

## FENTANYL AS A PREMEDICATION FOR ANAESTHESIA IN PAEDIATRIC SURGERY

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### Abstract

Pediatric patients suffer more psychological trauma during a surgical procedure because of the new surroundings and separation from their parents. Proper psychological or pharmacological preparation is mandatory in this age group. Fentanyl, because of its pharmacokinetics, seems to be an ideal premedication for short surgical procedures. This randomized double blind study was done at Department of Anaesthesia in Holy Family Red Crescent Medical College Hospital, Dhaka from 2004 to 2005. Total number of patients was fifty. They were divided into two groups. The effectiveness of 2 µg/kg of intramuscular fentanyl in children with premedication has been compared with saline pretreated patients. The children in fentanyl group were significantly more drowsy in holding area and more cooperative at the time of induction of anaesthesia than the children given intramuscular saline (p<0.01). There was significant difference in the time taken for the recovery between the two groups (p<0.01). According to this study, fentanyl pretreated children were anxiety free and had a smooth anaesthetic course and postoperative recovery than the non-premedicated patients.

### Introduction

Induction of Anaesthesia in the paediatric patients presents a challenge to the anaesthesiologists<sup>1</sup>. Backenhoff demonstrated that stormy anaesthetic induction in children lead to an increased incidence of postoperative behavioural problems<sup>2</sup>. Fear of painful or unpleasant procedures and separation from parents can result in a stormy induction, possibly resulting in lasting psychological effects<sup>1</sup> and also the unallayed anxiety of these children frequently prevented smooth induction of anaesthesia<sup>2</sup>.

Post operative mal adaptive behaviors such as new onset enuresis, feeding difficulties, apathy and withdrawal and sleep disturbance may result from anxiety before surgery<sup>3</sup>. In fact studies have indicated up to 60% of all children undergoing surgery may present with negative behavioral changes at two weeks postoperatively<sup>4,5</sup>. In addition to behavioral manifestation, pre operative anxiety activates the human stress response leading increased serum cortisol epinephrine and natural killer cell activity<sup>3,6</sup>.

These problems can be diminished by psychological preparation; however, a pharmacological adjunct may be more reliable and better suited for efficient use of operating room time than psychological preparation<sup>7,8</sup>.

Generally, premedication is not given to healthy children scheduled for routine outpatient surgery because of the impression that preoperative sedation will prolong anaesthetic emergence. Recent studies show that this is not true, so it would be unfair that out patients are deprived of the beneficial effect of premedication. An ideal anaesthetic premedication regimen in children would provide adequate sedation and relief of anxiety without prolonging postoperative recovery and without reliance upon a painful or threatening method of administration<sup>9</sup>.

Various combinations and techniques of premeditation have been tried but each has advantages and disadvantages. Some oral and intramuscular premedication like diazepam, pathedine, morphine etc have some disadvantages like delayed onset of action and delayed emergence which are not desirable in out-patient surgery. Fentanyl is a short acting potent narcotic and its onset of action is rapid when used intramuscularly and also it is proved to decrease recovery time when used as a premedicant. So, it may be an ideal premedication in children.

### Materials and methods

Fifty healthy children, (ASA physical status I or II) ages two to eight years, scheduled for outpatient surgery at Holy Family Red Crescent Medical College Hospital were studied. Characteristics of the patient population are shown in Table-I.

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The study was explained to the parents and informed consent was obtained. Patients were randomized from a code maintained by the pre-op holding nurse, into either the placebo or study (premedicated) group patient. Premedicated group received 2 ug/kg Fentanyl intramuscularly and placebo group received same volume/kg of normal saline by the same route. The study was double blinded.

Each patient received premedication or placebo in the holding area ten minutes before the induction of anaesthesia. After ten minutes, patients were taken to the operating room. Induction of anaesthesia was completed with halothane, nitrous oxide and oxygen by face mask and anaesthesia was maintained by halothane, 50% nitrous oxide and 50% oxygen. In some patients endotracheal intubation was done and anaesthesia was maintained with halothane, 50% nitrous oxide, 50% oxygen and ventilation was controlled intraoperatively. No narcotics were given. Muscle relaxants were used only if surgically indicated and when patients were incubated.

