A COMPARATIVE STUDY OF RECTAL PENTOTHAL * AND MORPHINE FOR BASAL ANESTHESIA UPON CHILDREN FOR TONSILLECTOMY

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DURING the years 1932 to 1948, anesthetics employed for tonsillectomies on children at The New York Hospital were vinethene or ethyl chloride induction followed by ether using the open drop technic with subsequent insufflation of ether and oxygen. Premedication consisted of atropine sulfate in doses appropriate to age and weight. In many instances, this was a satisfactory procedure. The screaming and crying which frequently occurred despite attempts at psychotherapy, however, were not readily forgotten. In present day anesthesia, the aim has been to make everything as pleasant as possible for the patient, but until recently, preoperative preparation of the child for anesthesia has been neglected. Following the work of M. Digby Leigh (1), Burnap (2), Weinstein (3, 4, 5, 6), and Schotz (7), however, much progress has been made using rectal pentothal and other forms of basal anesthesia in children. Despite that work, few institutions have attempted to change their older methods which did not include basal anesthesia for children.

At The New York Hospital, the members of the Department of Pediatrics consulted with the members of the Departments of Otolaryngology and Anesthesiology to devise a method to decrease the psychic trauma of anesthesia in children. Pediatric psychiatrists have become increasingly aware of this problem in the last few years. Dr. Levy (8) reported on the psychic trauma of operations in children.

Dr. Edith Jackson (9) has discussed the possibility that neurotic symptoms have their origin in traumatic hospital experience and the greater probability that unfavorable reactions to hospitalization are caused by an activation or reinforcement of anxieties or neurotic trends already present.

Many anesthesiologists also have been aware of this problem. Despite the work of Burnap (2) and Weinstein (3, 4, 5), there has been

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apprehension about the use of rectal pentothal; therefore, it was decided to investigate the problem.

HISTORY

Basal anesthesia is a light degree of anesthesia obtained by giving sufficient premedication to allow the patient to be brought to the operating room in an unconscious state, yet not sufficiently depressed for surgical procedures (10). Sise (11) stated that, as rectal anesthesia, pentothal was used very little. Weinstein (3) reported a series of cases in which 5 tonsillectomies were done with rectal pentothal as the basal anesthetic. He concluded that larger doses of pentothal sodium could be given with more rapid elimination and less depression. Weinstein (4, 5, 6) reported a total of 2500 cases using rectal pentothal. Of these cases, 35 were tonsillectomies. Shotz (7) reported 3 cases of infants in which this same method was used. Burnap (2) reported 103 cases of tonsillectomies.

PROCEDURE

The technic used by Burnap (2) and the dosage suggested by Weinstein (3, 4, 5, 6) were followed; however, intubation was not found necessary in any instance. Patients undergoing tosillectomies were divided into two series. The children in Series I received atropine sulfate one hour before operation and pentothal sodium by rectum one-half hour before operation followed by open drop ether and then insufflation of ether and oxygen. The children in Series II received morphine sulfate and atropine sulfate, using a dosage suggested by M. Digby Leigh, followed by induction of anesthesia with open drop vinethene, ether sequence and insufflation of ether and oxygen.

Series I

In this series, on the evening before the operation a visit was made to evaluate the child emotionally and to become acquainted with him. At the evening visit, orders were written which consisted of nothing by mouth after midnight, a tap water enema until clear, and atropine sulfate one hour preoperatively.

On the morning of operation, a 10 per cent solution of pentothal sodium in tap water was prepared. A dose of 0.2 cc. of 10 per cent solution per pound of body weight was used. The anesthesiologist gave the enema on the ward one-half hour before the operation. No cap or mask was worn by the anesthesiologist. The curtains around the child's bed had previously been drawn and the light subdued by the nurse. The child, who had become acquainted with the anesthesiologist, was told he was going to have another small enema. The patient was turned on his side, and the lubricated catheter inserted 3 inches into the rectum. The solution was introduced slowly and the catheter cleared with air to insure that the total dose was given. The

catheter was allowed to remain in place in case a supplemental dose was necessary and the buttocks were strapped with adhesive.

