ANALGESIA IN INSTRUMENTAL VAGINAL DELIVERY BY
THE INTERMITTENT SELF-ADMINISTRATION OF
METHOXYFLURANE USING A DISPOSABLE VAPORIZER

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SUMMARY

The self-administration of methoxyflurane using a disposable plastic inhaler has been
examined as a method for providing analgesia for instrumental vaginal deliveries. The
obstetric procedures included difficult forceps deliveries, breeches and complicated
twins. Methoxyflurane is considered to be a valuable addition to the armamentarium
of the obstetrician. In association with local anaesthetic techniques it is possible to
consider avoiding general anaesthesia for some complicated vaginal deliveries.

It is desirable that all patients should receive adequate relief of pain in childbirth, particularly
during instrumental vaginal delivery. Some authors (O'Sullivan, 1969) consider that a regional block,
particularly by the epidural route provides the ideal method of relieving pain for these patients. This
technique is being more widely adopted but requires trained staff and specialized hospital facilities. In this
unit it is used for a limited number of patients with selected indications. In general, patients requiring
instrumental vaginal delivery are given other forms of regional analgesia, either alone or combined with
intravenous or inhalational analgesics, or a general anaesthetic is administered. In obstetrics, however,
general anaesthesia has contributed to the number of avoidable maternal deaths recorded (Report on
advocated the wider use of local anaesthetic techniques to avoid the dangers of general anaesthesia in
obstetrics. Methoxyflurane has been shown to be a safe drug in normal deliveries when self-administered
for analgesia in spontaneous vaginal deliveries (Major, Rosen and Mushin, 1966, 1967; Jones et al,
1969; Rosen et al., 1969). It is against this background that it was decided to evaluate methoxy-
flurane as an analgesic for instrumental vaginal deliveries.

MATERIALS AND METHOD

With the exclusion of patients for whom a general anaesthetic was considered more appropriate, the
patients selected were those requiring analgesia for instrumental vaginal delivery.

Methoxyflurane was given alone or together with regional anaesthesia and was self-administered using
a disposable vaporizer (Analizer; Abbott Laboratories Ltd). The vaporizer is a cylindrical plastic
tube 15.6 cm long and 2.5 cm in diameter, containing an absorbent wick and disc-shaped baffles. One
end of the tube is narrowed to form a mouthpiece with an adjacent narrow segment which is only 2.2
cm in diameter. Thus near the mouthpiece there is a 0.3 cm shoulder to allow connection of the inhaler
either to a standard anaesthetic mask or other anaesthetic fitting with an internal diameter of 2.2
cm. In addition to the baffled main inlet port and mouthpiece, the body of the inhaler has a lateral
opening between mouthpiece and wick to allow the entrainment of air. The inhaler may be used with
the “diluter hole” open, or closed, either by the patient with the fingers or occluded with adhesive
tape. The whole is secured to the user’s wrist by an attached tape, overdosage being obviated in self-
administration, the device falling away from the face before the patient becomes anaesthetized.

Performance of the vaporizer.

Inspiratory flow rate has been advanced by Crawford and Tunstall (1968) as being of primary impor-
tance in determining the output concentration from equipment for inhalational analgesia during labour,
but no relevant data are available for the Analizer. Romagnoli and Korman (1962), however, showed
that the majority of women in labour have a mean

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minute volume ventilation of 14 l./min, with a range of 8–24 l./min, and study of performance curves, produced from chromatographic analysis supplied by the manufacturer of this inhaler, shows that with minute volumes ranging from 10 to 20 l./min, the methoxyflurane concentration with diluter hole covered varies between 0.7 and 0.8 per cent. There is a rapid exponential decline as the inhaler becomes exhausted, giving a sharp end-point to activity, after 20 minutes of continuous use with a minute volume of 20 l./min, and after 35 minutes with a minute volume of 10 l./min.

**Technique.**

The inhaler was charged by pouring 15 ml of methoxyflurane from a single dose container into the vaporizing chamber and was then used by placing the mouthpiece directly in the mouth or by breathing through an attached anaesthetic mask. For instrumental delivery the diluter hole was covered.

Before instrumental interference the patient was introduced to and encouraged to practise with the inhaler until familiar with the method of use, a fitted anaesthetic mask being supplied if preferred. Tissue concentration of the drug was built up by use of the inhaler for some 5 minutes before the start of the procedure and the inhaler then used intermittently whenever relief of pain was required. As the inhaler was used intermittently, the methoxyflurane did not become exhausted in any case in this series.

**Application.**

This method was used in 41 cases requiring instrumental delivery, none of whom had received methoxyflurane during labour. Of these 41 cases, 5 were breech deliveries with forceps used to deliver the after-coming head. There were two sets of twins with the first twin in each case presenting as a breech. In one case the lie of the second twin was not longitudinal and delivery, which was complicated by the presentation of the cord, was effected by internal version and breech extraction. In the other case the second twin presented as a transverse lie and was delivered by external version and breech extraction. In 34 forceps deliveries where the presentation was cephalic, 6 required rotation of the foetal head with Kielland’s forceps. The remainder were cases where the House Officer had asked for assistance and these cases could not, therefore, be termed “lift-out” forceps deliveries.

