

1951

Use of sodium pentothal in vaginal obstetrics

Richard Carl Toren
University of Nebraska Medical Center

This manuscript is historical in nature and may not reflect current medical research and practice. Search [PubMed](#) for current research.

Follow this and additional works at: <https://digitalcommons.unmc.edu/mdtheses>

Recommended Citation

Toren, Richard Carl, "Use of sodium pentothal in vaginal obstetrics" (1951). *MD Theses*. 1792.
<https://digitalcommons.unmc.edu/mdtheses/1792>

This Thesis is brought to you for free and open access by the Special Collections at DigitalCommons@UNMC. It has been accepted for inclusion in MD Theses by an authorized administrator of DigitalCommons@UNMC. For more information, please contact digitalcommons@unmc.edu.

THE USE OF SODIUM PENTOTHAL IN VAGINAL OBSTETRICS

Richard Carl Toren

Submitted in Partial Fulfillment for the Degree of

Doctor of Medicine

University of Nebraska, College of Medicine

January 15, 1951

Omaha, Nebraska

INTRODUCTION

The purpose of this paper is to show, by a review of the literature, the place of sodium pentothal in the field of obstetrical anesthesia. Although this drug is used for cesarean section, as well as vaginal deliveries, this paper will be concerned only with the latter.

Intravenous anesthesia was first reported in 1847 by Pirogoff and Von Fluor who used ether. The first barbituric acid compound used was sodium amytal, first reported in 1929. Sodium pentothal was developed by Tabern and Volwiler, and introduced clinically by Lundy and his associates at the Mayo Clinic in 1934.

Sodium pentothal is an ideal anesthetic because the equipment needed for its use is simple and readily available. The induction stage is easy and rapid and the recovery period is short and pleasant with a lower incidence of post-operative complications, particularly nausea and vomiting.

This drug is a barbituate which differs little in chemical structure from pentobarbital sodium, sodium amytal, and evipal soluble. It acts as a central nervous system depressant, causing varying degrees of sedation, hypnosis, analgesia and anesthesia, depending on the dose. The chief site of action of pentothal has not been exactly determined, though it is believed that it depresses primarily the cerebral cortex and secondarily the mid-brain and the brain stem. It probably exerts little depressant effect on the spinal cord and spinal

cord reflex arcs. The drug is practically completely destroyed in the body, though its site of destruction is not known. Evidence suggests that the liver may be, for the most part, involved.

Sodium pentothal depresses the respiratory center in direct proportion to the size and rapidity of injection of the dose. The pulse rate is usually slightly increased at first but returns to near normal with continuation of anesthesia. The blood pressure may also drop slightly immediately after induction but returns to normal levels within a few minutes, except in patients with hypertension. Electrocardiographic tracings are not affected when sodium pentothal is properly administered. Peripheral vasodilatation is usually noted within ten to fifteen minutes. Liver function is not depressed by the drug. Other effects of the drug include slightly depressed urinary excretion, elevation of blood sugar, reduction in the size of the spleen and an increase in red blood cells and hemoglobin in the peripheral circulation. During pentothal anesthesia the tone of the smooth muscles seems to be decreased. There are no essential changes in the chemical composition of the blood, and coagulation time is not affected. There is evidence that the parasympathetic nervous system is stimulated or sensitized to reflex stimulation, the effect being particularly notable during and immediately following induction. This is believed to account for the coughing, sneezing and laryngeal spasm

sometimes encountered.

Hellman, Shettles, and Stran (10), making use of the fact that sodium pentothal exhibits a maximum absorption of ultra-violet light at 2880 A⁰, reported a new method of determining blood concentration of the drug. They reported that intravenous pentothal quickly crosses the uteroplacental barrier and within ten or twelve minutes reaches equal concentration in fetal and maternal blood. Little of the drug, however, reaches fetus during the first five minutes after beginning the anesthetic. Dreisbach and Snyder (5) showed that when experimental rabbits were given ten milligrams of pentothal intravenously per kilogram of body weight at term, the fetal respiratory rate was decreased to one third the initial rate for a period of about five minutes. This fetal apnea was shown to be due to the drug itself and not anoxemia as the oxygenation and carbon dioxide content remained normal in the blood.

