ANAESTHESIA FOR ADENOTONSILLECTOMY*

A Critical Approach

BY

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ADENOTONSILLECTOMY is probably the commonest inpatient operation performed today and almost certainly accounts for at least half of all children exposed to the risk of anaesthesia and surgery. In 1956, in the Kingston Hospital Group, a total of 8,437 inpatient operations were performed. Of these 15.4 per cent were for adenotonsillectomy on patients aged 12 and under, representing 67.5 per cent of all operations performed on children during the year.

In view of the numerical importance of the operation, it seems desirable that the anaesthetic method commonly used for it should be critically scrutinized in the light of the changing techniques and current thought of modern anaesthesia.

For the sake of simplicity it is assumed that the commonest surgical technique is removal of the adenoids first, then dissection of the tonsils, and that the surgeon uses the Boyle-Davis gag.

THE STANDARD METHOD: A CRITICAL APPRAISAL

Premedication. Quinalbarbitone (Seconal) is given by mouth in a dose which it is hoped will ensure that the child will arrive in the operating theatre asleep and thus have no memory of the induction of anaesthesia. Here the choice of drug calls for comment. Quinalbarbitone is a drug which many prescribe and, maybe, take themselves to ensure a good night's sleep. Its time of action is about three to four hours. When used as premedication for adenotonsillectomy the child remains under its influence for some time after return to the ward, and this may well explain the delirium and postoperative restlessness associated with the drug. Its success depends on the child’s co-operation in swallowing it. It is thus often impossible to produce basal narcosis by this method in the nervous and unco-operative child, the very one for whom a pleasant experience of anaesthesia is most desirable.

A further objection is that it is usually given in capsules made up to either ¾ grain (50 mg) or 1½ grains (100 mg). In children drugs must be given according to body weight, but where they are administered in capsules precision is limited by the dose or multiples of the dose supplied by the makers of the capsules. There is also doubt as to whether the capsules dissolve satisfactorily in the alimentary tract. On two occasions, one has seen partially disintegrated capsules containing the white powder of the barbiturate in the postoperative vomitus. Had these children not vomited they would have continued to absorb their premedication for some time after the operation. As might be expected, neither child had been satisfactorily asleep in the anaesthetic room although the quinalbarbitone had been given the requisite hour and a half beforehand.

Some of these objections may be countered by the administration of the drug removed from the capsules and given in jam or orange juice with glucose. It may be given with greater precision in relation to the child’s weight in the form of the Elixir. In either case the child may refuse to swallow it, as the bitter taste is difficult to disguise. Even if it is swallowed, the child may
vomit, and it is impossible to determine the amount absorbed and how much supplementary drug should be given to replace that lost by vomiting. Assuming the drug is retained, anything taken by mouth may excite gastric secretion, and the more tasty the vehicle the greater the amount of fluid likely to be in the stomach. A fairly copious vomit is not uncommon during induction of anaesthesia following oral premedication, and the hazards of inhalation of gastric contents are too well known to require re-emphasis.

To sum up, there is much to be said for methods of premedication by other than the oral route.

**Induction.** The problems of induction may first stem from the possibility that the premedication may be ineffective or wrongly timed so that the child comes to the theatre awake, crying and uncooperative. Induction may be further embarrassed by excessive salivary and bronchial secretion. Let us assume, however, that the premedication leaves nothing to be desired and that the child arrives fast asleep. Anaesthesia may be induced without the child awakening with nitrous oxide or with ethyl chloride, though the latter's pungency may arouse those who are only lightly asleep. The difficulty of maintaining a clear airway then arises, for the child is undergoing the operation more often than not on account of upper respiratory obstruction. Add to this the masseteric spasm which often accompanies the use of ethyl chloride and the vomiting which may follow the premature insertion of an oral airway, and the anaesthetist's cup of agony is indeed filled to overflowing.

After induction, ether is administered until the patient is in the third plane of surgical anaesthesia. This is often time consuming, and although time should not be a primary consideration in anaesthesia and surgery, no one will deny that the temper of all concerned is improved if the list proceeds without undue delay.

It would be an advantage if the swift and smooth methods of induction of anaesthesia used in adults were to be applied to children.

