TRICHLORETHYLENE ANAESTHESIA IN OBSTETRICS: A REPORT¹

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TRICHLORETHYLENE was first used for maternity anaesthesia in Edmonton hospitals in 1950. Since that time over 30,000 deliveries, 19,413 of them at the Royal Alexandra Maternity Hospital, have been accomplished with the aid of this anaesthetic agent, with what we believe to be good results.

No standard premedication is used in obstetrical patients. The obstetricians make their own choice in this matter. The most common drug administered is meperidine 100 mg. with an attempt made not to administer it within two hours of delivery. A small number of patients receive meperidine 100 mg. plus hyoscine 0.4 mg. Other receive promethazine 50 mg. and meperidine 50 mg. and some get pentobarbital 90 mg. and meperidine 100 mg. All patients, with the exception of those receiving hyoscine, are given atropine 0.4 mg. approximately one-half hour before delivery.

Heidbrink gas machines are used for the administration of the trichlorethylene, nitrous oxide, oxygen mixture. The circle system of the machine is used, with the carbon dioxide absorber cut out of the circuit providing a partial rebreathing system. The soda lime is moved from the CO₂ absorber when trichlo-ethylene is in use to avoid any neurological complications which might result from the products of reaction between trichlorethylene and soda lime. A Heidbrink "Trimar" vaporizer is incorporated in the circle system.

If further analgesia is required during second stage labour, flow rates of N₂O 4.5 L. min. and O₂ 4.5 L./min. are given to the patient by self-administration or by a nurse. The self-administration of trichlorethylene for analgesia during the early phases of labour was discontinued about four years ago. It was felt by the anaesthetic staff and the obstetrical department that the prolonged administration of trichlorethylene prior to delivery had a noticeably depressant effect on the respirations of the infant.

During the late second stage of labour when the anaesthetist takes over, the flow rates are changed to N₂O 6 L./min. and O₂ 3 L./min. When the infant's head begins to distend the perineum, trichlorethylene is added to the mixture. The concentration of trichlorethylene is gradually increased and at the time that the episiotomy is performed the patient is usually unconscious. The concentration of trichlorethylene is then reduced just sufficiently to allow painless delivery and repair of the perineum. This usually means that the vaporizer is set at the second, third or fourth notch, with a total gas flow still about 9 L./min. The deepest level of anaesthesia obtained corresponds to plane 1 of stage 3.

Of the infants born under this technique 75 per cent require no care except for drainage of mucus by posture and suction. These infants cry immediately after delivery. Of the remainder 20 per cent are given oxygen to overcome cyanosis. The remaining 5 per cent may require some mechanical assistance

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to attain normal respiratory activity and colour. The 25 per cent with respiratory difficulties includes those cases where labour was difficult and also the difficult forceps deliveries.

Blood loss during the third stage of labour is minimal in the opinion of the obstetrical staff and no greater than with other techniques.

Ergotrate 0.25 mg. is usually administered intravenously when the anterior shoulder descends under the pubic arch.

Following the termination of the anaesthetic the majority of patients are awake and talking within five minutes.

All cases, including difficult mid-forceps rotations and extractions, are managed by this technique although we usually prefer low spinal anaesthesia for the latter when we are forewarned of trouble. Breech deliveries are also managed with trichlorethylene and nitrous oxide but with very low concentrations of the former to retain the patient's co-operation during the delivery. We prefer to administer pudendal blocks to these patients. Patients requiring relaxation of the uterus during delivery are given ether. Caesarean sections are managed with spinal or general anaesthesia.

Complications arise with trichlorethylene just as they do with any anaesthetic agent. Nausea and vomiting are frequently seen, especially in patients with full stomachs, and give some cause for concern. The routine use of ergotrate may have something to do with this. Fortunately, the patients are nearly always awake when this occurs and, if not, they are in possession of their protective reflexes. In our series we have encountered only one patient with an acid-aspiration syndrome and she recovered without special therapy. There are no cases on record in the Royal Alexandra Hospital of pneumonia following aspiration of stomach contents after trichlorethylene anaesthesia. Three cases of aspiration occurring in one of the other hospitals, each resulting in severe pneumonitis. Each of these patients recovered.

Partial respiratory obstruction is often a problem with certain patients. These patients hold their mouths tightly shut during anaesthesia, making insertion of an oral airway difficult, and many of them have a degree of nasopharyngeal obstruction. The passage of a well-lubricated nasopharyngeal tube resolves this problem. Laryngeal spasm may occasionally occur to some degree when the perineum is put on the stretch as the foetal head is crowning. It disappears after the birth of the head.

The expiratory phase of respiration may be very noisy owing to the blowing of air through the closed lips.

Tachypnoea may occur from overdose of trichlorethylene. Reduction of the concentration overcomes this complication.

Bradycardia was a frequent finding before the routine use of atropine, with rates as low as fifty per minute occasionally seen. It is seldom encountered now. Occasional irregularities in rhythm are noted, especially if the concentration of trichlorethylene is too high.

