EFFECT OF ANAESTHETIC TECHNIQUE ON BLOOD LOSS IN TERMINATION OF PREGNANCY

S. R. DUNN, J. SECKER WALKER, D. L. ASTON AND D. CRIPPS

SUMMARY

Seventy-five patients were anaesthetized for termination of pregnancy by suction curettage using four methods of anaesthesia. Blood loss was measured with a haemoglobin dilution technique. The patients' opinion of the anaesthetic was recorded. Blood loss was unacceptably high with thiopentone, nitrous oxide and oxygen with trichloroethylene compared with the other three techniques which were: diazepam/pentazocine, paracervical block with incremental doses of methohexitone, thiopentone, suxamethonium and hyperventilation with nitrous oxide and oxygen, and ketamine with paracervical block. Postoperative side effects occurred least frequently in association with the diazepam/pentazocine technique.

Acute blood loss is a major complication of operations for termination of pregnancy. In a series of 1000 cases, Loung, Buckle and Anderson (1971) found that 309 patients lost more than 200 ml of blood and, of these, 61 required fluid replacement. Cullen, Margolis and Eger (1970) have shown that when halothane was used for suction termination, decrease in alveolar concentration to less than 1% was associated with decrease in blood loss. When the alveolar concentration was reduced to 0.5% and continued with nitrous oxide 75% the average blood loss was still 169 ml. Intermittent positive pressure ventilation with nitrous oxide and oxygen plus intravenous adjuvant alone was associated with less blood loss than when halothane was added to the mixture.

Before the use of diazepam intravenously, two methods were commonly used for anaesthesia for suction termination at this hospital, namely thiopentone, nitrous oxide and oxygen with trichloroethylene, and thiopentone, suxamethonium, endotracheal intubation and intermittent positive pressure ventilation with nitrous oxide and oxygen. At about the same time as the Abortion Act came into force, a technique was evolved in which diazepam and pentazocine were injected intravenously and combined with methohexitone and paracervical block. Apart from the simplicity of administration, it was observed that the blood loss from the operation appeared to be less using this method than when using the more conventional methods of anaesthesia. The introduction of ketamine seemed to offer another form of anaesthesia suitable for suction termination.

Preliminary observations appeared to support the view that the anaesthetic agents used were major factors influencing blood loss. In the study of Cullen, Margolis and Eger (1970) blood loss was deduced by subtracting the estimated amniotic fluid volume for gestational age from the total volume of fluid in the sucker bottle. In this study we attempted to measure the blood loss more directly. The principal purpose of the investigation that follows was to measure the blood loss and to compare the loss using four different anaesthetic techniques.

Loung, Buckle and Anderson (1971) state that blood loss obviously varies with gestational age and their data tend to support this. Cullen, Margolis and Eger (1970), however, could find no evidence that gestational age, duration of anaesthesia, duration of uterine aspiration or parity affected the blood loss.

Knox and colleagues (1970) and Morgan and colleagues (1971) recorded a high incidence of unpleasant psychological sequelae after the use of ketamine as the sole anaesthetic agent. All the patients in the study were asked to complete a questionnaire on the morning following the operation.

METHOD

Patients were divided into nine groups of varying gestational ages and parity in order to eliminate the possible bias of gestation and parity on the difference in blood loss using different anaesthetic techniques.

Patients weighing 50 kg or more were premedicated with pethidine 50 mg, promethazine 25 mg and atropine 0.5 mg; patients weighing less than 50 kg were given pethidine 25 mg, promethazine 25 mg, and atropine 0.5 mg.

Four anaesthetic techniques were used:

1. Thiopentone 200–450 mg, nitrous oxide and oxygen with trichloroethylene.
2. Thiopentone 200–450 mg, suxamethonium 75 mg, intubation, nitrous oxide and oxygen, intermittent positive pressure ventilation and intermittent suxamethonium (to a total dose of 100–125 mg).
3. Intravenous ketamine 2 mg/kg and paracervical block with 20 ml 1% lignocaine.
4. Intravenous pentazocine 30 mg, diazepam 10–20 mg, 10 mg increments of methohexitone (to a total dose of 20–80 mg) and paracervical block with 20 ml of 1% lignocaine.