**Maintenance of anaesthesia.** The patient has now reached the operating table, is placed in position and the surgeon inserts the Boyle-Davis gag. Some of our less experienced surgical colleagues find difficulty in inserting the gag quickly and without obstructing the patient's airway; they are often in doubt as to which size of tongue-plate is appropriate to the patient. Unless the gag is inserted quickly and the flow of nitrous oxide, oxygen and ether passed to the patient without delay through the side tube of the gag, the child is liable to recover sufficiently for the return of the pharyngeal and laryngeal reflexes. The operation is then held up while anaesthesia is deepened—not an easy matter with the gag in place. In any case, insufflation through the gag is an extremely inefficient method of administration and it is not easy to maintain a satisfactory level of anaesthesia unless the patient has been well saturated with ether in the first place. This involves a degree of intoxication beyond that which is tolerated in modern adult anaesthesia.

A further complication is that some surgeons use continuous suction through a nasopharyngeal catheter which minimizes the amount not only of blood but also of anaesthetic vapour entering the trachea. A disturbing feature of insufflation anaesthesia for adenotonsillectomy is this possibility of aspiration of blood into the respiratory tract. Steele and Anderson (1950) aspirated the trachea in 129 children following an insufflation anaesthetic and recovered bloody secretion from 125, or 96.9 per cent. Admittedly the amounts recovered from most of the patients were small, the average amount being 3.7 ml. However, more than 5 ml were recovered from 26 patients, more than 10 ml from 8 patients, while the greatest amount recovered was 15 ml. These results give rise to fears for the safety of the tracheobronchial tree if protected by posture alone. Ballantyne and MacDermott (1953) indicate that care in maintaining the extended head posture and in turning the patient to the postoperative position without allowing the head to flex will minimize the chance of blood entering the trachea.

A further objection to insufflation anaesthesia is that the surgeon inevitably inhales quantities of ether vapour blown in his direction by the patient; one has often wondered whether he is as competent at the end of a long list as at the beginning, and it has been known for a surgeon to be obliged to interrupt his operating in order
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to recover from the influence of his patient's anaesthetic.

The chief problem, then, of the maintenance phase of anaesthesia in adenotonsillectomy is the control and protection of the airway and control of the level of anaesthesia. In all other operations we jealously guard these controls; it seems illogical to abandon them in this operation.

The postoperative phase. The operation completed, the patient is returned to the ward. All are agreed on the importance of the correct position of the patient on the theatre trolley, the head down posture and skilled supervision by an experienced sister on return to bed.

Owing to the prolonged effects of the barbiturate premedication and the saturation with ether, the child remains for some time in the stage of delirium between anaesthesia and return to consciousness. Cyanotic episodes associated with retching, vomiting and laryngeal spasm are common and add to the very justifiable anxieties of the nursing staff.

After recovery of consciousness, the children appear pale and waxy, at least for the first 24 postoperative hours. Many are unco-operative and irritable. One might attribute this to the pain of the operation, but these troubles are notably absent when the patient is given an analgesic element in the premedication and if anaesthesia is maintained at a light level throughout the operation.

Is it, then, really fair that we should continue to inflict upon children an anaesthetic which we would not at the present day accept for ourselves?

MODERNIZATION OF ANAESTHESIA FOR ADENOTONSILLECTOMY

For some time the practice of paediatric anaesthesia has been gradually approximating to that for surgery in adults. This trend has been noticeable in recent papers on the subject at present under discussion (table I).

Following this trend it is suggested that children and adults may be anaesthetized by virtually identical methods. In other words a practicable technique for anaesthesia in adenotonsillectomy is:

Premedication

Papaveretum and scopolamine.

Induction

Intravenous thiopentone—suxamethonium—intubation.

