

## CURRENT COMMENT AND CASE REPORTS

CURRENT COMMENT is a section in ANESTHESIOLOGY in which will appear invited and unsolicited professional and scientific correspondence, abbreviated reports of interesting cases, material of interest to anesthesiologists reprinted from varied sources, brief descriptions of apparatus and appliances, technical suggestions, and short citations of experiences with drugs and methods in anesthesiology. Contributions are urgently solicited. Editorial discretion is reserved in selecting and preparing those published. The author's name or initials will appear with all items included.

### AN APPARATUS FOR TRICHLOROETHYLENE ANALGESIA

The relief of pain and human suffering is one of the aims to which the medical profession is dedicated. Anesthetists particularly are conscious of this responsibility and are striving constantly to find ways and means whereby patients may be made more comfortable during times of stress. Within the last ten years evidence has accumulated that trichloroethylene is capable of inducing marked analgesia without necessarily associated unconsciousness. This is a potent drug which produces its pain-relieving effects in inhaled concentrations of 0.5 to 1.5 volumes per cent. Like other potent agents, its use can be abused and deleterious effects observed, particularly on the myocardium (1) (2). However, when it is employed with judgment, circumspection and primarily for the potent analgesia it affords, very useful functions can be served without endangering the patient (3) (4).

The chemical and pharmacologic properties of trichloroethylene have been detailed elsewhere (5). For present purposes, it is recalled that this drug exists at room temperature as a liquid, and has the rather high boiling point of 87° C. Its lack of volatility and potency in low concentrations prevents satisfactory vaporization when it is dropped on an absorbent face mask. In order to vaporize it adequately for controlled clinical application, special inhalers have been devised. The accompanying photographs show the first trichloroethylene inhaler made in the United States (figs. 1 and 2).\*

\* The "Duke University" inhaler is designed and made by Mr. George W. Newton, and is obtainable from Ayerst, McKenna and Harrison Ltd., 22 East 40th St., New York 16, N. Y.

The inhaler shown is simple in design, construction and operation. It weighs about 16 ounces and can be held comfortably in the hand of the patient or administrator. On the end of the inhaler away from the mask are a number of notches and a depressed opening which leads into the body of the apparatus. When the inner metal tube is turned to the "Fill" position, as it can be by the key, a hemostat or a pair of scissors, the instrument is ready to be charged. Trichloroethylene, 15 cc., is poured into the hole and is absorbed by the material which lines the wall of the cylinder. After one minute the indicator on the end may be turned anywhere between "Min." and "Max.," and the instrument is ready for use. After it is filled it may be placed in any



Fig. 1. Inhaler for administration of trichloroethylene vapor (side-view).

position without danger of leakage. When the gauge is set near "Min.," very little air passes over the surface of trichloroethylene, and the patient receives low concentrations of the vapor. With the instrument set near "Max.," considerable air passes over the absorbing surface, and higher concentrations of vapor are delivered. By means of the interferometer, it has been determined that under clinical conditions this inhaler will deliver concentrations that vary between 0.1 and 1.3 volumes per cent. When the cylin-

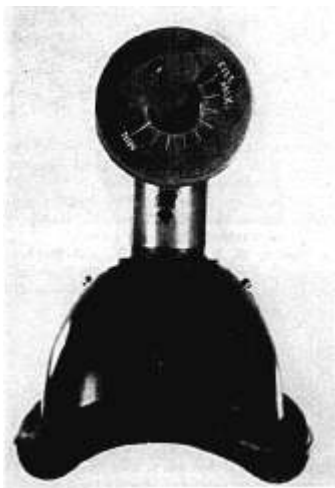


FIG. 2. Inhaler for administration of trichloroethylene vapor (end view). Opening where inhaler is loaded and key whereby concentration can be adjusted are shown.

der is warmed for some time by the hand, concentrations may be increased to 1.4 volumes per cent.

The analgesic vapor is delivered by means of the patient's own efforts. On inspiration air is drawn through the opening which is used for charging the inhaler, then over the absorbing surface to a greater or lesser extent, and through the face mask to the lungs. Two thin, metal, nonresistant valves are incorporated into the mask end of the

cylinder in such a way that expirations pass out directly into the atmosphere through the holes in the mask end of the cylinder. This nonrebreathing mechanism ensures stability of vapor concentration and prevents accumulation of carbon dioxide. The resistance encountered in moderate breathing through the apparatus varies between 1.0 and 4.0 cm. water. With normal respirations the resistance is only 0.3 to 0.6 cm. water.

The neck of the instrument is of such a diameter that standard McKesson face masks will fit into it. A small delivery tube has been incorporated into the neck so that oxygen may be supplied to enrich the inhaled atmosphere.