Investigation has been carried out to determine the action of intravenous anesthesia in the presence of hemorrhage. Wood and Jaco (6) reported that the anesthetic dose required to produce anesthesia is not necessarily reduced with slight hemorrhage but should be reduced with marked hemorrhage. Burstein and Hershey (7) carried out experiments on dogs and cats in which the animals were bled prior to the intravenous administration of pentothal. The results reported were highly unpredictable and in the most cases disastrous, resulting in death. There is no conclusive evidence

that intravenous pentothal either increases or decreases blood loss during delivery.

Although it is generally believed that sodium pentothal is largely destroyed in the liver, and therefore should be avoided as the anesthetic of choice in cases of toxemia of pregnancy, Hunter (8) reports that liver function tests on the first and tenth days following pentothal anesthesia are normal. This is compared to a twenty-five per cent decrease in liver function following ether anesthesia, and a forty-nine per cent decrease following spinal anesthesia.

TECHNIQUE

In reviewing the series of cases reported it is seen that there are variations in the material and methods used for the anesthesia. The earlier investigators used a five per cent solution of sodium pentothal, but this has since been replaced by a two and one half per cent solution in most instances. A two per cent solution is also reported as having been used.

Most of the reports on pentothal as an obstetrical anesthesia have come from the larger institutions with specially trained personnel and special equipment. Because of this it has been charged that pentothal is a satisfactory anesthetic only under special conditions. There is reported, however, a significant series of cases from two moderate sized Army Hospitals in Alaska where no special equipment or personnel were available. (14)

La Brecque (2) in an earlier report of eighty cases used a five per cent solution of pentothal. He did not use analgesic or amnestic drugs. This investigator was impressed by the usefulness of this method of anesthesia in cases complicated by upper respiratory infections, bronchitis, asthma, tuberculosis, bronchiectasis and where a heavy meal had been eaten shortly before the onset of labor. He used pentothal in several cases of toxemia of pregnancy without difficulty but did not recommend it.

Kassebohm and Schreiber (1) also used a five per cent solution of sodium pentothal in a series of two hundred fifty cases. Their most frequent type of delivery was low forceps with episiotomy. Toxemia, sepsis and intrauterine manipulations, such as version, were reported as contra-indications to pentothal. Never was more than one gram of the drug used.

A further modification of technique was employed by Rucker (3) in his series. He used a variety of analgesics and amnestics including morphine, scopolamine, sodium amytal and rectal ether. Although both five and two and one half per cent solutions of pentothal were used, he preferred the two and one half per cent. This was used in conjunction with perineal block and the intravenous drug was stopped as the head delivered.

Since that time the two and one half per cent solution has been used almost exclusively except for Dippel and his associates (12), who report using a two per cent solution.

The technique of administration of anesthesia of these later reports varies only slightly among the different investigators. The sedation consists of a barbiturate, demerol and scopolamine. The barbiturate is given when the patient is in active labor with about three centimeters of cervical dilation. With a dilation of six to eight centimeters and an uneventfully progressing labor, demerol, one hundred milligrams, with scopolamine 1/150 grain is given intramuscularly. If sedation is adequate the amount of sodium pentothal needed for the actual delivery is less and the induction is smooth and rapid.

The patient is placed on the delivery table, prepared, draped and catheterized when dilation is complete and the vertex is at or just above the perineum . The anesthetic is then administered.

