	31 ±18	86* ±19	87 ±20	25 ±13	82 ±24

* $p < 0.05$ compared to preinduction values

† For the pancuronium drip group this is the time at which 15 µgm/kg fentanyl had been infused

References.

1. Stanely TH and Webster LR: Anesthetic Requirements and Cardiovascular Effects of Fentanyl-Oxygen and Fentanyl-Diazepam-Oxygen Anesthesia in Man. Anesth Analg (Cleve) 57: 411-416, 1978.

2. Corssen G, Domino EF and Sweet RB: Neurolept Analgesia and Anesthesia. Anesth Analg (Cleve) 43:748-763, 1964.