ANAESTHESIA FOR CATHETERON TREATMENT OF CARCINOMA OF THE UTERUS

J. N. Horton

SUMMARY

The technique of anaesthesia for catheteron treatment of carcinoma of the uterus must incorporate adequate preoperative sedation in unfit and elderly patients, general anaesthesia of short duration for dilatation of the cervix and introduction of guide tubes, and a rapid recovery of consciousness before the patient is isolated in the treatment room. The most effective combination of drugs has proved to be premedication with intramuscular droperidol and fentanyl with supplementary intravenous doses of these as necessary to produce light sedation. Induction of anaesthesia with methohexitone is followed by nitrous oxide-oxygen with increments of methohexitone or 0.5–1% halothane. Rapid recovery of consciousness occurs before the patient is isolated in the treatment room; while in the treatment room, heart rate and rhythm, electrocardiogram and respiration are remotely monitored and the patient is observed on closed-circuit television. Alternative anaesthetic and monitoring techniques are discussed.

Radiotherapy has been a standard treatment of certain cases of carcinoma of the cervix and body of the uterus for many years. Recently, the use of intracavity high-intensity radiation from the catheteron has replaced the traditional use of radium in some centres. This form of treatment offers certain advantages over conventional radium techniques: (a) it practically eliminates radiation hazards; (b) the position of the isotope sources can be readily checked and maintained constant during treatment; (c) it reduces treatment times and inconvenience to the patient (Joslin, O'Connell and Howard, 1967).

Treatment consists of introducing high-intensity $^{60}$Co sources into the uterus and lateral fornices under remote control. Initially, guide tubes are placed in each lateral fornix and in the uterus after dilatation of the cervix. Low-intensity radium sources are then temporarily inserted into each guide tube to enable the expected rectal radiation dose to be calculated. The patient is immediately transferred to an adjacent screened treatment room (fig. 1) and the guide tubes are connected to hollow flexible cables leading from a screened safe containing the radioactive cobalt sources. The sources are driven electrically along the flexible cables and into the guide tubes, while the patient is observed by the anaesthetist and radiotherapist from outside the treatment room. The sources lie in close proximity to the site of the growth and deliver a high dose of radiation for a period of between 2 and 4 minutes. This treatment is usually given weekly for between 2 and 5 weeks. A detailed description of the method has been given by Joslin (1971).

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Anaesthetic techniques for this procedure are governed by the following requirements.

(i) Adequate preanaesthetic sedation for patients who are often elderly, unfit, and frequently emotionally disturbed because of knowledge or suspicion of a growth. Both preanaesthetic sedation and subsequent anaesthesia must be acceptable to patients because of the need for repeated treatments.

(ii) Light general anaesthetic for examination, biopsy and dilatation of the cervix and insertion of guide tubes. This must be followed by a rapid return to consciousness before the patient is isolated in the treatment room. Emergence vomiting is particularly undesirable, both from the point of view of the risk of inhalation of gastric contents and from the danger of pelvic damage following straining down on the guide tubes.

(iii) Light sedation during the cathetron treatment, since voluntary or involuntary movement of the pelvis resulting from the slight discomfort of the treatment position may lead to physical or radiation damage from displacement of the radioactive sources.

The techniques of premedication, anaesthesia, sedation monitoring which have been evolved for the procedure are reviewed in this article. The complete records of 92 patients were available for survey. The age distribution is shown in figure 2, and the number of treatments received by each patient is summarized in figure 3.

**MATERIAL AND METHOD**

**Physical status.**

Patients were classified according to the scale proposed by the American Society of Anesthesiologists (Annotation, 1963). The distribution of physical status is shown in figure 4, and a summary of preoperative complications encountered is shown in table I. The necessity for early treatment of the carcinoma precluded extended courses of preoperative treatment for such conditions as, for example, obesity. Diabetes and essential hypertension were managed appropriately and anaemia, which is a common clinical finding in carcinoma of the uterus, was corrected by blood transfusion in seven patients. Patients with chronic bronchitis were treated by preoperative physiotherapy and antibiotics.

Although all patients had carcinoma of the uterus, selection of patients for this form of treatment meant that no patient had evidence of distant metastases.

**Premedication.**

A number of different drug combinations were used in succession in a search for the most suitable premedication for the procedure. Pentobarbitone 100–120 mg, given orally 2 hours before anaesthesia, was used on 158 occasions. Promethazine 25 mg
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Fig. 4. Physical status of patients receiving cathetron treatment. Physical status is graded according to the scheme suggested by the American Society of Anesthesiologists (Anesthesiology (1963), 24, 111).

Table I. Preoperative systemic complications of patients receiving cathetron treatment.