A trichloroethylene vaporizer such as described can be used to relieve pain in a variety of situations. Perhaps its most common application at the moment is during obstetrical labor (6). After the definite establishment of contractions, or when the cervix is about 3 cm. dilated, the inhaler may be given to the mother with the information that three or four breaths at the commencement of a pain will provide analgesia without interfering with the contraction. As labor progresses and pains become more severe, the personnel in charge may increase the concentration of trichloroethylene by turning the notch on the end of the apparatus. This cannot be done by the patient unless some strong instrument is made available to her. If the patient becomes overly ambitious and takes numerous breaths through the inhaler at one time, she may become unconscious. When this happens, however, the muscles of the arm relax, the mask falls away from the face, and she recovers consciousness without irrationality in about thirty seconds. Some patients, especially multiparas, will carry through delivery with analgesia self-administered in this way. Others will require pudendal block, or a switch to nitrous oxide-oxygen and trichloroethylene terminally. In the concentrations absorbed, this drug does not produce respiratory depression of the fetus. The psychologic advantage of a mother who knows that she has the ability to control her pain herself is of considerable importance.

The analgesic potency of trichloroethylene self-administered through the inhaler has been recognized by other specialists in

medicine. It has been found of definite value in the changing of painful burn dressings (7), for cystoscopies and minor urologic procedures, in removal of painful vaginal packs, for incision and drainage of abscesses, for suture of lacerations, particularly in children, and for relief of intractable pain in a patient in the terminal stages of carcinoma. Should large numbers of casualties be thrust upon this country by events of the future, it is possible that such a type of analgesia might prove most important.

Finally, it can be stated that the intermittent self-administration of trichlorethylene primarily for analgesia has proved to be devoid of complications of a serious nature. (8). It provides a means of analgesia which cannot be duplicated by other drugs or techniques today.

C. R. STEPHEN, M.D.C.M.,  
W. K. NOWILL, M.D.,  
R. MARTIN, M.D.,  
*Division of Anesthesia,  
Duke Hospital,  
Durham, N. C.*

#### REFERENCES

1. Barnes, C. G., and Ives, J.: Electrocardiographic Changes During Trilene Anesthesia, *Proc. Roy. Soc. Med.* **37**: 528-532 (July) 1944.
2. Waters, R. M.; Gillespie, N. A., and Orth, O. S.: Trichlorethylene Anesthesia and Cardiac Rhythm, *Anesthesiology* **4**: 1-5 (Jan.) 1943.
3. Ostlere, G.: Role of Trichlorethylene in General Anaesthesia, *Brit. M. J.* **1**: 195-196 (Jan. 31) 1948.
4. Stephen, C. R., and Slater, H. M.: Newer Anesthetic Agents in Children, with Special Reference to Trichlorethylene and Kemithal, *Anesthesiology* **12**: 135-144 (March) 1951.
5. Hewer, C. L.: Recent Advances in Anaesthesia and Analgesia (Including Oxygen Therapy), ed. 6, Philadelphia, The Blakiston Company, 1948.
6. Scales, J. J., and Ohlke, R. F.: Use of Trichlorethylene in Obstetrical Analgesia and Anesthesia, *Canad. M. A. J.* **64**: 235-237 (March) 1951.
7. Pickerell, K. L.; Stephen, C. R.; Broadbent, T. R.; Masters, F. W., and Georgiade, N. G.: Self-induced Trilene Analgesia in Plastic Surgery, with Special Reference to Burn Patient, *J. Plastic & Reconstruct. Surg.* (in press).
8. Nowill, W. K.; Martin, R., and Stephen, C. R.: Present Status of Trichlorethylene for Analgesia and Anesthesia (to be published).

### SYSTOLIC BLOOD PRESSURE DETERMINATION IN THE NEWBORN AND INFANT

In the newborn and infant it is difficult to obtain blood pressure readings by the auscultatory or oscillatory method. The palpatory method is useful in infants whose blood pressure is normal but is of little value when the young patient is in shock.

Systolic blood pressure readings of reasonable accuracy (5 mm. of mercury as checked by the palpatory method when it was feasible) have been obtained by the following method. The small, 1 inch wide, infant cuff is wrapped around the arm in the usual manner and pinned down. The upper extremity is raised and the arm is gently compressed by the physician's palm in order to blanch it. Simultaneously the cuff is inflated to about 120 mm. of mercury, the extremity is placed horizontally and the palm pressure is released. A demarcated blanched

area remains (fig. 1). The cuff is then gradually deflated at a rate of 2 mm. of mercury per second. The systolic reading is taken at the moment that capillary refill occurs, that is, when the blanched area resumes its previous color (fig. 2).

The normal range of systolic blood pressure readings for newborn infants has been between 70 and 95 mm. of mercury. The method has been useful during operative procedures and in following the progress of the infant in shock. Systolic blood pressure readings have also served as a guide to the rate of blood replacement during exchange transfusions.

BERNARD E. CAPPE, M.D.,  
IRVING M. PALLIN, M.D.,  
*Jewish Hospital of Brooklyn,  
Brooklyn, New York*