During the next few minutes, the anesthesiologist talked quietly to the child observing him as he became drowsy and fell into a light sleep. When the child did not respond to his name, an additional five minutes was allowed before he was moved. This extra time was found to be important since the ensuing trip and moving about were stimulating. The patient was brought to the operating room in his own bed and transferred to a stretcher. During the trip from the ward to the operating room, the anesthesiologist stayed at the head of the bed to observe color, respiration and any untoward reaction that might occur.

In the anesthesia room, the depth of narcosis was determined as described by Burnap (2). In the ideal plane of anesthesia, the pupils are central and fixed, the eyelid reflex gone, the corneal and light reflex intact, and the child responds to supra-orbital pressure or pressure on ear cartilage by movement of the head or one of the extremities. In every instance, the color was good, the respiration regular, the blood pressure steady and the pulse slightly accelerated. The induction was begun using the open drop ether technic. Usually, the ether caused the child to be aroused to the stage of excitement lasting from five to twenty seconds. When the child was in the second plane of the third stage, he was brought into the operating room and then insufflation technic, using ether and oxygen, was begun. In no instance was intubation necessary.

Series II

In this series, the children were admitted to the hospital on the morning of operation. The anesthesiologist visited the child to make his acquaintance and to evaluate his emotional status. The child was given morphine and atropine one and one-half hours preoperatively and was brought to the operating room fifteen minutes before the beginning of the operation. The anesthesiologist attempted to make the child feel at ease. Story books and toys were present for the child to play with before the induction was begun.

Each patient was evaluated in both series as to:

1. Emotional status preoperatively. Each child was rated just before induction as: Class I, lethargic or completely unconscious; Class II, relaxed, unafraid; Class III, wide awake and active, and Class IV, hyperactive.
2. Stage of excitement. The length and nature of this were noted along with the smoothness of the induction.
3. Amount of anesthetic agents used.
4. Any complications of the anesthesia.
5. Length of time of recovery.
6. Amount of excitement during recovery.

7. Duration of postoperative sleep on the ward following recovery.
8. Nausea, vomiting and amount of postoperative nursing.
9. The child's reaction in the morning. He was questioned concerning his recollection of the events which transpired on the previous day and whether they were pleasant or unpleasant to him.
10. The child's reaction ten days later. The mother and child were interviewed in the clinic on the tenth postoperative day.

SUMMARY OF FINDINGS

The average age of the patients in this series was 5 years (table 1). The average weight was 40 pounds. In those cases in which rectal pentothal was given, it was found that the average time for the patient to fall asleep was about seven minutes. The time was slightly shorter for children under 5 years of age. The average time between the administration of rectal pentothal and the ether anesthesia was about thirty minutes and the average time of total anesthesia in this series about sixty minutes (table 2).

TABLE 1

AGE DISTRIBUTION

Age, Years	Method	
	Rectal Pentothal	Morphine and Atropine
1	0	0
2	1	1
3	4	4
4	7	10
5	9	13
6	7	6
7	9	6
8	6	1
9	4	3
10	2	3
11	0	3
12	1	0
Total	50	50

The reaction time in this series was between 60 to 120 minutes (table 3).
Smooth induction with rectal pentothal was obtained in 43 of the 50 cases.

In Series II, preanesthetic evaluation of the effect of morphine and atropine revealed that 14 per cent were lethargic, 68 per cent relaxed and unafraid, 16 per cent wide awake and active and 2 per cent hyperactive. In this series, the average total anesthesia time was thirty to forty minutes and the reaction time thirty to fifty minutes (table 3). Of the 50 patients premedicated with morphine and atropine, smooth induction was obtained in 40.

Postoperative vomiting occurred in 22 per cent of the patients in

whom pentothal was used and in 54 per cent of those in whom morphine and atropine were employed (table 4).

In the series given pentothal, there was usually one small emesis in the recovery room. In the series given morphine and atropine, there were at least two bouts of emesis.