<table>
<thead>
<tr>
<th>Condition</th>
<th>No. of patients</th>
<th>(%) of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diastolic 90–120 mm Hg</td>
<td>51</td>
<td>(55.4)</td>
</tr>
<tr>
<td>Diastolic above 120 mm Hg</td>
<td>3</td>
<td>(3.3)</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>10</td>
<td>(10.8)</td>
</tr>
<tr>
<td>Angina</td>
<td>4</td>
<td>(4.3)</td>
</tr>
<tr>
<td>Chronic respiratory disease</td>
<td>16</td>
<td>(17.4)</td>
</tr>
<tr>
<td>Severe obesity</td>
<td>15</td>
<td>(16.3)</td>
</tr>
<tr>
<td>Anaemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemoglobin above 12 g/100 ml</td>
<td>17</td>
<td>(18.5)</td>
</tr>
<tr>
<td>Haemoglobin below 10 g/100 ml</td>
<td>2</td>
<td>(2.2)</td>
</tr>
<tr>
<td>Psychiatric disorders</td>
<td>4</td>
<td>(4.4)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>3</td>
<td>(3.3)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>12</td>
<td>(13.0)</td>
</tr>
<tr>
<td>Antihypertensive therapy</td>
<td>8</td>
<td>(8.7)</td>
</tr>
<tr>
<td>Steroid therapy</td>
<td>4</td>
<td>(4.3)</td>
</tr>
</tbody>
</table>

*Several patients had more than one complication.

Anaesthesia.

As with premedication, a variety of techniques were used in succession, in an endeavour to find the most suitable combination of drugs for the circumstances. The most frequently used techniques are summarized in Table II.

The most convenient and effective sequence has proved to be droperidol 2.5 mg and fentanyl 0.05 mg intramuscularly 1 hour preoperatively (Norris and Telfer, 1968), with supplementary intravenous doses of droperidol and fentanyl given on arrival in the anaesthetic room until the patient is drowsy but readily rousable. This is followed by a "sleep-dose" of methohexitone and anaesthesia is maintained with nitrous oxide-oxygen and either 10 mg increments of methohexitone or 0.5–1% halothane for the short surgical procedure. Before isolation in the treatment room the patient is awake, but sedated.

Table II. Anaesthetic techniques used for patients receiving cathetron treatment.

<table>
<thead>
<tr>
<th>Technique</th>
<th>No. of occasions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Droperidol 5–10 mg i.v., fentanyl 0.025–0.075 mg i.v., nitrous oxide-oxygen</td>
<td>156</td>
</tr>
<tr>
<td>Droperidol 5–10 mg i.v., fentanyl 0.025–0.075 mg i.v., methohexitone 50–100 mg i.v., nitrous oxide-oxygen</td>
<td>153</td>
</tr>
<tr>
<td>Droperidol 5–10 mg i.v., fentanyl 0.025–0.075 mg i.v., methohexitone 50–100 mg i.v., nitrous oxide-oxygen halothane</td>
<td>49</td>
</tr>
<tr>
<td>Trichloroethylene-air analgesia*</td>
<td>4</td>
</tr>
<tr>
<td>Methoxyflurane-air analgesia*</td>
<td>9</td>
</tr>
<tr>
<td>No general anaesthetic given</td>
<td>2</td>
</tr>
</tbody>
</table>

*0.5% trichloroethylene in air (Tecota vaporizer).
0.2–0.5% methoxyflurane in air (Pentec draw-over vaporizer).

Monitoring.

During induction and maintenance of anaesthesia, the pulse is monitored by palpation of the radial artery, blood pressure by an oscillotonometer, and respiration by the excursions of the reservoir bag.

Remote monitoring during exposure to the radiation sources is carried out as follows.

(a) The patient is directly observed by means of closed-circuit television, using a Pye camera with 25-mm lens and the image displayed on a 48-cm screen monochrome receiver.

*Thalamonal, Janssen Pharmaceuticals.
(b) Heart rate and rhythm are monitored by an ultrasonic flow transmitter-detector (Rushmer, Baker and Stegall, 1966) (Sonicaid Model D 205) with the transducer placed over the precordium.

(c) Respiration rate and patency of the airway are monitored by a thermistor probe mounted at the junction of two small polythene tubes placed near the nose and mouth or by a thermocouple mounted on a headband (Gundersen, 1971). The output is displayed on the screen of the e.c.g. equipment as a respiratory pattern or on a ratemeter which incorporates an apnoea alarm.

(d) The electrocardiogram can be displayed if necessary on an oscilloscope or direct-writing machine (M. & I.E. Videograph 1A).