A two and one half per cent solution is prepared by dissolving one gram of pentothal in forty cubic centimeters of sterile water. Twenty cubic centimeters are placed in a syringe and the needle placed in an antecubital vein. Two or three cubic centimeters are injected and the patient is instructed to count out loud. If pain is experienced in the arm it is probable that the pentothal is being injected extravascularly or intraarterially. As the patient counts, an additional two to three cubic centimeters is injected every twenty to thirty seconds. The counting will slow and then

stop, the jaw drops and must be supported and the skin becomes pale although the mucous membranes remain pink. The pupils are noted to react to light but this becomes more sluggish as the anesthesia deepens. The eyes finally become fixed in a mid position with the pupils slightly dilated. Breathing is regular but depressed moderately in depth. With anesthesia complete the perineum becomes relaxed and is easily dilated. This procedure is varied slightly by Schmidt and Weinbaum (14) who start the anesthetic while the patient is being draped and prepared for delivery. Oxygen may or may not be administered to the mother as a prophylaxis against fetal anoxia. This depends upon the speed of delivery and length of anesthesia. Immediately following delivery the cord is clamped and the baby placed where the nose, nasopharynx and pharynx can be cleaned with suction. Additional pentothal is given if needed for the episiotomy repair, but it is the general opinion that one gram is the maximum dose allowable.

The method of delivery under pentothal anesthesia when divided according to operative or spontaneous, was in most cases operative. La Brecque (2) reports the highest number of spontaneous deliveries with a seventy one per cent incidence. In Hellman's (11) series of one thousand, four hundred fifteen deliveries approximately thirty two per cent were spontaneous. This is almost identical to the figures reported by Dippel and his associates (12). Rucker (3) reports only eight per cent spontaneous deliveries. Mellman and his co-workers (11) are of the opinion that pentothal anesthesia

is not suitable for spontaneous delivery. This is in agreement with the reports of Dippel (12) and Greenhill (9). Their reasons are that because the patients are semi-anesthetized it is more dangerous to the patient, and the mechanical difficulties are increased by the movements of the patients under the stimulation of pains. It has also been shown that pentothal will efface the bearing down efforts in sixty per cent of the patients anesthetized with it. This is not in accord with the findings of Schmidt and Weinbaum (14) who report sixty per cent of multiparous deliveries and twenty four per cent primiparous deliveries as spontaneous.

Of the operative deliveries reported, the great majority were low forceps. Although intrauterine manipulations were done this type of procedure is generally contraindicated. Cesarean section was included in the reports of Hellman (11), Boyd and Jones (13) and Hunt and Lundy (4) but the discussion of these will not be included in this paper.

EFFECT on the MOTHER

It is evident from the reports of the various investigators that sodium pentothal is a pleasant anesthetic from the view-point of the patient. Both induction and recovery are, for the most part, uneventful and smooth. Nausea and vomiting are not seen with this anesthesia as they are with the inhalation type. Pentothal does not produce the headache and occasional bladder incompetence which sometimes accompanies saddle block anesthesia. Another factor in favor of this drug is that

it does not impair uterine contractibility and contraction. This finding was reported by Kassabohm and Schreiber (1).

Boyd and Jones (13), in their series of two hundred and ninety-four cases, grade the effect of sodium pentothal on the patient. Grade I included those patients with no difficulties, pre or post- anesthetic. Grade II included the patients in whom the induction stage was not smooth and slight difficulty was encountered. Grade III included patients where serious difficulties were present. Grade IV included anesthetic deaths.

Of this group, all but four of the patients were classified as Grade I. Five pre-eclamptic mothers and one chronic nephritic mother were among the patients in Grade I. There was also a diabetic mother who took the anesthetic without difficulty.

There were two cases classified as Grade II. One of these mothers vomited after receiving one tenth of a gram of sodium pentothal. Anesthesia was discontinued and her post partum course was uneventful. The other patient in this classification developed laryngospasm, which was controlled by the insertion of an airway and the administration of oxygen.

There were also two cases in Grade III. One of these patients vomited as the anesthetic was started and her respiration stopped. Three tenths of a gram of pentothal had been given. Regular breathing was established in eight minutes after the use of tracheal aspiration and artificial respiration.

