METHOXYFLURANE IN MAJOR ORAL SURGERY

BY

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SUMMARY

A series of cases undergoing major oral surgery such as mandibular osteotomy or ostectomy is described, using methoxyflurane as the main anaesthetic agent with nitrous oxide and oxygen. The anaesthetic technique is outlined, and the advantages of such are discussed with special reference to the immediate postoperative period.

The use of methoxyflurane (Penthrane) as an anaesthetic agent has not been popular in this country for a number of reasons. Foremost among these have been the prolonged induction time (Thomason, Wright and Holaday, 1962) and the delayed rate of recovery (Campbell, Hvolboll and Brechner, 1962), both due to the low vapour pressure and blood solubility of this agent. Because of its high lipid solubility, however, methoxyflurane is a potent and good analgesic drug and has been used in obstetrics for this sole reason (Major, Rosen and Mushin, 1966). In consequence of the lengthy induction time, its main use is limited to long surgical procedures, but its delayed time of recovery and sustained analgesic properties make it a suitable drug for use in cases in which these are desirable effects.

The surgical correction of mandibular deformity of a congenital or acquired nature may be accomplished, inter alia, by the techniques of osteotomy or ostectomy of either the ramus or body of the lower jaw. For aesthetic reasons the current tendency is to avoid an external scar by utilizing an intra-oral approach, a procedure the success of which has been greatly facilitated by modern anaesthetic techniques and the introduction of antibiotic therapy. Although a significant improvement is obtained in relation to masticatory efficiency and speech, the majority of patients are seeking an improvement in appearance and a restoration of facial harmony which, in itself, is invariably accompanied by a corresponding benefit from the psychological aspect.

The intra-oral techniques employed necessarily result in considerable postoperative oedema of a variable and often unpredictable degree. Operations which are confined to the body or horizontal part of the mandible may cause swelling of the floor of the mouth but those surgical procedures related to division or sagittal splitting of the ramus require extensive subperiosteal stripping of the bone, both to eliminate muscle tension post-operatively and also to ensure adequate access to the operative site. Consequently the degree of postoperative oedema in this area is greater and, in particular, tends to encroach upon the oropharyngeal space.

The patency of the oral airway is further restricted by the necessity to immobilize the mandible by intra-oral splints and the unavoidable oedema of the lips which have to be stretched and manipulated during the operation. While a nasopharyngeal tube may be reassuring in maintaining the airway, the lumen may become blocked by blood and mucus and some postoperative ooze from the intra-oral wounds is inevitable. The preservation of the airway is, therefore, the most important aspect of the postoperative care of such patients and continuous nursing supervision is essential during the first 48 hours. Although tracheostomy would be an obvious way of eliminating such problems, such a procedure would seem to be a negation of the principle of avoiding an external scar and does, in itself, carry certain inherent operative and postoperative complications. Consequently it has been deemed desirable to keep a nasal endotracheal tube in situ for several hours after termination of actual surgery. It was thought that the postoperative analgesic

The properties of methoxyflurane would help in such cases and reduce the need for narcotics and other drugs known to be respiratory depressants during the immediate postoperative period. It is well recognized that respiratory depressants inhibit the accessory muscles of respiration and thus increase the dangers of oedema of the glottis where this is a possibility.

In all, 27 cases involving major oral surgery are here reported in which methoxyflurane has been used for anaesthetic maintenance. The anaesthetic procedure is set out below.

**ANAESTHETIC TECHNIQUE**

The patients ranged in age from 13 to 51 years, and were all fit subjects, being free from anaemia as well as respiratory and cardiovascular disease. They were all to undergo major oral surgery (mandibular and/or maxillary osteotomy or osteotomy) for occlusal abnormalities and/or prognathism. All had cap splints cemented in position prior to operation.