A two-way intercom enables the patient and observer to communicate verbally if necessary. The screened doors to the treatment room incorporate safety microswitches so that opening the doors will automatically cause the withdrawal of the radioactive sources into the safe; in an emergency, access to the patient can therefore be obtained within a few seconds. In the event of failure of the electricity supply to the unit, the sources are automatically returned to the safe under gravitational force.

**Morbidity and mortality.**

There were no deaths during the course of cathetron treatments. Complications encountered were usually minor and readily treated. Eight patients vomited or strained before or during the period in the treatment room, three patients doing so on more than one occasion. In no case was there evidence of inhalation of gastric contents or of pelvic damage. Nevertheless, we now give all patients Mist. Mag. Trisilicate 15 ml before anaesthesia to reduce gastric acidity (Taylor and Prys-Davies, 1966). Two patients developed postoperative chest infections—one of these developed recurrent infections after each treatment. In both cases these resolved satisfactorily with antibiotic therapy. Two patients displayed marked restlessness requiring the interruption of treatment and further sedation. One of these patients displayed acute anxiety during successive treatments and eventually was managed by general anaesthesia with endotracheal intubation throughout each treatment. One patient had marked haemorrhage from the uterus following dilatation. This necessitated postponement of cathetron treatment for vaginal packing and blood transfusion.

**Discussion**

The problems of anaesthesia of patients receiving cathetron treatment centre around the necessity for a patient who has been anaesthetized a few minutes before to be effectively managed from a remote position outside the treatment room. Anaesthesia by remote control has received the attention of several workers. Harrison and Bennet (1963) describe the management of children having courses of radiotherapy requiring up to 19 anaesthetics and advocate the use of a cotton-wood "butterfly" near the airway as a respiration monitor. Cullen (1963) anaesthetized patients receiving up to 30,000 rads over 45–105 minutes for intracranial tumours, using a Ruben valve and 9-metre length of tubing to the anaesthetic machine outside the chamber, and monitored blood pressure and e.c.g. by extended tubing and electrical leads. Browne, Boulton and Crichton (1969) avoided the need for repeated intubation by means of a modified oropharyngeal airway in patients receiving radioactive cobalt therapy on 10 occasions for retinoblastoma, and utilized the Cotel Keating pulse monitor. In the latter two papers, the authors monitored respiration by movements of the reservoir bag, and observed the patients by closed-circuit television. Since our patients are only sedated while in the treatment room, endotracheal tubes or oropharyngeal airways would not be tolerated; however, we have found temperature-change respiration probes to be a useful means of ensuring that respiration is adequate and that the airway is not obstructed. The alternative would be to maintain anaesthesia following dilatation of the cervix until the completion of each treatment; however, we feel that under these circumstances, the patency of the airway could not be assured without endotracheal intubation which is undesirable when repeated on several occasions.

Although ketamine has been used with success in this unit for other radiation therapy procedures, particularly in children, we have no experience of its use in cathetron therapy; but the high incidence of hypertension and emergence hallucinations might prove particularly disadvantageous in this group of patients. Paracervical block has been used by Olsen and Hormback (1970) for intrauterine insertion of radium. This procedure might be fraught with considerable difficulty when there is distortion of the pelvic anatomy by growth as in stage II and stage III carcinoma of the cervix.

Halothane possesses the advantage of a readily controllable level of light anaesthesia and rapid
recovery with a low rate of postoperative nausea and vomiting. Against this must be weighed the small but significant risk of hepatitis following multiple exposures to halothane within a short time (Mushin, Rosen and Jones, 1971). However, it is felt that this risk is acceptable in circumstances where the use of halothane is required to provide conditions which cannot be produced by other means for this essential treatment.

Some reports (Ashton, O'Connor and Williams 1963; Chambers, Sewell and Young, 1964) suggested an association between halothane, hepatitis, and exposure to radiation. While it is not possible to deny a coincidence of factors in the cases described in both these reports, the course of events could equally well have been due to a hypersensitivity reaction to multiple halothane exposures. Despite the report of Pennington (1968) who described the formation of at least toxic breakdown product of halothane following exposure of this substance to gamma-radiation, it is unlikely that the relatively small dose of radiation received by in-vivo halothane would have a significant effect on its breakdown. However, this breakdown might be important if halothane were repeatedly exposed to gammaradiation while in a vaporizer on an anaesthetic machine normally kept in proximity to the patient during treatment.