There were no post-operative difficulties. The other patient suffered an immediate post partum hemorrhage and became apneic. This may have been due to the sodium pentothal but it is more likely that the blood loss caused the apnea. Post partum hemorrhage was reported in one other case.

There were no anesthetic deaths in this series.

Hellman and his associates (11), report only three cases of post-operative pneumonia in the one thousand four hundred and fifteen cases in their series. There were, however, two maternal deaths in the series. Both of these deaths occurred in toxemic patients. One of these patients was delivered by cesarean section and will not be discussed in this paper. The other patient was a nineteen year old primigravida with a diagnosed twin pregnancy. She entered the hospital approximately three weeks before the estimated date of confinement. She had made eight visits to the pre-natal clinic with no deviations from normal noted until the last visit when her blood pressure was 150/100, a trace of albumin, a four pound weight gain in one week, slight edema, but no symptoms. She was admitted to the hospital at this time. Her course grew steadily worse with the onset of headaches, vomiting, epigastric pain and drop in blood pressure. Labor was induced and under sodium pentothal anesthesia, stillborn, macerated twins were delivered. One half gram of pentothal was used. In spite of transfusions of whole blood and plasma, the blood pressure fell and the patient expired eight hours post

partum. There was no autopsy. In regard to this case, the author states that the patient's course was downhill before anesthesia and there was no evidence that the anesthetic aggravated the condition.

Rucker (15) also reports a maternal death. This patient was an eighteen year old primipara in whom labor was induced by rupturing the membranes. Labor lasted seventeen hours and thirty-nine minutes. The head was in R.O.P. position and an easy version and extraction were done. Six hundred and twenty-five milligrams of sodium pentothal were used in conjunction with a pudendal block. One cubic centimeter of ergotrate was given intravenously. A small trickle of blood was noted following the ergotrate but this bleeding was controlled by elevation of the fundus. The patient was put to bed in apparently good condition but one and three quarters hours after delivery her condition became suddenly worse and she expired fifteen minutes later. No autopsy was obtained but the symptoms were similar to those seen in multiple lung emboli.

Schmidt and Weinbaum (14) report difficulty in eleven out of two hundred fifteen cases. Of these cases, one developed laryngospasm and one had complete apnea for ninety seconds. Both of these cases were then carried under gas, oxygen and ether anesthetic for the remainder of the deliveries. There were also five cases reported which developed shallow respirations but were carried successfully under pentothal with the addition of oxygen. Vomiting occurred in two patients, both

of whom had vomited prior to the start of the anesthetic. Neither of these patients aspirated. Increased muscular tonus with small tonic spasms of the extremities was reported in two patients. The cause was not determined.

Three instances of major complications are reported by Dippel and his co-workers (12). This is from a series of three hundred fifty cases. One of these cases cannot be blamed on the drug itself for it was injected into the tissues outside of the venous system. Pain and hyperemia were noted in the area of injection. This continued for approximately three days after which no residual effect was apparent. The other two cases involved vomiting and incomplete anesthesia. This group of investigators also report fourteen cases in which supplementary anesthesia was employed, an incidence of four per cent. An interesting fact brought out in this report is that ninety-four per cent of the anesthetics were given by the obstetrical residents and internes, while only six per cent were given by the anesthesia staff. This was also reported by other investigators and is added evidence of the simplicity of administration of this drug.

The reports of Rucker (3), La Brecque (2), and Kassebohm and Schreiber (1) are similar to those discussed above in that the incidences of anesthetic complications are so low as to be almost negligible. There are no reports of maternal deaths in these series.

EFFECT on the INFANT

The effect of sodium pentothal anesthesia on the infant is more difficult to determine because of the variations encountered in the process of delivery. It has been shown earlier in this discussion that fetal respiration is decreased by sodium pentothal. For this reason the patients selected for this anesthesia generally do not include those cases in which prematurity is anticipated. Congenital abnormalities, breech extractions, cord wrapped around the neck and other birth trauma are also factors which must be considered.