**Table I :** Characteristics of the patients

Parameters	Placebo group	Premedicated group
Number	25	25
Male/ Female	19/6	22/3
Mean age (SD)	4.44 (2.11) years	3.52 (1.89) years
Procedures :		
Hernia	09	10
Circumcision	49	03
Undescended testis	05	06
Sigmoid polyp	02	02
Superficial lesions	05	02
Perinial fistula	-	01
Hydrocele	-	01

**Table II :** Evaluation scales

State of consciousness :
1 – Excited or agitated
2 – Awake
3 – Drowsy
4 – Asleep
5 – Barely arouse able
Attitude:
1 – Resistant
2 – Mildly resistant

3 – Apprehensive
4 – Mildly anxious
5 – Cooperative
Induction of anesthesia:
1 – Marked excitement
2 – Moderate resistance
3 – Awake with slight resistance
4 – Awake with no resistance
5 – Still with slight movement
6 – Still with out movement

After giving premedication the effect of the medication was evaluated by one of the investigators in the preoperative holding area. Another investigator evaluated the effects of induction and emergence from anaesthesia in the operating room and on admission to and discharge from the recovery room by using the scales in Table-II. The incidence of crying, and the duration of recovery room stay also were recorded.

**Results**

The results show that in relation to the cooperation of the children in holding area and arrival to operating room, their untoward response to induction of anesthesia with fentanyl premedication was far more superior than placebo group (p<0.01). Moreover, the recovery of the children was uneventful and time taken for the discharge of the patient from the recovery was significantly shorter (p<0.01). In the holding area, none of the children were excited or agitated in fentanyl group, and about 32% of the patients were drowsy in this group. About 40% of the patients were cooperative in premedicated group whereas 8% were cooperative in placebo group. On arrival to operating room, half of the patients who were not premedicated were agitated and resistant whereas more than 50% of the children who received fentanyl were adequately sedated and cooperative (p<0.01). Induction of anaesthesia was associated with 44% of marked excitement in placebo group whereas there was no such response in fentanyl premedicated children. During the recovery, the fentanyl premedicated group had a smooth course in comparison to non-premedicated children, where the incidence of excitement was about 36%. Children receiving premedication exhibited a significantly lower incidence of crying and had significantly lower incidence of secretions. The difference between the time taken for the recovery of the children from

anaesthesia in the two groups were statistically significant ( $p < 0.01$ ). Results were analyzed by t-test and significance assigned to p-values 0.05

significant and the p-values 0.01 very significant. Statistical data of comparison between the two groups is presented in Table- IV.

**Table III :** Evaluation of perianaesthetic condition and mental state

Location/ Observation	Scale	Frequency		
		Placebo	Premedicated	
Holding area : State of consciousness	Excited/agitated	02 (8%)		
	Awake	23 (92%)	17 (68%)	
	Drowsy		08 (32%)	
	Asleep			
	Barely arouseable			
	Attitude	Resistant	02 (8%)	
		Mildly resistant	16 (46%)	03 (12%)
		Apprehensive	02 (8%)	04 (16%)
		Mildly anxious	03 (12%)	08 (32%)
		Cooperative	02 (8%)	10 (40%)
Crying	Yes	07 (28%)	03 (10%)	
O.R. arrival : State of consciousness	Excited/agitated	13 (52%)		
	Awake	12 (48%)	05 (20%)	
	Drowsy		20 (80%)	
Attitude	Asleep			
	Barely arouse able			
	Resistant	15 (60%)		
	Mildly resistant	07 (28%)	08 (32%)	
	Apprehensive		05 (20%)	
	Mildly anxious	02 (8%)	04 (16%)	
	Cooperative	01 (4%)	08 (32%)	
	Crying	Yes	20 (80%)	08 (32%)
		Induction of anaesthesia:		
	Marked excitement	Marked excitement	11 (44%)	
Moderate resistance		11 (44%)	05 (20%)	
Awake with slight resistance		02 (8%)	11 (44%)	
Awake with no resistance			05 (20%)	
Still with slight movement			02 (8%)	
Still without movement			02 (8%)	
Recovery room : State of consciousness	Excited/Agitated	09 (26%)		
	Awake	09 (36%)	05 (24%)	
	Drowsy	06 (24%)	19 (76%)	
	Asleep Barely arousable	01 (4%)		
Attitude	Resistant	08 (32%)		
	Mildly resistant	13 (52%)	10 (40%)	
	Apprehensive	03 (12%)	06 (24%)	