While a variety of anaesthetic techniques have been used in this series, the use of neuroleptanaesthesia has proved very satisfactory in most cases, combining the advantages of cardiovascular stability (Zauder et al., 1965), a rapid return to "tranquil semi-sedation", and a low emesis rate (Prys-Roberts and Kelman, 1967). Cardiac dysrhythmias have been notably absent, and this may be related to the protective influence of droperidol (Long, Dripps and Kelman, 1967). Cardiac dysrhythmias have been notably absent, and this may be related to the protective influence of droperidol (Long, Dripps and Price, 1967).

Since repeated treatments are required, and many of the patients are technically or medically unsuitable for other forms of treatment, it is important to make the anaesthetic procedures acceptable to the patient. The technique described is quite acceptable to most patients, despite the unhappy emotional state of many of those receiving this treatment.

ACKNOWLEDGEMENTS

I am grateful to Professor William W. Mushin, C.B.E., for his advice and encouragement, to Dr C. A. Joslin, F.F.R., D.M.R.T., for access to the case-notes of patients in his care, and to Mr E. K. Hillard, L.I.B.S.T., for the diagram and figures. Much of the monitoring equipment used was provided by Tenovus.

REFERENCES


ANESTHESIE POUR TRAITEMENT AU CATHETRON DU CANCER UTÉRIN

SOMMAIRE

La technique de l'anesthésie pour le traitement au cathétron du cancer de l'utérus doit comprendre une sédation préopératoire adéquate chez les patientes âgées et en mauvaise condition, une anesthésie générale de courte durée par la dilatation du col utérin et l'introduction des bougies de dilatation, et un rapide retour à l'état conscient avant d'isoler le patient dans la salle de traitement. Il a semblé que la meilleure association de médicaments était
une prémédication avec droperidol et fantanyl par voie i.m. et des doses intraveineuses supplémentaires de ces médicaments suivant les besoins pour produire une sédation légère. L'induction de l'anesthésie au méthohexitone est suivie d'un mélange protoxyde d'azote/oxygène avec en supplément du méthohexitone ou 0,5 à 1 pourcent d'halothane. La patiente redevient consciente rapidement avant d'être isolée dans la salle de traitement; la fréquence et rythme cardiaques, l'électrocardiogramme et al respira-
tion sont contrôlées à distance pendant son séjour dans
la salle de traitement et la patiente demeure sous observa-
tion par circuit fermé de télévision. L'auteur discute
d'autres techniques d'anesthésie et monitoring.

ANASTHESIE FÜR DIE CATHETRON-
BEHANDLUNG DES UTERUSCARCINOMS

ZUSAMMENFASSUNG
Das Vorgehen bei einer Anästhesie für die Cathetron-
Behandlung des Uteruscarcinoms muss umfassen: eine
adäquate präoperative Sedierung älterer Patientinnen in
schlechter körperlicher Verfassung, eine allgemeinnarkose
von kurzer Dauer für die Dilatation der Cervix und die
Einführung der Leitstift und eine rasche Wiedergewin-
nung des Bewusstseins, bevor die Patientin im Behand-
lungsraum isoliert wird. Als die wirksamste Medika-
mentenkombination hat sich eine vPrämedikation mit
Droperidol und Fentanyl intramuskulär mit zusätzlichen
intravenösen Gaben von dieser Mittel erwiesen, soweit
dies für eine leichte Sedierung erforderlich ist. Der
Narkoseeinleitung mit Methohexitone folgt lachgas-
Sauerstoff mit weiteren Gaben von Methohexitone oder
0,5–1 % Halothan. Das Bewusstsein wird rasch wieder-

ANESTESIA PARA EL TRATAMIENTO DEL
CARCINOMA DEL UTERO CON CATETRON

RESUMEN
La técnica de la anestesia para el tratamiento del
carcinoma del útero por catetron debe incluir una
sedación preoperatoria adecuada en pacientes ancianas
en mal estado de salud, anestesia general de corta
duración para la dilatación del cuello e introducción de
tubos de guía y una rápida recuperación de la conciencia
antes de que el paciente sea aislado en el cuarto de
tratamiento. La combinación más eficaz de medicamentos
ha resultado ser la premedicación con droperidol y fentanil
intramuscular con dosis intravenosas suplementarias de
estos medicamentos seguido necesario para producir una
sedación ligera. La inducción de la anestesia con meto-
hexitona es seguida por óxido nitroso-oxigeno con
incrementos de metohexitona o halotano al 0,5–1 por
ciento. Hay una rápida recuperación de la conciencia
antes de que el paciente sea aislado en el cuarto de
tratamiento; mientras esté en el cuarto de tratamiento, la
frecuencia y ritmo cardíacos, electrocardiograma y respira-
ción son monitorizados desde lejos y el paciente es
observado sobre una televisión de circuito cerrado. Son
discutidas otras técnicas anestésicas y de monitorización.