Since adrenalin may produce ventricular fibrillation during trichlorethylene anaesthesia it is forbidden to keep mixtures of adrenalin and local anaesthetic agents in the maternity hospital. This prevents accidental administration which might have tragic results.

Agitated, nervous women are sometimes quite resistant to trichlorethylene. I can recall one patient who would not go to sleep in spite of a high concentration of the agent. Intravenous injection of 50 mg. of Demerol at this point transformed it into a very easy anaesthetic and the baby was born shortly thereafter. Usually, a little gentle persuasion and some patience overcome this problem.

Convulsions during anaesthesia have been rare. This complication occurred in four patients. The cause was not determined. One patient convulsed twenty minutes after awakening and no cause could be determined.

The total number of deliveries at the Royal Alexandra Maternity Hospital from January 1, 1954, to January 1, 1958, was 19,645. Of these 90 per cent were done under trichlorethylene anaesthesia. Forceps were used in 33 per cent of the deliveries.

In this series two of the mothers died, one from exsanguination following rupture of the uterus from internal version done under ether and the other from a pulmonary embolus three days after a Caesarean section done under spinal anaesthesia. There have been 448 cases of maternal morbidity, none of which could be attributed to trichlorethylene.

The perinatal death rate averaged over the 4-year period is 26.01/1,000 (provincial, 23.9/1,000) births which includes all of the prematures, whether they were considered viable or not. It also includes the congenitally deformed still-born infants.

Perinatal Death Rate

1954	$\frac{126}{4,511}$	= 27 95 per 1,000 births
1955	$\frac{125}{4,795}$	= 26 06 per 1,000 births
1956	$\frac{126}{5,112}$	= 24 64 per 1,000 births
1957	$\frac{134}{5,227}$	= 25 63 per 1,000 births
Total	$\frac{511}{19,645}$	= 26 01 per 1,000 births

The neonatal mortality rate³ is 14.37/1,000 live births.

Neonatal Mortality Rate

1954	$\frac{75}{4,460}$	= 16 81/1,000 live births
1955	$\frac{66}{4,736}$	= 13 93/1,000 live births
1956	$\frac{65}{5,051}$	= 12 86/1,000 live births
1957	$\frac{73}{5,166}$	= 14 13/1,000 live births
Total	$\frac{279}{19,413}$	= 14 37/1,000 live births

³This figure includes all live born babies, prematures, etc., who subsequently died in hospital.

The number of premature infants (under five pounds) was 1,211 or 6.06 per cent. The perinatal death rate for premature infants is 289 per 1,000 births (provincial 233). The neonatal mortality rate in premature infants is 187.7 per 1,000 live births.

We recognize the fact that trichlorethylene leaves a lot to be desired as far as a perfect anaesthetic agent is concerned. However, the low maternal death rate, the paucity of serious complications, and the favourable infant death rate in this series leads us to believe that trichlorethylene is a safe anaesthetic agent for obstetrical use.

This method of maternity anaesthesia is used in the four Edmonton hospitals. There have been no maternal deaths attributable to trichlorethylene.

The University of Alberta Hospital has had over 10,000 deliveries since 1950 and their neonatal death rate was 2.9 per cent. The perinatal death rate in this series was 1.6 per cent.

The Edmonton General Hospital has a series of 5,000 deliveries from July, 1955, to December, 1957. Their neonatal death rate was 3.03 per cent and the perinatal death rate 1.8 per cent.

SUMMARY

A series of over 30,000 maternity cases, in which trichlorethylene was used as the main anaesthetic agent is presented.

There was no maternal death attributable to the anaesthetic technique. Of these cases 19,645 were done in the Royal Alexandra Hospital in Edmonton. The perinatal death rate was 2.6 per cent. The neonatal death rate was 1.4 per cent. At the University of Alberta Hospital, where 10,000 cases were done, the neonatal death rate was 2.9 per cent. The perinatal death rate was 1.6 per cent. In the Edmonton General Hospital, where 5,000 cases were done, the neonatal death rate in this series was 1.8 per cent and the perinatal death rate was 3.03 per cent. These death rates are uncorrected for such things as congenital deformities.

RÉSUMÉ

Nous avons présenté une étude de 30,000 cas de maternité où nous avons employé le trichlorethylene comme agent anesthésique principal.

Aucune mort maternelle n'a été attribuable à la technique anesthésique.

A l'hôpital Royal Alexandra à Edmonton 19,645 cas ont été faits. Le taux de mortalité périnatale a été de 2.6%. Le taux de mortalité néonatale a été de 1.4%. A l'hôpital de l'Université d'Alberta 10,000 cas ont été faits. Le taux de mortalité néonatale a été de 2.9%. Le taux de mortalité périnatale a été de 1.6%. A l'hôpital Edmonton General 5,000 cas ont été faits. Dans ce groupe, le taux de mortalité néonatale a été de 1.8% et le taux de mortalité périnatale a été de 3.03%. Ces taux de mortalité ne sont précis à cause de facteurs, tels que les déformités congénitales.