TABLE 2

LENGTH OF ANESTHESIA

Time, Minutes	Method—No. of Cases: 50 Cases of Pentothal*	50 Cases of Morphine and Atropine
30	0	16
40	0	22
45	4	7
50	14	2
55	13	1
60	13	2
70	4	0
80	2	0
80–100	0	0
Total	50	50

* This includes pentothal given approximately one-half hour preoperatively.

Twenty-four hours after operation, 92 per cent of the patients who received pentothal showed no recollection of the anesthesia, the anesthesia room, or the operating room (table 5).

The last thing they remembered was receiving the enema. Four per cent had vague memories of the procedure and another 4 per cent have definite memories of the anesthesia room.

In the morphine-atropine series, 94 per cent of the patients had definite memories of the anesthesia room plus the administration of the anesthetic. Two per cent had vague memories and 4 per cent had no memory at all of the entire procedure.

TABLE 3

REACTION TIME

Time, Minutes	Method—No. of Cases: 50 Cases of Pentothal	50 Cases of Morphine and Atropine
20	1	4
30	1	16
40	1	9
50	2	12
60	12	1
70	7	6
80	6	1
90	5	1
100–120	11	0
120–150	2	0
150–300	2	0
	50	50

TABLE 4

Method	Induction	Cases	Length of Anes. Admin., Minutes (Average)	Reaction Time, Minutes (Average)	Postop. Vomiting, Per cent	Recollection 24-hour Follow-up Cases Per cent		
Pentothal	Smooth	43	Between	Between	22	None	46	92
	Mild excitement	7	50–60 *	60–120		Vague	2	4
						Definite	2	4
	Prolonged excitement	0						
Morphine and Atropine	Smooth	40	Between	Between	54	None	2	4
	Mild excitement	7	30–40	30–50		Vague	1	2
						Definite	47	94
	Prolonged excitement							

* Includes pentothal given approximately one-half hour preoperatively.

There was no direct complication of the anesthesia. No instance of laryngospasm in either series was noted. There was no need for intubation. In the entire series of 100 cases, one child in the pentothal series developed postoperative bleeding. He was brought to the operating room and hemostasis accomplished. It was thought that the postoperative bleeding might have been recognized earlier if the child had not been depressed from the pentothal.

TABLE 5

TWENTY-FOUR HOUR FOLLOW-UP

Recollection	Pentothal		Morphine and Atropine	
	Cases	Per cent	Cases	Per cent
None	46	92	2	4
Vague	2	4	1	2
Definite Memory	2	4	47	94

In every one of the 100 cases, a careful ten-day follow-up was carried out. Table 6 gives a fairly good picture. The following observations, however, may be made:

1. In Series I, 4 per cent of the children indicated, as far as could be ascertained, that their stay in the hospital was unpleasant. Thirty per cent of Series II thought that it was definitely an unpleasant time.

2. After ten days, the memory of the anesthesia and anesthesia room was the same as recorded on the twenty-four-hour follow-up in both series (table 4).

3. In Series II, 28 per cent showed some evidence of emotional disturbances. Four of them began having nightmares, whereas they had had none previously. One child had an increase in enuresis.

TABLE 6

Method	Pleasant or Unpleasant Memories		Memory of Anesthesia Room		Memory of Anesthesia		Presence of Nightmares, Behavior Problems, Enuresis		Desire to Return to Hospital	
		Cases		Cases		Cases		Cases		Cases
Pentothal	Pleasant	14	Yes	2	Yes	2	Yes	1	Yes	42
	Noncommittal	34	Vague	2	Vague	2	More easily upset	4	No	8
	Unpleasant	2	No	46	No	46	No	45		
Morphine and Atropine	Pleasant	2	Yes	46	Yes	40	Yes	4*	Yes	32
	Noncommittal	33	No	4	Frightened	7		1**	No	18
								1***		
	Unpleasant	15			No	3	More easily upset	7		
							No	37		

* Nightmares.
**Walked in sleep for first time.
*** Increased enuresis.