All patients were given ergometrine 0.5 mg when the cervix was first dilated.

Immediately before induction of anaesthesia a sample of blood was drawn, diluted to 1:200 with modified Drabkin's reagent and the haemoglobin concentration estimated using a Linson 3 Photometer (Lars Ljungberg & Co., Stockholm, Sweden) with a 540 m/colour filter. The surgeons took great care during the procedure to collect as much blood as possible on swabs and the instruments were wiped with a swab, while the curette was flushed with 500-ml distilled water. The swabs, the 500-ml distilled water and the contents of the suction bottle were placed in a jar containing 250-ml distilled water with 1000 units of heparin: 2–3 hours were allowed for haemolysis to occur and the swabs were then squeezed out into the solution. This solution was then made up to 1 l. with distilled water, 20-ml aliquots were filtered to remove turbidity producing particulate matter and diluted appropriately with modified Drabkin's reagent to estimate the haemoglobin levels in a similar manner to the preoperative haemoglobin estimation. The error in measuring known volumes of blood was estimated to be ±6%.

If the blood loss extended to the drapes, then the contents of the sucker bottle, the washout from the curette and the swabs were placed in a perometer (Grant's Instruments, Ltd, Cambridge), which gave a direct reading of the volume of blood put in. The error of measurement of blood by this method was estimated as ±5%.

Patients were asked to answer a questionnaire on the morning after the operation in order to provide any indication of any difference that might exist between the acceptability of different techniques.

RESULTS

Seventy-five patients were included in the investigation. The characteristics of the four trial groups prior to operation are shown in table II. All four groups were similar with respect to age, and as a direct result of stratification, with respect to parity and gestation.

At an early stage in the trial it became obvious that blood loss in patients anaesthetized with thiopentone, nitrous oxide and oxygen with trichloroethylene was very much greater than in patients anaesthetized by the other three methods. As a result, the surgeons asked for this method to be discontinued because they felt it unreasonable to continue when the risk of excessive blood loss was obviously increased. Consequently there were only 7 patients in this group.
to contribute to the analysis. Once the method using trichloroethylene was abandoned, no patient in the series required intravenous fluids.

The distribution of blood loss in the four groups is illustrated in figure 1. Table III shows the (geometric) mean blood losses and 95% confidence limits in each group. The difference between the blood loss with the nitrous oxide, oxygen, and trichloroethylene technique (mean 241 ml) and the blood loss in the other three groups is statistically significant (P<0.001). The other three means do not differ significantly from each other (0.10<P<0.20).

**TABLE III. Mean blood loss associated with each anaesthetic technique.**

<table>
<thead>
<tr>
<th>Anaesthetic Technique</th>
<th>No. of Patients</th>
<th>Mean Blood Loss (ml)</th>
<th>95% Confidence Limits of Mean Blood Loss (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide, oxygen, trichloroethylene</td>
<td>7</td>
<td>241</td>
<td>144-420</td>
</tr>
<tr>
<td>Intermittent positive pressure ventilation</td>
<td>21</td>
<td>52</td>
<td>36-74</td>
</tr>
<tr>
<td>Ketamine</td>
<td>23</td>
<td>35</td>
<td>25-50</td>
</tr>
<tr>
<td>Diazepam/pentazocine</td>
<td>24</td>
<td>32</td>
<td>23-45</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The results show that the blood loss (approx. 250 ml) using trichloroethylene was about five times that associated with the other three techniques. The work of Talbert and colleagues (1958) demonstrated that trichloroethylene has very little effect on isolated strips of either normal or gravid uterine muscle. Some other factor must be responsible for the increased bleeding with this agent. The other three methods of anaesthesia were all equally good, the mean blood loss being 32-52 ml.

The method employing intermittent positive pressure ventilation with nitrous oxide and oxygen and intermittent suxamethonium puts the patient at marginal extra risk from the morbidity associated with intubation and the side effects of suxamethonium. The questionnaire indicates that just under half of the patients anaesthetized in this way suffered nausea or vomiting after operation.