In 13 cases, all occipito-anterior vertex presentations, rapid forceps delivery was anticipated and methoxyflurane was used alone.

In the remaining 28 cases, where greater difficulty was anticipated, methoxyflurane was employed together with a local anaesthetic of 0.5% lignocaine without adrenaline. Vulval and perineal infiltration was used in 6 cases and pudendal block in the remaining 22.

**Observations.**

The following observations were made and the results recorded: (1) patient acceptance of the inhaler; (2) ease of use of the inhaler; (3) degree of pain relief; (4) mental relaxation; (5) physical relaxation; (6) patient co-operation; (7) duration of administration. They were assessed by observers as being “satisfactory” or “unsatisfactory”.

**RESULTS**

**Patient acceptance** of the inhaler was considered to be satisfactory in 37 cases (90%). Three of the remaining 4 cases initially disliked the smell of methoxyflurane but subsequently used the method successfully. One patient had difficulty in using either the Analgizer alone or with an attached anaesthetic facemask and was considered by the authors to be one of patient failure rather than method failure.

**Ease of use** of the inhaler was judged as satisfactory in 40 cases (98%). Twenty-eight (70%) of these 40 cases preferred to use the apparatus attached to an anaesthetic facemask while 12 preferred to use the Analgizer without the mask. One patient, unable to use the Analgizer, experienced the same difficulty with a fitted anaesthetic mask.

**Degree of pain relief** was considered to be satisfactory in 33 cases (81%). In 13 cases in whom methoxyflurane was used alone as an analgesic, pain relief was satisfactory in 9 (69%). Of the remaining 28 cases in whom methoxyflurane analgesia was supplemented by local anaesthetic techniques, pain relief was considered to be satisfactory in all 6 patients in whom vulval and perineal infiltration was used and in 18 (82%) of the 22 patients in whom pudendal block was used. When considering 28 patients in whom local anaesthetic infiltration was used with methoxyflurane analgesia, pain relief was satisfactory in 24 (86%).

**Mental relaxation** was judged to be satisfactory in 33 patients (81%) who were relaxed and cooperative. Eight patients remained apprehensive.
although cooperative, whilst excitement was marked in 4 of these. One mother who remained apprehensive and uncooperative proved difficult to manage throughout her labour and delivery. The authors feel that in this patient a general anaesthetic might have been preferable.

Physical relaxation was judged to be satisfactory in 28 patients (70%). In 13 patients, restlessness with leg movement troublesome to the obstetrician was a feature in 12, although in only 1 patient was this a problem and may, it is felt, be attributed to poor selection for this technique.

Patient co-operation was satisfactory in 40 patients (98%); only 1 patient was unable to co-operate with the obstetrician. In no case was drowsiness of concern.

Duration of administration. As the Analgizer was used intermittently an estimate of the total time of usage was not possible. Thirty-four patients (83%) used the Analgizer intermittently for up to 40 minutes duration. The longest period of use was 70 minutes (fig. 1). In general, between administrations, the patients lay quietly and often had amnesia with no memory of what was sometimes a difficult forceps delivery.

**Methoxyflurane and the neonate.**

In an attempt to evaluate the effect of methoxyflurane on the neonate the Apgar scores were compared in two series of 35 neonates. The cases were similar but not matched. One series of 35 neonates was taken from the 41 cases described above. The other series consisted of 35 neonates born to mothers in whom intravenous pethidine 100 mg was used to provide additional analgesia for instrument delivery where a local anaesthetic was not sufficient. In both groups all mothers received pethidine 100 mg by intramuscular injection within the time interval of 65–540 min prior to delivery and all deliveries in both series were personally conducted by one of us (D.J.H.).

The Apgar scores in two series are compared in table I.

**DISCUSSION**

Bodley and colleagues (1966) using a Cyprane inhaler delivering 0.5 per cent methoxyflurane in air, noticed no side effects in the mother when using it intermittently for pain relief during labour in 62 patients. Marx, Chen and Tabora (1969) used the Analgizer with methoxyflurane as we have described, with good to excellent pain relief in 14 obstetric patients, 3 of whom had forceps delivery. There were no adverse effects upon the mother, foetus, labour, or upon the baby at birth. pH and base deficit values in mother and neonate in 12 cases were within normal limits.

Major, Rosen and Mushin (1966) using a Pentec vaporizer showed that 0.35 per cent methoxyflurane inhaled intermittently was a safe and useful

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**Table I**

<table>
<thead>
<tr>
<th>Agent</th>
<th>No. of cases</th>
<th>8-10</th>
<th>6-7</th>
<th>0-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methoxyflurane</td>
<td>35 (d)</td>
<td>26</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Pethidine i.v.</td>
<td>35 (d)</td>
<td>25</td>
<td>11</td>
<td>1</td>
</tr>
</tbody>
</table>

In both groups all mothers had received pethidine 100 mg i.m. 65–540 min prior to delivery.