<table>
<thead>
<tr>
<th>Table I</th>
<th>Techniques for adenotonsillectomy in children.</th>
<th>Standard anaesthetic technique for adult tonsillectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Premedication</strong></td>
<td>Quinalbarbitone and atropine</td>
<td>Papaveretum and scopolamine or quinalbarbitone and atropine</td>
</tr>
<tr>
<td></td>
<td>Quinalbarbitone, pethidine and atropine</td>
<td>Papaveretum and scopolamine</td>
</tr>
<tr>
<td></td>
<td>Papaveretum and scopolamine</td>
<td>Papaveretum and scopolamine</td>
</tr>
<tr>
<td><strong>Induction</strong></td>
<td>Ethyl chloride or N₂O and O₂ deep ether</td>
<td>N₂O and O₂, thiopentone i.v. deep ether</td>
</tr>
<tr>
<td></td>
<td>N₂O and O₂, thiocarbanilide light ether</td>
<td>N₂O and O₂, thiopentone i.v. and gallamine. Sometimes intubation</td>
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<td></td>
<td>N₂O and O₂, thiocarbanilide light ether</td>
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<tr>
<td><strong>Maintenance</strong></td>
<td>N₂O and O₂ and deep ether</td>
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<tr>
<td><strong>Method of maintenance</strong></td>
<td>Insufflation</td>
<td>Insufflation, sometimes endotracheal</td>
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<td>Endotracheal</td>
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</tbody>
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Maintenance

Nitrous oxide and oxygen with a trace of cyclopropane, trichloroethylene, ether, vinyl ether or halothane through an endotracheal tube.

Premedication. Anderson (1951) drew attention to the use of papaveretum and scopolamine as premedication in children. She pointed out that contrary to the general view they were tolerant of opiates and the dosage table suggested indicated that a 5-stone (31.6 kg) child would receive the full adult dose of 21 mg and 0.45 mg of papaveretum and scopolamine respectively. The full dosage table is given in table II. In the interests of greater precision and in order to keep dosage proportional to body weight, it is suggested that one minim (0.06 ml) of the standard papaveretum-scopolamine solution be given per 5 lb (2.7 kg) of body weight. This corresponds with Anderson's dosage for the smaller children but is a little lighter for the larger.

This premedication normally ensures that the child comes to the theatre, not necessarily asleep, but quiet, happy and sufficiently co-operative to allow the anaesthetist to perform venepuncture with ease.

There may be those who still demand that children be brought to the theatre asleep rather than risk the possibility of psychic trauma which may only be masked by papaveretum and scopolamine. As a basal narcotic, rectal thiopentone has proved very satisfactory. In a dose of 1 g. per 50 lb. (22.7 kg) it can be given with great precision in relation to body weight as a 5 per cent solution. Provided the full dose is retained it can almost be guaranteed that the child will be asleep within 10 minutes. Narcosis is at its greatest depth about 20 minutes later and if no anaesthetic were given, recovery of consciousness would be expected in about 90 minutes after the administration. Prolonged postoperative delirium is thus rarely seen. The timing of the administration must be exact and atropine must be given as soon as the child becomes drowsy.

In order to continue with the technique to be described, thiopentone induction is omitted and the endotracheal tube passed after an injection of suxamethonium only.

The disadvantages of rectal thiopentone include the possibility of a bowel action and soiling the bed linen and the extra responsibility thrown on the nursing staff by the care of the child in deepening narcosis before arrival in the theatre, though this should be no more exacting than after an effective dose of quinalbarbitone.

Induction. Thiopentone, 100 to 300 mg is

<table>
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<th>Body weight</th>
<th>Papaveretum (grain)</th>
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<tr>
<td>2 stone</td>
<td>1/9</td>
<td>1/450</td>
<td>5.6</td>
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<tr>
<td>3 stone</td>
<td>1/6</td>
<td>1/300</td>
<td>8.5</td>
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<tr>
<td>4 stone</td>
<td>1/4</td>
<td>1/200</td>
<td>12.7</td>
</tr>
<tr>
<td>5 stone</td>
<td>1/3</td>
<td>1/150</td>
<td>16.9</td>
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Anderson's dosage

Author's scale 1 minim/5 lb weight

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given intravenously. The readiness with which one may induce anaesthesia with thiopentone depends on the availability of a vein and the co-operation of the patient. In children, a vein can usually be found on the back of the hand, and the nurse who comes to the theatre with the child can help by grasping the forearm gently but firmly and flexing and extending the wrist for some little time before anaesthesia is induced. Following papaveretum-scopolamine premedication, there is seldom any show of fear on the part of the patient (figs. 1 and 2). The behaviour of a series of 100 children following venepuncture is given in table III.