Premedication consisted of perphenazine (Fentazin) 5 mg given intramuscularly 2 hours pre-operatively, and papaveretum 20 mg and hyoscine 0.4 mg 1 hour pre-operatively. Anaesthesia was induced with thiopentone (200-400 mg). This was followed immediately by spraying the nares with a prilocaine aerosol and the insertion of a few drops of castor oil to facilitate nasal intubation. Suxamethonium (50-100 mg) was administered and nasal intubation (usually blind) with a nasal streamline cuffed endotracheal tube was carried out. The cuff was inflated to just the correct size to cause an airtight fit of the tube in the trachea. Anaesthesia was maintained with nitrous oxide and oxygen. The pharynx was packed with 2-inch ribbon gauze, moistened slightly with catheter lubricant. Arterial pressure, pulse and ECG were continuously monitored. Within 10 minutes of the patient receiving IPPV and methoxyflurane the blood pressure began to fall. Within 20 minutes it had reached its lowest level. The lowest reached in any patient in this series was 60 mm Hg.

Operation time varied from 2 hours 15 minutes to 5 hours 15 minutes. Just prior to intermaxillary fixation, the pharyngeal pack was removed and the head was then extended slightly to facilitate the drainage of blood and secretions into the nasopharynx.

At the end of the operation the methoxyflurane was turned off and the patient's lungs ventilated with nitrous oxide and oxygen for a short time (up to 15 minutes) until spontaneous respiration recurred. The use of neostigmine was never necessary. When the tidal volume had reached at least 350 ml and the systolic pressure had returned to 100 mm Hg the patient was returned to the ward with the endotracheal tube in situ while breathing oxygen. Close supervision was carried out by medical and nursing staff; regular recording of pulse, blood pressure and tidal volume was made throughout the immediate postoperative period. Blood loss at operation was always minimal, averaging 350 ml, and replacement was rarely needed.

**Postoperative management.**

The patients remained unconscious for a considerable time. After an average of 2 hours some
involuntary movement occurred; after 3 hours they were rousable. They all remained calm and very little sedation was necessary, the first dose usually being given only after 12 hours. Perphenazine 5 mg i.m. was given 4-hourly, and the only analgesics used were pentazocine (Fortral) or dihydrocodeine (DF.118).

After consciousness had returned, 4-hourly physiotherapy was commenced. The patients tolerated the endotracheal tube extremely well and complained of no discomfort. The cuff was kept inflated until the tube was removed, which was always during the first postoperative morning (an average of 15 hours postoperatively). It was found that by keeping the cuff inflated, the tube was tolerated more easily. The explanation for this might be that an inflated cuff prevents the end of the endotracheal tube from irritating the tracheal mucous membrane on movement of the head. A refinement would be to use an endotracheal tube with two cuffs, one above the other, so that the seal would not be broken as one could be inflated before releasing the other cuff. This procedure would obviate any risk of damage to the trachea. So far, such an endotracheal tube is not available though tracheostomy tubes with two cuffs may be obtained.

In one case, however, a young man aged 17 who underwent an Obwegeser's ostectomy of the mandible, the external swelling was so considerable that the tube was kept in the trachea for a total period of 38 hours. The only medication given was perphenazine 5 mg every 4 hours, and even in this case the patient tolerated the tube extremely well.

There was always a degree of postoperative soft tissue oedema but there were no cases of respiratory embarrassment after extubation. Facilities for suction must be available. Equipment for reintubation (together with wire cutters and an Abelson cricothyrotomy needle) was kept closely at hand (Goldman, 1968) but since employing the technique described here no occasion for its use has arisen.

The perphenazine was usually discontinued after 24 hours, and the analgesics after 48 hours. Chest radiographs were taken on the first postoperative morning and repeated daily, if necessary. The intravenous infusion was continued until the patient was able to swallow fluids satisfactorily through a straw, usually after 36 hours. Dextrose 5 per cent was used, though every 24 hours 500 ml of amino-acids solution (Aminosol-Vitrum) was administered. Considerable benefit in the running of the continuous infusion was obtained from adding hydrocortisone 1 mg and heparin 500 units to each 500 ml of solution after the first 24 hours.