Boyd and Jones (13) report no fetal deaths in their series of two hundred ninety-four cases. Two hundred and seventy-six of these infants cried spontaneously, eighteen had a mild degree of asphyxia but responded rapidly and one was severely depressed but responded. Of the nineteen infants who required some degree of resuscitation, pentothal alone was thought to be the cause in eleven cases.

Hellman and his associates (10) report no increase in fetal mortality over that with other types of anesthetics. In their series of one thousand four hundred and twenty-one infants there were seventy deaths giving a mortality rate of four and nine-tenths per cent. Of these deaths, the fetal heart was heard prior to anesthesia in thirty-three cases, giving a corrected mortality rate of two and four-tenths per cent. The causes of death in these thirty-three infants were listed as prematurity, intracranial hemorrhage, congenital abnormality, large baby with traumatic delivery, post

partum meningitis, asphyxia following placenta previa, and undetermined in four cases. Although it is not possible to state that sodium pentothal was a contributory factor, this group believes that there were no instances in the entire series where this anesthetic agent was directly responsible for an infant's death.

The findings listed above compare with the report of Dippel and his co-workers (12). They report ten fetal deaths in a series of three hundred fifty cases. Of these, four were stillborn, one being an excessive-sized erythroblastotic fetus. The other three deaths were thought to be caused by premature separation of the placenta (two cases), and prolapse of the umbilical cord. None of the six neonatal deaths could be blamed on the anesthetic as the deliveries were not normal or did not involve normal babies. The most serious effect of pentothal noted was in a second twin delivered by midforceps extraction whose mother had been anesthetized for sixteen minutes before the delivery. The baby was obviously narcotized but responded to moderate resuscitation and was apparently undamaged.

Schmidt and Weinbaum (14) report six fetal deaths in a series of two hundred and sixteen babies. Two of these babies were known to be dead prior to parturition. There were three anacephalic monsters all of whom died shortly after delivery. One baby did not respond although the fetal heart was heard just before delivery. The baby appeared normal and as an

autopsy was not done the death must be attributed to anesthetic depression.

In the other reports which were reviewed (1,2, 3,) the findings were essentially the same as those discussed above. There were no reports of fetal deaths or severe fetal complications in these series.

SUMMARY

In this paper, all of the available literature has been reviewed in order to determine the place of intravenous pentothal in the field of obstetrical anesthesia.

The pharmacology of pentothal was discussed and it was shown that the drug is a central nervous system depressant presumably acting chiefly on the cerebral cortex. Respiratory depression is caused in direct proportion to the size and rapidity of the dose. The normal physiology of the body, other than that mentioned above, is little affected by the drug. Uterine contractibility was not believed to be affected but the bearing down reflex of the patient was obliterated. The fact that sodium pentothal is simple to administer and is very pleasant from the patient's view point was brought out in the paper.

It was also shown that pentothal rapidly crosses the uteroplacental barrier and reaches equal concentration in fetal and maternal blood within ten or twelve minutes. Little of the drug reaches the fetal circulation until after

the first five minutes of the anesthetic. Experimentally, fetal respiration was seen to decrease to one third of the initial rate for about five minutes, when animals were given intravenous pentothal.

Two other factors in the use of sodium pentothal were discussed. The first of these referred to the control of anesthesia after hemorrhage. It was concluded that pentothal was very unpredictable under such conditions. The effect of the drug on the liver was also discussed and it was shown that there was no depression of liver function after pentothal anesthesia.

Technique of administration of sodium pentothal was discussed. Both five per cent and two and one-half per cent solutions were used. Differences in technique of this anesthetic, according to the various authors, was brought out, and a generally accepted method was discussed in more detail. It was shown that intrauterine manipulations, prematurity and toxemia were contraindications to the use of pentothal. Spontaneous delivery, as a contraindication, was also discussed.