The induction dose of thiopentone is followed by suxamethonium 15 to 25 mg, and after relaxation has become complete the trachea is intubated through the mouth. It is here that the method varies from normal adult practice, in that the necessity for removing the adenoids and the possibility of trauma to the narrow nasal air passages in children preclude intubation through the nose. The endotracheal tube should be fitted with a "nasal" connecting piece and should be attached to the catheter mount before intubation. The whole assembly is fixed with adhesive tape so that the tube emerges from the right side of the mouth and the catheter mount lies on the patient's chin (fig. 3).

Maintenance. Anaesthesia is maintained both before and after resumption of spontaneous respiration with nitrous oxide and oxygen with a trace of cyclopropane or a volatile agent. Recently traces of halothane (Fluothane) have been found to be satisfactory supplement to nitrous oxide and oxygen, enabling the patient to remain at a very light level of narcosis without coughing on the tube. In the operating theatre the Boyle-Davis gag is inserted by the surgeon. Timing is important so that the gag is placed in position while the mas-
seters are still relaxed by the suxamethonium given for intubation. The catheter mount connecting the tube to the anaesthetic machine should be fixed alongside the upright part of the Boyle-Davis gag so that the tube lies flat along the floor of the mouth (fig 3). The adenoids and left tonsil are removed and all bleeding arrested in the left tonsillar fossa. The tube is then transferred to the left side of the mouth by temporarily detaching the catheter mount from the expiratory valve, cutting the adhesive tape and carefully moving the tube so that it does not slip out of the trachea (fig. 4). The right tonsil is then removed, bleeding arrested and the operation completed.

This method ensures a pleasant, rapid induction for the patient and a clear airway at a light level of anaesthesia throughout the operation. The presence of the tube in the larynx reduces the chance of aspiration of blood and, if desired, a small pack may be placed round the tube for greater safety. Surgical access is good and is not seriously limited by the presence of the tube in the mouth; indeed on many occasions the right tonsil has been removed without the tube having to be transferred to the left side of the mouth. The surgeon does not inhale quantities of ether vapour.

The postoperative phase. The child recovers consciousness rapidly and in most cases remains quiet under the analgesia endowed by the premedication; he can sometimes even be induced to smile very shortly after the operation. He is rosy cheeked and does not show the waxy pallor well recognized as the sequel of deep ether narcosis. His wellbeing is reflected in his appetite for breakfast the following morning.

It may be objected that the tube passed through the mouth inevitably occupies part of the small operating space available to the surgeon particularly during the digital examination of the nasopharynx. To obviate this objection the tube can be accommodated between the tongue and a specially designed tongue-plate. Such an instrument was described by Humby and Hawksley (1943) for cleft palate surgery, while Monro (1948) reported on such an instrument specially made for use in tonsillectomy. A simple instrument has been made by cutting a slot down the centre of a standard Boyle-Davis tongue-plate, bevelling the edges of the slot on the lingual surface and fitting a small metal bridge at the distal end to prevent the tube wedging in the slot (fig. 5; Doughty, 1957). The tube can be accommodated out of sight of the surgeon under the tongue plate without obstruction to the airway. It is made in three sizes, the largest being suitable for adults, in whom a satisfactory anaesthetic for tonsillectomy may be given by this means and a nasal intubation avoided (fig. 6).
In using the gag with the slotted tongue plate, anaesthesia is induced as before and the tube passed orally, but instead of its being fixed on the right side of the mouth, it is placed centrally. It should not only be fixed centrally over the lips and teeth but it should be seen that the tongue lies symmetrically under the tube within the mouth. The surgeon then passes the gag with the slotted tongue plate into the mouth taking care that the central fixation of the tube is not disturbed. This takes some practice and the extra trouble may not be tolerated by the less patient surgeon. It is important that too small a size of tongue plate should not be used, as the tube will become obstructed as it curves over the bulge of the tongue beyond the end of the tongue plate. The use of this device avoids the need for changing the tube from one side to the other during the course of the operation and it enables both tonsillar beds to be under inspection simultaneously at the end of the operation.

In short, then, it is suggested that a technique widely used for adult tonsillectomy requires only slight modification to give very satisfactory anaesthesia for adenotonsillectomy in children.