Crying Time from R.R. admission to discharge home (minutes)	Mildly anxious	01	(4%)	05	(20%)
	Cooperative			04	(16%)
	Yes	20	(80%)	07	(28%)
		24.6		22.4	
		minutes		minutes	

**Table IV :** Statistical data of comparison between two groups (premeditated and control).

Evaluation scales	Premedicated (n-25)	Control (n-25)	P values
Holding area:			
state of consciousness	2.24±0.44	1.92±0.28	p<0.05
Attitude	3.88±1.05	2.56±1.12	p<0.01
Crying	-	-	
O.R. arrival:	2.72±0.54	1.48±0.51	p<0.01
State of consciousness			
Attitude	3.28±1.3	1.72±1.21	p<0.01
Crying	-	-	
Induction of anaesthesia	3.37±1.58	1.68±0.63	
Recovery room:			
State of consciousness'	2.8±0.5	2±0.91	p<0.01
Attitude	2.8±1	1.72±0.80	p<0.01
Crying	-	-	
Time of recovery	23.4±3.13	25.2±4.44	p<0.01

### Discussion

As the incidence of the surgical treatment of the various clinical conditions is increasing, there is increasing demand for the availability of hospital beds. As most of the surgical procedures are minor they can be carried out as an outpatient procedure, that is, the patient gets admission, gets operated and discharged on the same day.

As the bulk of surgery is increasing the number of paediatric patients operated for various minor surgical procedures are also increasing steadily. About 50% of all surgical procedures could be done as out patients. The misconception during the out patient anaesthesia is that the patients who receive premedication do not recover properly after anaesthesia<sup>10</sup>. This denied most of the outpatients of premedication. As the outpatients are also having the same amount of stress as in-patients it is unfair to keep them tense, anxious and worried for the surgical procedures. And it is also proved that judicious administration of premedication with proper choice and knowledge of pharmacokinetics

of the drug may even decrease the recovery time apart from relieving the patient from anxiety, tension and worries<sup>11</sup>.

As the non-premedicated paediatric patients have more psychological disturbance in comparison to adults, which may last into their later life they need premedication more frequently than do adults<sup>2</sup>. Fentanyl is a potent and short acting narcotic which is estimated to be 80 times as potent as morphine as an analgesic<sup>12</sup>. After intramuscular administration of 2 µg/kg it has a plasma half life of 3-4 hours with the duration of action of 1-2 hours. It is a good adjuvant to inhalational anaesthetics as analgesic. It can decrease the amount of inhalational anesthetic required to keep the patient anesthetized. This analgesic property and its short duration of action make it a very attractive and suitable premedicant for short outpatient surgical procedures<sup>13</sup>. Moreover, it is claimed that the decreased need of anesthetic drug during this procedure may shorten the recovery time<sup>14</sup>.

In this study, the effectiveness of the intramuscular

fentanyl premedication ten minutes before the induction of anaesthesia was evaluated, keeping in view the pharmacokinetics of Fentanyl. This was a double blind study between two groups of children using fentanyl and normal saline. It was observed that the fentanyl premedicated children were very calm in the holding area and were cooperative in the operating room. and had shown less straining and struggling during induction in comparison to the control group as shown in Tables III and IV and as well as the recovery of the premedicated patients was smooth and the time taken for recovery was comparatively shorter than non-premedicated children.

According to this study, the fentanyl premedicated children experienced less anxiety and strain during surgery and had better recovery. It is expected that they had less psychological trauma and probably they may not have the long term psychological consequences. So, it is recommended that the use of fentanyl or any other parallel drug as premedicant may be very useful for all paediatric out patients.

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