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 Title : AMNESIA TO VISUAL STIMULATION AFTER LARGE DOSE OF FENTANYL
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Introduction. It has been observed^{1,2,3} that narcotic premedications (IM or IV) even in fairly large doses do not produce significant perioperative amnesia. This lack of amnesic effect of the narcotics is significant because a number of them do produce good sedation. Narcotics are extensively used as the major component of the so called "balanced" anesthesia technique and also as sole anesthetic agents especially in patients undergoing cardiac operations. It is not surprising that intraoperative awareness during "balanced" anesthesia and also during narcotic/oxygen anesthesia has been a problem. While employing fentanyl for induction of anesthesia in cardiac operations we observed that most patients do become unresponsive when they have received about 10-15 µg/kg dose of fentanyl. However, the dose at which most patients become amnesic to various stimuli is not known. We decided to investigate this pharmacological property of fentanyl and correlate this with blood levels.

Method. This study was done in 43 adult patients scheduled for coronary artery bypass surgery. The procedure was fully explained to each patient and informed consent obtained the day before the surgery. Premedication consisted of morphine 0.2 mg/kg, IM, one hour before the induction of anesthesia. After the usual monitoring lines were established, the induction of anesthesia was started with fentanyl, given at a constant infusion of 0.5 µg/kg/min. Visual memory cards consisting of large black and white sketches of animals or objects were shown to the patients during the induction of anesthesia when a predetermined dose was reached. The patient was asked to identify the card at each time of the visual stimulus. The first memory card was always shown just prior to the beginning of fentanyl infusion (control) and a maximum of four other cards were shown to each patient subsequently. In 20 patients this was done at 0, 1, 2, 3 and 5 µg/kg doses and in other 23 patients at 0, 4, 5, 6, and 7 µg/kg doses. (see table) Blood samples were obtained at various times during induction of anesthesia, and fentanyl concentrations determined by radioimmuno assay. Twenty-four hours after the operation (or when the patient was able to respond appropriately), each patient was visited by one of the investigators (R.B. or S.P.K.) and was asked to first recollect and then recognize the memory cards from a bunch of similar cards. Lack of both "recollection" and "recognition" was considered fentanyl induced visual amnesia.

Results. The results are shown in the table. Some patients became unresponsive or rigid before all the cards could be shown to them. When this occurred, they were excluded from the analysis at that point. Blood level of fentanyl showed a consistent rise with increasing doses, reaching to 9.89 + 3.42 ng/ml at 10 µg/kg dose. The frequency of visual amnesia was clearly related to dose and reached more than 50% at 6 - 7 µg/kg dose.

Discussion. The induction of anesthesia with fentanyl infusion was extremely slow. Some patients remained responsive even when 10 - 15 µg/kg dose was administered. The use of visual memory cards to determine the frequency of amnesia thus was very appropriate and the results showed remarkable consistency with increasing doses. The frequency of 50% visual amnesia was achieved with a dose of 6 - 7 µg/kg fentanyl (blood level of 6.69 + 2.17 to 7.50 + 2.63 ng/ml). Presence of visual amnesia does not necessarily mean the presence of amnesia to other types of stimuli e.g. pain, auditory. We know that these sensations persist at deeper planes of CNS depression. However, like the concept of MAC with the inhalation anesthetic agents, the knowledge of dose required to produce visual amnesia in 50% of the population should serve as a guideline, when fentanyl is being used as part of "balanced" anesthesia or sole anesthetic agent.

TABLE

Fentanyl Dose µg/kg	N	Blood Level ng/ml	Frequency Amnesia %
0	43 (43)	0	2.3
1	20 (20)	1.97 + 2.57	0.0
2	20 (20)	3.48 + 2.13	10.0
3	20 (20)	4.28 + 0.49	15.0
4	23 (23)	5.08 + 1.94	21.7
5	43 (39)	5.89 + 2.44	25.6
6	23 (19)	6.69 + 2.17	57.8
7	23 (16)	7.50 + 2.63	62.5
10	—	9.89 + 3.42	—

Note: N in parenthesis = patients who identified the memory card during exposure.

References.

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