DISCUSSION

The desirability of intubating children for adenotonsillectomy is controversial. Magill (1948) has expressed what may be the majority view as follows: "The necessity for intubation for the dissection of tonsils in children is open to question. Many experienced surgeons and anaesthetists will agree that a capable anaesthetist should be able to provide adequate facilities for a capable surgeon and protection for the patient without intubation." Baron and Kohlmoos (1951) state: "It is difficult to understand why in children endotracheal anaesthesia should be used for adenotonsillectomy. Anaesthetists have argued that they protect the patients' airway from the blood overflow that occurs in the hands of certain surgeons. This may be so in some instances, but it does not seem reasonable that an endotracheal tube should be used as a substitute for good surgery." It will be noted that both authorities stress that intubation should be unnecessary with capable surgery, yet it must be admitted that the tonsil session provides experience to many a novice surgeon and anaesthetist.

In considering the question one must assess the advantages and then count the cost. Intubation enables a rapid induction to be followed by maintenance at a light level of anaesthesia throughout the operation, with control of the airway, protection of the tracheobronchial tree from inspired blood and protection of the surgeon from the anaesthetic vapours. The patient, having been only lightly anaesthetized, recovers consciousness very rapidly, gives less trouble to the nursing staff and suffers negligible constitutional disturbance.

The cost of intubation is firstly the increase in complexity of anaesthetic technique. We accept this in adults, so why not in children? Of itself intubation does not guarantee a perfect airway. The problems of too long or too short a tube, kinking or compression of the tube may arise, but the prevention or solution of these difficulties is well within the competence of the average anaesthetist. Trauma inflicted by the laryngoscope is a possibility, but the perfect conditions provided by suxamethonium for intubation should make trauma inexcusable. We have progressed since 1930 when Moss declared: "ploughing up the pharynx with a laryngoscope in an attempt to dig out an epiglottis from a pool of bloody mucus is one of the least inspiring sights of modern anaesthesia."

There remains for consideration the danger of the immediate and late sequelae of damage to the
vocal cords and trachea. Laryngeal granulomata rarely occur in children, but glottic oedema and membraneous laryngotracheitis with sloughing of the mucous membrane may be fatal. Many of the cases reported may be attributed to a traumatic intubation, unsuitable lubricant on the tube, failure to suppress the cough reflex after intubation, too large a tube, or the presence of the tube in the trachea for an excessively long time. In this connection, Pender (1954) compared the incidence of the complications of intubation after neurosurgical operations with an average time of 138 minutes and after adenotonsillectomy with an average time of 41 minutes. In the neurosurgical group the incidence was 5.4 per cent of 334 operations, while in the tonsil group the incidence was only 0.3 per cent of 1,050 operations.

Collins and Granatelli (1956) recorded hoarseness and laryngeal stridor following intubation for tonsillectomy in 19 out of 500 cases—3.8 per cent. In all these there was evidence that the intubation had been difficult. The same authors, however, report similar symptoms in 21 out of 200 patients—10.5 per cent—who were given an insufflation anaesthetic without intubation. This lends substance to the view that the forceful blast of cold ether vapour impinging upon the larynx may be no less responsible for postoperative discomfort than a gentle intubation.

These figures are from American papers and there exist many instances in other contexts where transatlantic experiences do not accord with those in this country.

CONCLUSION

A critical approach to established methods of anaesthesia for adenotonsillectomy is long overdue and is worthy of the attention of anaesthetists.

Collins and Granatelli (1956) write: "The most neglected of anaesthetic procedures is that for tonsillectomy. The anaesthesia is usually considered to be too minor and too simple to deserve the attention of the expert. It is relegated to the novice and conditions are permitted that would not be tolerated in any adult patient. From the moment the child enters hospital he is shocked, psychologically, physiologically and pharmacologically."

These are strong words with which one may or may not agree. That many anaesthetists fight shy of the tonsil list is unfortunately true. It is possible that their aesthetic sense is offended by the outmoded and inelegant methods forced on them by the conservatism of their surgical colleagues. The removal of tonsils and adenoids is usually a child's first experience of hospital treatment. He must be conceded the same right as his parents to the skilled application of the methods of modern anaesthesia.

REFERENCES