The effect of sodium pentothal on the mother and infant was reviewed in approximately twenty-six hundred cases. There were three maternal deaths reported, two being toxemic mothers and very poor anesthetic risks. The other occurred in a patient in whom a version and extraction were done. This death was attributed to multiple lung emboli. There were twenty-four other complications discussed, most of which were very slight.

The effect of the anesthetic on the infant was discussed. None of the investigators reported a higher fetal mortality with pentothal than with other types of anesthesia. There was only one case of fetal death that could be blamed on sodium pentothal alone. Of the remaining fetal deaths reported, the cause of death could not logically be blamed on the anesthetic.

CONCLUSIONS

1. Sodium pentothal is a safe, pleasant anesthetic and is a valuable addition to the field of obstetrical anesthesia.
2. It is generally contraindicated in cases of spontaneous delivery, toxemia of pregnancy and intrauterine manipulations, and prematurity.
3. The technique of administration of sodium pentothal anesthesia is easily learned but its use by untrained personnel is not advocated.

BIBLIOGRAPHY

1. Kassebohm, F. A., and Schreiber, M. J.: Intravenous anesthesia in obstetrics; comparative study of pentothal and evipal soluble with report of 250 cases. *Am. J. Surg.* 40: 377-383, May 1938.
2. La Brecque, F. C.: Intravenous anesthesia in obstetrics. *New England J. Med.* 219: 954, 1938.
3. Rucker, E.: Intravenous anesthesia in obstetrics. *Virginia M. Monthly.* 70: 35-37, Jan. 1943.
4. Hunt, A. B., and Lundy, J. S.: Combined local and intravenous anesthesia for cesarean section. *Proc. Staff Meet. Mayo Clinic* 16: 191-192, 1941.
5. Dreisbach, R., and Snyder, F. F.: Effect on fetus of pentobarbital sodium and pentothal sodium. *J. Pharmacol. & Exper. Therap.* 79: 250, 1943.
6. Wood, D. R., and Jaco, N. T.: The effect of hemorrhage on anesthetic dosage. *J. Pharmacol & Exper. Therap.* 79: 259-265, 1943.
7. Burstein, C. S., and Hershey, S.G.: Circulatory effects from pentothal sodium administered soon after hemorrhage. *Proc. Soc. Exper. Biol. & Med.* 53: 80-81, 1943.
8. Hunter, A. R.: The dangers of pentothal sodium anesthesia. *Lancet* 1: 46-48, 1943.
9. Greenhill, J. P.: Anesthesia in obstetrics. *Am. J. Obst. & Gynec.* 54: 74-81, July 1947.
10. Hellman, L. M.; Shettles, L. B.; and Stran, J.: Quantitative method for determination of sodium pentothal in blood. *J. Biol. Chem.* 148: 293-297, May 1943.
11. Hellman, L. M.; Shettles, L. B.; Manahan, C. P.; and Eastman, N. J.: Sodium pentothal anesthesia in obstetrics. *Am. J. Obst. & Gynec.* 48: 851-860, Dec. 1944.
12. Dippel, A. L.; Helman, R. J.; Wolters, C. E.; Wall, H. A. Jr.; and Hairston, F. H.: Sodium pentothal anesthesia for selected vaginal obstetrics. *Surg. Gynec. & Obst.* 85: 572-582, Nov. 1947.
13. Boyd, K. B., and Jones, A. R.: Pentothal sodium, terminal obstetrical anesthesia. *Am. J. Obst. & Gynec.* 59:931-935, April 1950.

BIBLIOGRAPHY (Continued)

14. Schmidt, R. T. F., and Weinbaum, J. A. : Pentothal sodium anesthesia for vaginal delivery. U. S. Armed Forces Med. J. 1: 874-880, August 1950.
15. Rucker, M. Pierce. Discussion under 11.