**Discussion**

In these cases undergoing major oral surgery it seemed advisable to leave the trachea intubated during the immediate postoperative period in order to safeguard the airway. The airway may be endangered by postoperative haemorrhage, haematoma or oedema of the glottis and must be safeguarded despite the jaws being firmly fixed together. Postoperative intubation is perhaps even more advisable where skilled intensive care or postoperative recovery facilities are not available or are limited.

Methoxyflurane was considered a suitable anaesthetic agent to use as it gave a prolonged period of recovery and produced good sedation, tube tolerance and analgesia. There was no necessity to give stronger analgesics, such as the opiates, with the inherent risk of producing respiratory depression. However, to achieve this, a concentration of methoxyflurane of at least 1.5 per cent had to be given throughout the period of maintenance of anaesthesia. The long operation times in these cases also served as an advantage for the use of this drug, as time was allowed for equilibrium to be achieved.

Nausea and vomiting have been reported as side effects of methoxyflurane (Roberts and Cam, 1964). To counteract these, perphenazine was used both pre-operatively and postoperatively. Active vomiting occurred in only two cases; this was at a time when the endotracheal tube was still in place, so there was little danger to the airway.

The hypotensive effect of methoxyflurane (Walker, Eggers and Allen, 1962) was used to advantage in these cases to provide a good operative field and to reduce the necessity for blood transfusion. The slow return of the blood pressure was an advantage in that it reduced postoperative haemorrhage and haematoma. As hypotension was used, adequate pulmonary ventilation was ensured by the use of IPPV.

There have been varied reports as to the effect
of methoxyflurane on the release of catecholamines (Israel, Criswick and Dobkin, 1962; Jacques and Hudon, 1963). No cardiac irregularity was seen in our cases during or after anaesthesia when adrenaline was used for local infiltration in a concentration of 1:300,000 and combined with an anti-arrhythmic amine (prilocaine).

There were no cases of postoperative chest infection and none of toxic reaction in the liver, or other sequelae. All cases left hospital within 10 days.

The technique described in this series was used for mandibular osteotomy or ostectomy. It could well be used for other cases of major oral surgery where the requirements are similar, such as condylectomy or excision of tumours.

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REFERENCES


METHOXYFLURANE DANS LA CHIRURGIE ORALE MAJEURE

SOMMAIRE

Les auteurs décrivent une série de cas, qui devaient subir une intervention chirurgicale orale majeure, comme l’ostéotomie ou l’ostectomie mandibulaire, et où le methoxyflurane constituait l’anesthésique principal avec protoxyde d’azote et oxygène. La technique d’anesthésie est décrite et les avantages en sont discutés, spécialement par rapport à la période postopératoire immédiate.

METHOXYFLUORAN BEI DER GROSSEN MUNDCHIRURGIE

ZUSAMMENFASSUNG

Es werden eine Reihe von Fällen mit größeren Mundoperationen wie Unterkieferosteotomie oder Ostektomie beschrieben, bei denen Methoxyfluoran als Hauptanästhetikum mit Lachgas und Sauerstoff verwendet wurde. Die Anästhesietechnik wird umrissen und ihre Vorteile werden mit einem besonderen Hinweis auf die unmittelbare postoperative Periode diskutiert.

BOOK REVIEW


The first edition of this volume was published only four years ago, in 1965. That it should be followed by a second edition within only three years is a testimonial to its well-deserved popularity. In spite of the relatively limited scope required of a book for students and residents, the authors contrive to mention within its covers most of the problems and techniques of modern anaesthesia. Indeed it is a marvel of compresion that they are able to convey the basic ideas underlying things like uptake and elimination of anaesthetic drugs, hypoxia during anaesthesia, electronarcosis, neuroleptanalgesia and the like.

The fact that the new edition contains 18 pages more than its predecessor does not imply the addition of any major material, but rather the careful and painstaking revision of each chapter, to bring it up to date. As previously, however, the material is presented in a simple and clear manner for those who seek an introduction to the specialty of anaesthesia and want to know what it is all about.

Apart, however, from anaesthesia for the dental surgery, for the out-patient and for obstetrics, the remainder of the work is concerned with general principles and not with specific techniques. The book is beautifully set out and well illustrated.

We would heartily commend it as previously.

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