**TABLE IV.**

(a) Incidence of bad dreams, awareness under anaesthesia and unpleasant emergence.

<table>
<thead>
<tr>
<th>Anaesthetic Technique</th>
<th>Total</th>
<th>Positive reply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide, oxygen, trichloroethylene</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Intermittent positive pressure ventilation</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Ketamine</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Diazepam/pentazocine</td>
<td>24</td>
<td>2</td>
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</tbody>
</table>

(b) Incidence of nausea or vomiting postoperatively.

<table>
<thead>
<tr>
<th>Anaesthetic Technique</th>
<th>Total</th>
<th>Positive reply</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
</tr>
<tr>
<td>Intermittent positive pressure ventilation</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>Ketamine</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Diazepam/pentazocine</td>
<td>24</td>
<td>0</td>
</tr>
</tbody>
</table>
The techniques using diazepam and ketamine involved paracervical block. From previous experience it did not seem to us that paracervical block alone was an acceptable technique for patients. It was included with the diazepam/pentazocine and ketamine techniques at the beginning of the trial to ensure adequate cervical analgesia. Since it was therefore part of the techniques used, we have not attempted to estimate the effect of paracervical block alone on blood loss in this study. However, Cullen, Margolis and Eger (1970) found no statistically significant difference between blood loss using paracervical block alone and that using thiopentone, nitrous oxide and oxygen with intravenous pethidine supplementation. The use of ketamine is associated with a low blood loss, is easy to administer, and appears to be reasonably free of respiratory and circulatory complications, provided that the patient is not hypertensive. However, despite injecting diazepam 5 mg intravenously at the end of the operation, 6 of 18 patients reported that they suffered unpleasant psychic sensations either while under the anaesthetic, or on awakening. Patients presenting for termination of pregnancy are under psychological stress in any case, and in the writers' view the incidence of this side effect is unacceptably high. It has, however, been recently reported (Laird and Sage, 1972; Johnstone, 1972) that alteration of the premedication and adjustment of the dose can reduce this side effect.

The combination of diazepam and pentazocine with intermittent doses of methohexitone was associated with low blood loss. It is easy to administer, but saline should be used to flush the needle to prevent thrombophlebitis. Surgeons preferred the diazepam/pentazocine technique to the use of trichlorethylene because the uterus felt firmer both when curetting and at the end of the procedure. This technique produced no complications during anaesthesia and the nursing staff preferred this form of anaesthesia because of the low incidence of postoperative complications. The questionnaire revealed that only 2 of 24 patients suffered adverse psychological reactions, while none complained of nausea and vomiting.

Of the four techniques examined in this study, that using pentazocine and diazepam was associated with minimal blood loss and the lowest incidence of other undesirable effects.

ACKNOWLEDGEMENTS
We wish to thank Mrs C. Howland of the MRC Statistics Unit for her advice and statistical analysis of the results; the Department of Obstetrics and Gynaecology, Sister Mary Wood and the theatre staff of the National Temperance Hospital for their co-operation; the Department of Anaesthesia for their encouragement and Mrs B. Barry for her secretarial assistance.

REFERENCES

EFFET DE LA TECHNIQUE DE L'ANESTHESIE SUR LA PERTTE DE SANG A LA FIN DE LA GROSSESSE

Soixante-treize patientes sont anesthésiées à la fin de la grossesse pour curetage par aspiration en utilisant quatre méthodes d’anesthésie. La perte de sang était mesurée à l’aide d’une technique de dilution de l’hémglobine. On enregistrer l’opinion de la patiente sur l’anesthésie. La perte de sang était inacceptablement élevée avec le thiopentone, le protoxyde d’azote et l’oxygène avec le trichloroéthylène comparés aux deux autres techniques suivantes: diazépam/pentazocine, blocage paracervical avec des doses augmentées de méthohexitone, thiopentone, suxaméthonium et hyperventilation avec protoxyde d’azote, oxygène et kéttamine avec blocage paracervical. Les effets secondaires postopératoires sont moins fréquents avec la technique de l’association diazépam/pentazocine.