Seven of these children were more easily upset, according to the mothers. They slept poorly, were more irritable and their appetites were poor. One of these latter children awoke crying on three consecutive nights. In one other instance, the mother stated that the child "has been very frightened since he had his tonsils out and won't let me out of his sight."

In Series I, the pentothal group, 8 per cent were classified as being more easily upset. There was one instance of nightmare, but no increased enuresis or increase in behavior problem (table 6).

4. In Series II, the morphine series, 36 per cent of the children would not have liked to return to the hospital whereas, in the pentothal series, just 16 per cent expressed the same opinion (table 6).

DISCUSSION OF RESULTS

It was found that both of these methods were satisfactory and a definite improvement over the older method of using atropine alone.

The method of morphine and atropine premedication has certain advantages over rectal pentothal. The morphine and atropine method results in a shorter total anesthesia time, amounting to approximately twenty to thirty minutes less than with rectal pentothal. The presence of an anesthesiologist is not required during the administration of the morphine-atropine premedication as it is in the case of rectal pentothal. An overnight stay and enema the night before are advocated but not required. The volatile anesthetic induction averaged the same length of time in both series and was equally satisfactory. Therefore, it is thought that morphine and atropine as premedication for patients undergoing tonsillectomy is a very satisfactory method.

The advantages of pentothal are many. This study was primarily begun to find a satisfactory method for alleviating psychic trauma caused by anesthesia. In discussing this method with other anesthesiologists, it was discovered that there was a great fear of laryngospasm. There was, also the added problem of intubation. It was decided to be prepared to intubate, but not to adopt this as part of the method. Not one of the 50 patients was intubated and it was not necessary in any instance. No case of laryngospasm was encountered. No complication resulted from this anesthesia technic.

In all 50 cases, the anesthesiologist had no problems arising from the time the anesthesia had been started to the end of the operation. The color remained good in every instance, the respiratory rate unchanged, the blood pressure unaffected and the pulse slightly elevated. Respirations were quiet and there was a good exchange. Everyone who observed these patients was impressed with the ease of anesthesia and the pleasure of having the child fall asleep in his own room and not wake up until he was back in his own room. The inductions were smooth with only occasional mild excitement. Ether was used as a primary anesthetic agent and approximately half the amount was necessary that had previously been required for those patients in whom atropine was used as premedication. The reaction time was undoubtedly prolonged and was proportional to the operating time. This method produced a marked decrease in the instance of postoperative vomiting and less postoperative care was required. A careful emotional evaluation revealed satisfactory results.

The contraindications for the rectal pentothal method are respiratory obstruction, liver or kidney disease, rectal disease and anemia.

Rectal pentothal has been employed mainly for patients having tonsillectomy, but it has also been used in angiocardiography with local procaine as a supplement. It is planned to extend this form of anesthesia to all operative procedures on infants or children. The hazards of any rectal administration are recognized (12), but our results indicated that the method described is safe.

The only real disadvantage was the necessity for the anesthesiologist to stay with the child from the beginning of the rectal instillation to the conclusion of the anesthesia. This method may not be practical in many institutions, in which case the morphine and atropine premedication may be used satisfactorily.

In discussing this method with other anesthesiologists, it was thought that these children under rectal pentothal might have been in a state of hypoxia during the prolonged reaction time. We do not believe that there was hypoxia during this period, but the problem will be investigated. Gasometric oxygen determinations of these children at various intervals during the procedure are now being done and will be reported at a later date.

CONCLUSION

A comparative study of 100 tonsillectomies on children has been presented. Fifty children received rectal pentothal as basal anesthesia and 50 received morphine and atropine as premedication.

Both methods were satisfactory and there were no anesthetic complications in 100 cases.

The administration of rectal pentothal without intubation resulted in a safe and simple procedure in our hands. A careful study of the psychic reaction of the children has shown that emotional trauma was reduced to a minimum. In this respect, it was superior to the results obtained when morphine and atropine were used for premedication.

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