(a) Stillbirth: intrauterine death at 39 weeks gestation; breech delivery.
(b) Intrapartum haemorrhage with signs of foetal distress; forceps delivery.
(c) Breech delivery; intubation required.
(d) Two sets of twins in each group giving 37 babies in each group.
analgesic in labour and possessed advantages over trichloroethylene. In a later paper, Major, Rosen and Mushin (1967) confirmed that 0.35 per cent methoxyflurane was the most satisfactory concentration and that a higher concentration introduced an unacceptable degree of drowsiness. We used concentrations of 0.7 to 0.8 per cent and only one patient developed drowsiness. As all our cases were instrumental deliveries this did not impede the progress of labour.

The Analgizer is small, lightweight and disposable. However, compared with more sophisticated vaporizers, it has the disadvantage of being uncalibrated. The vapour concentration varies with the minute volume of the patient and the ambient temperature. Administration requires supervision but we had no evidence of dangerous overdosage and the variation in concentration is small and acceptable.

The Analgizer provided adequate pain relief in over 80 per cent of our cases and patient acceptance, ease of use, co-operation and degree of sedation were satisfactory. In 30 per cent of cases physical relaxation was not satisfactory and movement of the legs was troublesome to the operator. In 4 patients excitement and restlessness were marked. Rosen and colleagues (1969) associated restlessness with the combination of pethidine and methoxyflurane and all 4 of these patients had received an intramuscular injection of pethidine at some time prior to delivery. We found excitement and restlessness occurred in patients who were unduly anxious before having any drugs and who had had advice from more than one medical or nurse attendant on the use of the Analgizer. It is not possible to compare the effectiveness of the present method of giving pain relief with any other method which avoids general anaesthesia, as the cases selected are quite different in the present series. Scudamore and Yates (1966) concluded that for forceps delivery of moderate difficulty or where rotation is required, a pudendal block was not adequate and that some other form of anaesthesia was recommended. From the present series it may be concluded that a pudendal block in association with the self-administration of methoxyflurane is adequate for such manoeuvres.

In a consideration of the effect of methoxyflurane in the neonate, the results were virtually identical in two comparative groups, both premedicated with i.m. pethidine. Methoxyflurane was used to provide additional analgesia in the one group and intravenous pethidine in the other.

The Analgizer supplied for the purpose of this study is not available commercially in this country and a more sophisticated, calibrated form of vaporizer, designed to provide a fixed concentration of methoxyflurane, is now supplied by the same manufacturer.

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REFERENCES


ANALGESIE MISE EN OEUVRE PAR AUTO-ADMINISTRATION A LA DEMANDE DE METHOXYFLURANE AU MOYEN D’UN INHALATEUR PORTATIF, AU COURS D’ACCOUCHEMENTS COMPORTEANT L’APPLICATION DE FORCEPS

SOMMAIRE

L’auto-administration de méthoxyflurane à l’aide d’un inhalateur portatif en matière plastique a été étudiée en tant que méthode destinée à obtenir une analgésie au cours d’accouchements comportant l’application de forceps. Les techniques obstétricales impliquées comportaient des applications de forceps difficiles pour présentations du siège et grossesses génitales compliquées. Le méthoxyflurane est considéré comme constituant un apport valable quant à l’arsenal de l’obstétricien. En ce qui concerne certains accouchements compliqués par voie vaginale, il est ainsi possible, en association avec des techniques d’anesthésie locale, d’envisager d’éviter un anesthésie générale.
BOOK REVIEW

Medical and Dental Hypnosis and its Clinical Applications.

The first edition of this book was reviewed by R. A. Millar in this journal in 1967. The second edition published some five years later, has been modified to meet certain criticisms made of the first edition.

This is essentially a practical man's guide to the use of hypnosis in mental and dental practice. It is lucidly and impellingly written and has some important warnings to would-be practitioners. Its subject matter is based on clinical rather than experimental evidence, and the author provides a useful chapter in the history of hypnosis as a method of treatment. As Dr Millar pointed out in his review of the first edition, this chapter draws attention to the "uncompromising and unimaginative attitude of orthodox medical bodies to those several mid-nineteenth-century exponents of hypnosis".

The author chooses the suggestion theory to explain hypnosis and in a later chapter examines some others. He summarily dismisses the role-playing theory despite the considerable researches of workers like Sarbin and Barber, neither of whom gets a mention anywhere in the book. These authors have shown that tolerance to pain, for example, can be achieved by role-playing subjects, to an extent which fully matches that of "hypnotized" subjects.

Since there is already an enormous literature of experimental studies of experience and behaviour under hypnosis, Dr Hartland is certainly justified in restricting his material to a practical description of techniques. However, in this day and age, it is desirable that claims for the efficiency of hypnosis in the treatment of such diverse conditions as nocturnal enuresis, asthma, migraine, insomnia, speech disorders, tics, menstrual disorders, dermatological conditions, obstetrics, psychological illness and psychosomatic symptoms, should each be separately supported by careful controlled studies. Reference to any such studies in the literature might have been made to substantiate these claims, or their absence noted.

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