ÜBER DEN EINFLUSS DER ANAESTHESIETECHNIK AUF DEN BLUTVERLUST BEI BEENDIGUNG DER SCHWANGERSCHAFT

ZUSAMMENFASSUNG
BOOK REVIEW


The concept of intensive care has gained worldwide acceptance. A new generation of doctors, nurses and paramedical personnel are now involved in the treatment of increasing numbers of critically ill patients. As new medical advances can successfully be applied to patients, so we will need more specially trained staff. If the necessary momentum is to be achieved in fulfilling these requirements we need more than practical experience to encourage recruitment. Diploma courses for nurses in intensive care are now being slowly established but they are limited by the degree of specialization of the units. It is therefore not surprising that a definite need has arisen for authoritative textbooks to explain the philosophical, psychological and ethical considerations involved in intensive care.

The authors of Principles of Intensive Care have appreciated this need but have set themselves a Herculean task in trying to write a book that will appeal to doctors, nurses and paramedical personnel equally. To strike a balance is undoubtedly difficult, if not impossible, and this accounts for the unevenness of the format.

Despite the obvious drawbacks the authors have managed to provide a little for everybody, although the book will have a greater appeal for the nursing profession than for others. This I believe is as it should be (although it was not the authors' intention) since the success of intensive care units, in terms of patient care, depends to a very great extent on the enthusiasm, skill and ability of the nursing personnel.

The first chapter, entitled “General Considerations”, is along conventional lines and includes details of administration, staffing, organization and design. A plea is made for direct involvement of the hospital bacteriologist in the day-to-day running of the unit. The contribution they can make is considerable but so far has not gained widespread acceptance.

The next two chapters are on the cardiovascular and respiratory systems. The importance of these topics is not open to doubt but they comprise half the content of the whole book. The questionable need to provide basic information on physiology and anatomy somewhat detracts from the compactness and high standard of the discussion on disturbances and management. The diagnosis of pericardial tamponade is far from easy and the isoprenaline test described is most useful. However, the diagram on page 39 does not help with the insertion of the needle to tap the pericardium, as suggested on page 30.

The next two chapters are on the so-called chapter on drug overdosage—two pages. The proportion of unconscious patients admitted to most intensive care units as a result of drug overdosage is high. The problems that they pose not only from management but also from subsequent care occupies a considerable amount of time and concern of the intensive care team, and the thoughts of the authors might well have been expanded.

The chapter on nursing procedures by “Francis Fieldgate” is well written with good diagrams and clear descriptions. Since it is directed at the nursing profession it does not suffer from the drawbacks of the other chapters. It would be invidious to comment on some of the details of management which must vary from unit to unit and hospital to hospital, but I feel that one particular piece of advice is highly dangerous. It is advised that nurses should hold their breaths during suction and when they need a breath so will the patient. Effective suction can be performed easily within 30 seconds and the nurses should be instructed to watch the patient's colour and the electrocardiogram during this procedure and not hold their breaths.

Most intensive care units will envy the ability to provide two nurses to perform aspiration of secretions in a clinically uncooperative patient. Advice is highly dangerous. It is advised that nurses should hold their breaths during suction and when they need a breath so will the patient. Effective suction can be performed easily within 30 seconds and the nurses should be instructed to watch the patient's colour and the electrocardiogram during this procedure and not hold their breaths.

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The Appendix includes details of drug dosage and suggests that drugs should always be given in relation to body surface area. This may be recommended on theoretical grounds but the practical problems in weighing and measuring the height of these critically ill patients are enormous. Personally I have found that the system of adjusting the dosages in relation to body weight has always worked very well and our nurses would require a lot of persuasion to change. A list of additional reading is also included.

Despite their criticisms, I would recommend this book as an introduction for medical students and those doctors who express an interest in intensive care, and I am sure it will be a popular addition to the nursing library.

D. L. Coppel